UMT Research Outlook

January – Sep 2020

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Table of Contents

School of Science (SSC)

Department of Mathematics

Research Articles

1. Javaid, M., Imran, M., **Imran, M. A.,** Khan, I., & Nisar, K. S. (2020). Natural convection flow of a second grade fluid in an infinite vertical cylinder. *Scientific Reports, 10*(1), 8327. doi: 10.1038/s41598-020-64533-z.
(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 3.998)
Abstract: In current study natural convection flow of second grade fluid in an oscillating infinite vertical cylinder is investigated. The dimensionless governing equations for temperature and velocity are obtained by introducing the non-dimensional variables. Exact solutions for temperature and velocity field are computed by means of integral transformation. Solutions for cosine and sine oscillations of velocity field are introduced in the form of transient and post-transient arrangements. A special case for Newtonian fluid is obtained from general results and transients solutions are computed in terms of tables. In the end, the impact of dimensionless numbers (Grashof and Prandtl numbers) at different values of time is presented in graphical form and found that velocity for Newtonian fluid has greater values than the second grade fluid. Furthermore, there are some comparisons of calculated solutions with existing solutions in literature.
Keywords: *not available.*

2. Kashuri, A., **Iqbal, S.,** Liko, R., Gao, W., & Samraiz, M. (2020). Integral inequalities for s-convex functions via generalized conformable fractional integral operators. *Advances in Difference Equations, 2020*(1), 217. doi: 10.1186/s13662-020-02671-4. **(Sajid Iqbal (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 2.421) (SKT Campus)**
Abstract: We introduce new operators, the so-called left and right generalized conformable fractional integral operators. By using these operators we establish new Hermite–Hadamard inequalities for *s*-convex functions and products of two *s*-convex functions in the second sense. Also, we obtain two interesting identities for a differentiable function involving a generalized conformable fractional integral operator. By applying these identities we give Hermite–Hadamard and midpoint-type integral inequalities for *s*-convex functions. Different special cases have been identified and some known results are recovered from our general results. These results may motivate further research in different areas of pure and applied sciences.
Keywords: *hermite–hadamard inequality, hölder inequality, power mean inequality, convexity, conformable fractional integral, general fractional integral operators.*

3. **Ahmed, N.,** Rafiq, M., Baleanu, D., Alshomrani, A. S., & **Aziz-ur-Rehman, M.** (2020). Positive explicit and implicit computational techniques for reaction–diffusion epidemic model of dengue disease dynamics. *Advances in Difference Equations, 2020*(1), 202. doi: 10.1186/s13662-020-02622-z.(**Nauman Ahmed, Muhammad Aziz-ur-Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 2.421)**
Abstract: The aim of this work is to develop a novel explicit unconditionally positivity preserving finite difference (FD) scheme and an implicit positive FD scheme for the numerical solution of dengue epidemic reaction–diffusion model with incubation period of virus. The proposed schemes are unconditionally stable and preserve all the essential properties of the solution of the dengue reaction diffusion model. This proposed FD schemes are unconditionally dynamically consistent with positivity property and converge to the true equilibrium points of dengue epidemic reaction diffusion system. Comparison of the proposed scheme with the well-known existing techniques is also presented. The time efficiency of both the proposed schemes is also compared, with the two widely used techniques.

Keywords: *structure preserving methods, finite difference schemes, dengue model, diffusion epidemic system, numerical simulations.*

4. **Ahmed, N.**, Korkmaz, A., Rafiq, M., Baleanu, D., Alshomrani, A. S., **Rehman, M. A.,** & Iqbal, M. S. (2020). A novel time efficient structure-preserving splitting method for the solution of two-dimensional reaction-diffusion systems. *Advances in Difference Equations, 2020*(1), 197. doi: 10.1186/s13662-020-02659-0. (**Nauman Ahmed, M. A. Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 2.421)**
Abstract: In this article, the first part is concerned with the important questions related to the existence and uniqueness of solutions for nonlinear reaction-diffusion systems. Secondly, an efficient positivity-preserving operator splitting nonstandard finite difference scheme (NSFD) is designed for such a class of systems. The presented formulation is unconditionally stable as well as implicit in nature and even time efficient. The proposed NSFD operator splitting technique also preserves all the important properties possessed by continuous systems like positivity, convergence to the fixed points of the system, and boundedness. The proposed algorithm is implicit in nature but more efficient in time than the extensively used Euler method.
Keywords: *operator splitting finite difference scheme, reaction-diffusion models, positivity, numerical simulations.*

5. **Malik, A., Ahmed, S., & Mahmood, S.** (2020). Some bianchi type cosmological models in f(R, φ) gravity. *New Astronomy, 81*, 101418. doi: https://doi.org/10.1016/j.newast.2020.101418. **(Adnan Malik, Shahzad Ahmed, Saqib Mahmood (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.058) (SKT Campus)**
Abstract: In this paper, we study three different Bianchi type line elements, like Bianchi type-I (BT-I), Bianchi type-III (BT-III) and Kantowski Sachs space-time in the framework of $f(R, \phi)$ theory of gravity, where R and ϕ represent the Ricci scalar and the scalar potential function respectively. We find the exact solution of vacuum field equations of $f(R, \phi)$ theory by taking valuable assumption that the expansion scalar ϑ is proportional to the shear scalar σ that is P=Qn. We also see some physical parameters like Hubble parameter H, volume scale factor V, average scale factor a, the expansion scalar ϑ and shear scalar σ for each metric. Finally, we analyze that the exact solution satisfied the present cosmic condition of universe and singularity (Big-Bang) is also justified through our evaluated solutions.
Keywords: *gravitation, anisotropic universe, dark energy.*

6. **Malik, A., Ahmad, S., & Ahmad, S.** (2020). Energy bounds in f(R, φ) gravity with anisotropic backgrounds. *New Astronomy, 79*, 101392. doi: https://doi.org/10.1016/j.newast.2020.101392. **(Adnan Malik, Shahzad Ahmad, Sagheer Ahmad (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.058) (SKT Campus)**
Abstract: This research work discusses the energy bounds in $f(R, \phi)$ with anisotropic background. For this purpose, a BT-I cosmological model in $f(R, \phi)$ is considered. After calculating field equations, we find the exact solutions by considering field equations of the $f(R, \phi)$ gravity model. To investigate the cosmic expansion, we explore the model $f(R, \phi)$ for f(R,φ)=R(1+α2R2φ2) and f(R,φ)=φ(R+αR2). We formulate the inequalities in energy constraints and use the Hubble, deceleration, jerk and snap parameters to evaluate the feasibility of the models given above. Graphical analysis shows that the NEC, WEC and DEC are satisfied with the appropriate anisotropy values and model parameters for the given above two $f(R, \phi)$ gravity models. In fact, for both of considered models, SEC is violated and models are found favorable for cosmic expansion.
Keywords: *gravitation, anisotropic systems, energy conditions.*

7. **Ahmed, N.,** Ali, M., Rafiq, M., Khan, I., Nisar, K. S., **Rehman, M. A.,** & Ahmad, M. O. (2020). A numerical efficient splitting method for the solution of two dimensional susceptible infected recovered epidemic model of whooping cough dynamics: Applications in bio-medical engineering. *Computer Methods and*

Programs in Biomedicine, 190, 105350. doi: https://doi.org/10.1016/j.cmpb.2020.105350. (**Nauman Ahmed, M. A. Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 3.632)**

Abstract: *Background and Objective* The positivity property of the non-linear dynamical systems is one of the essential features in different fields of bio-medical engineering, science and many more. The state variables, involving in the models, describing the natural phenomenon such as concentration, density and population size etc. must be positive. Therefore, the computing techniques used to solve the system of non-linear differential equations must be consisted with the continuous nature of the models. But, unfortunately there are some existing techniques in the literature that do not preserve the positivity property, especially for the multi-space dimensional models. So there is a gap in the literature that should be filled up, by constructing the positivity preserving numerical algorithms. In this study, we consider a susceptible-infected-recovered (SIR) reaction diffusion epidemic model in two space dimensions from biomedical engineering and solved numerically to observe the behavior of the model. Since the state variables involved in this system are population densities therefore we design a novel computational method which is time efficient because of its splitting structure and holds the positivity as well as other important structure of epidemic system. *Methods* Three different computational techniques are designed to examine the numerical solution of SIR model of infectious disease. Two approaches are well-known existing computing methods named as forward Euler finite difference (FD) method and backward Euler operator splitting finite difference (OS-FD) method. The third approach is operator splitting nonstandard finite difference (OS-NSFD) method which is devised by using the NSFD rules. *Results* The proposed OS-NSFD technique retains efficiently the stability of equilibria as well as the positivity. Graphical behavior depicts that the existing computing methods can not get success to preserve the structure of the epidemic system of whooping cough dynamics. At the same time OS-NSFD computing method is proven to be reliable and suitable for the system of bio-medical engineering mathematically and graphically. *Conclusion* A reliable and novel computing technique is developed for the solution of two dimensional reaction diffusion problem. This technique preserves all the imperative characteristics of the model under study. Also the time efficiency of this method makes it easy to find the solution of physical system in two space dimension. The comparison with other techniques shows the efficacy and reliability of the designed technique.

Keywords: *operator splitting finite difference scheme, reaction diffusion models, positivity, numerical simulations.*

8. Prasad, R., Ali, M., Xiang, Y., & **Khan, H.** (2020). A double decomposition-based modelling approach to forecast weekly solar radiation. *Renewable Energy, 152*, 9-22. doi: https://doi.org/10.1016/j.renene.2020.01.005. **(Huma Khan (Mathematics/SSC) Web of Science JCR Listed (IF: 6.274)**

Abstract: To meet the future energy demand and avert any looming crises, efforts are being carried out to utilize sustainable and renewable energy resources. In this paper, the naturally occurring non-linearity and non-stationarity deficiencies within the climatological predictors to forecast solar radiation (Rdn) are resolved via a multivariate empirical mode decomposition method (MEMD). First, a set of antecedent weekly lags at timescale (*t*-1) of input datasets were collated and then were divided into training and testing subsets. The MEMD method is restricted to dissolve the training and testing climatic data independently into intrinsic modes functions (IMFs). As the numbers of total IMFs were very large, the singular value decomposition (SVD) algorithm is accustomed for dimensionality reduction simultaneously capturing the most relevant oscillatory features embedded within the IMFs. Finally, the random forest (RF) model is applied to forecast Rdn at selected solar-rich regions in Australia. The resulting hybrid MEMD-SVD-RF model was established as a consequence of the aforementioned modelling strategy. The results are benchmarked with other comparative models. The hybrid MEMD-SVD-RF model generates better and reliable forecasts having significant implications for renewable and sustainable energy applications and resources management.

Keywords: *solar radiation, multivariate ensemble mode decomposition, MEMDSVD, random forest, energy.*

9. Abbas, M., Lael, F., & **Saleem, N.** (2020). Fuzzy b-Metric Spaces: Fixed Point Results for ψ-Contraction Correspondences and Their Application. *Axioms, 9*(2), 36. **(Naeem Saleem (Mathematics/SSC) SJR**
Abstract: In this paper we introduce the concepts of ψ -contraction and monotone ψ -contraction correspondence in "fuzzy b -metric spaces" and obtain fixed point results for these contractive mappings. The obtained results generalize some existing ones in fuzzy metric spaces and "fuzzy b -metric spaces". Further we address an open problem in b -metric and "fuzzy b -metric spaces". To elaborate the results obtained herein we provide an example that shows the usability of the obtained results.
Keywords: *fixed point, correspondence, fuzzy b-metric space, b-metric space.*

10. Na, W., Shah, N. A., Tlili, I., & **Siddique, I.** (2020). Maxwell fluid flow between vertical plates with damped shear and thermal flux: Free convection. *Chinese Journal of Physics, 65*, 367-376. doi: https://doi.org/10.1016/j.cjph.2020.03.005. **(Imran Siddique (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**
Abstract: In this article, we studied free convection flow of Maxwell fluid between two parallel plates a distance d apart from each other. The Caputo time-fractional derivative is used in model and the model is fractionalized through mechanical laws (generalized shear stress constitutive equation and generalized Fourier's law). Closed form solutions are found by means of Laplace and sine-Fourier transforms which are suitable for our boundary conditions. The solutions are expressed in the form of Mittag–Leffler function and generalized G–function of Lorenzo and Hartley. The viscous fractional and ordinary Maxwell and fractional model are presented as special cases. The effects of fractional and physical parameters are graphically illustrated.
Keywords: *free convection, maxwell fluid, damped shear and thermal flux, caputo time-fractional derivative.*

11. Ullah, N., Rehman, H. U., **Imran, M. A.,** & Abdeljawad, T. (2020). Highly dispersive optical solitons with cubic law and cubic-quintic-septic law nonlinearities. *Results in Physics, 17*, 103021. doi: https://doi.org/10.1016/j.rinp.2020.103021. **(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 4.019)**
Abstract: In this paper, the Kudryashov's method and generalized tanh method (GTM) are employed to retrieve the new distinct optical solitons for highly dispersive NLSE. These two schemes effectively acquire the exact solution of the model in the form of dark, singular, singular periodic and bright-singular combo optical solitons. These solutions assist the mathematicians and physicians to realize the physical phenomena of present model. The solutions in presents work indicate that these schemes offer us an influential mathematical tools for solving NLSEs in various areas of applied sciences. In addition, the graphical illustrations of some solutions are also illustrated.
Keywords: *Kudryashov's method, generalized tanh method, cubic-quintic-septic law, cubic law, highly dispersive solitons.*

12. **Ahmed, N.,** Rafiq, M., Baleanu, D., **Aziz-ur-Rehman, M.**, I., Ali, M., & Nisar, K. S. (2020). Structure preserving algorithms for mathematical model of auto-catalytic glycolysis chemical reaction and numerical simulations. *The European Physical Journal Plus, 135*(6), 522. doi: 10.1140/epjp/s13360-020-00539-w. **(Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 3.228)**
Abstract: This paper aims to develop positivity preserving splitting techniques for glycolysis reaction–diffusion chemical model. The positivity of state variables in the glycolysis model is an essential property that must be preserved for all choices of parameters. We propose two splitting methods that remain dynamically consistent with the continuous glycolysis reaction– diffusion model. The proposed methods converge to a true steady-state or fixed point under the given condition. On contrary to the classical operator splitting finite difference methods,

we use nonstandard finite difference theory to propose a new class of operator splitting techniques.
Keywords: *not available.*

13. **Imran, M. A.** (2020). Application of fractal fractional derivative of power law kernel (FFP0Dxα,β) to MHD viscous fluid flow between two plates. *Chaos, Solitons & Fractals, 134*, 109691. doi: https://doi.org/10.1016/j.chaos.2020.109691. **(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**
Abstract: In this problem, I have studied the application of newly introduced fractal fractional operators with power law kernel in fluid dynamics. We Considered the MHD viscous fluid flow between two plates such that the upper plate is in motion with constant velocity while the lower plate is at rest. The governing equation developed from the problem can be formulated withe fractal fractional derivative operator with power law kernel. The proposed fractal fractional model can be solved by means of Laplace transform technique and obtained exact solutions. To see the impact of magnetic field M, fractional α as well as fractal parameter β on the fluid velocity field, we plotted some graphs through MathCad software and presented in the graphical section. As a result, we found that for larger values of α and β, a decay in velocity of the fluid was observed. Further, fractal fractional model more slow down the velocity of the model in comparison of fractional only. Therefore, a combined approach of fractal fractional explains the memory of the function better than fractional only.
Keywords: *fractal fractional derivative, viscous fluid, power law kernel, couette flow.*

14. **Tabassum, M. F., Saeed, M.,** Akgül, A., Farman, M., & Chaudhry, N. A. (2020). Treatment of HIV/AIDS epidemic model with vertical transmission by using evolutionary Padé-approximation. *Chaos, Solitons & Fractals, 134*, 109686. doi: https://doi.org/10.1016/j.chaos.2020.109686.**(Muhammad Farhan Tabassum, Muhammad Saeed (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**
Abstract: Human Immunodeficiency Virus (*HIV*) infection has become a significant infectious disease for both developed and developing countries that can contribute to the acquired immunodeficiency syndrome (*AIDS*). In this study a nonlinear mathematical model for the transmission of *HIV*/*AIDS* has been proposed and discussed in a populace of changing size with transfer of infection. The theorems and propositions have been constructed for well-posed-ness and bounded-ness of the model respectively. Evolutionary Padé-approximation (*EPA*) technique has been used for the treatment of this nonlinear mathematical model. Initial conditions are converted into constraints and constraints' problem is transformed into unconstrained by using penalty function. In the suggested *EPA* method, no step lengths have to be chosen, also converges to a steady state point is proved. The model for the transmission of *HIV*/*AIDS* also solved by using non-standard finite difference (*NSFD*) scheme and results were compared, simulations justify our outcomes more efficient and compact. Finally, a convergence and error analysis evidence that the convergence speed of *EPA* is superior that of the *NSFD*.
Keywords: *HIV/AIDS transmission model, padé-approximation, differential evolution, non-standard finite difference, stability analysissensitivity analysis.*

15. **Iqbal, Z., Ahmed, N.,** Baleanu, D., Rafiq, M., Iqbal, M. S., & **Aziz-ur-Rehman, M.**,(2020). Structure preserving computational technique for fractional order Schnakenberg model. *Computational and Applied Mathematics, 39*(2), 61. doi: 10.1007/s40314-020-1068-1.(**Zafar Iqbal, Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 2.037)**
Abstract: The current article deals with the analysis and numerical solution of fractional order Schnakenberg (S-B) model. This model is a system of autocatalytic reactions by nature, which arises in many biological systems. This study is aiming at investigating the behavior of natural phenomena with a more realistic and practical approach. The solutions are obtained by applying the Grunwald–Letnikov (G–L) finite difference (FD) and the proposed G–L nonstandard finite difference (NSFD) computational schemes. The proposed formulation is explicit

in nature, strongly structure preserving as well as it is independent of the time step size. One very important feature of our proposed scheme is that it preserves the positivity of the solution of continuous fractional order S-B model because the unknown variables involved in this system describe the chemical concentrations of different substances. The comparison of the proposed scheme with G–L FD method reflects the significance of the said method.

Keywords: *fractional order differential equations, schnakenberg model, grunwald–letnikov approach, structure preserving method.*

16. **Iqbal, Z., Ahmed, N.,** Baleanu, D., Adel, W., Rafiq, M., **Aziz-ur Rehman, M.,** & Alshomrani, A. S. (2020). Positivity and boundedness preserving numerical algorithm for the solution of fractional nonlinear epidemic model of HIV/AIDS transmission. *Chaos, Solitons & Fractals, 134*, 109706. doi: https://doi.org/10.1016/j.chaos.2020.109706.(**Zafar Iqbal, Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

Abstract: In this article, an integer order nonlinear HIV/AIDS infection model is extended to the non-integer nonlinear model. The Grunwald Letnikov nonstandard finite difference scheme is designed to obtain the numerical solutions. Structure preservence is one of the main advantages of this scheme. Reproductive number R_0 is worked out and its key role in disease dynamics and stability of the system is investigated with the following facts, if $R_0 < 1$ the disease will be diminished and it will persist in the community for $R_0 > 1$. On the other hand, it is sought out that system is stable when $R_0 < 1$ and $R_0 > 1$ implicates that system is locally asymptotically stable. Positivity and boundedness of the scheme is also proved for the generalized system. Two steady states of the system are computed and verified by computer simulations with the help of some suitable test problem.

Keywords: *HIV/AIDS disease transmission, Structure preserving algorithm, Fractional order epidemic model, Simulations.*

17. **Manzoor, R., Adeel, M., & Saeed, M.** (2020). Dynamics of collapsing stellar filament and exotic matter. *International Journal of Modern Physics D, 29*(05), 2050036. doi: 10.1142/s0218271820500364.(**Rubab Manzoor, M. Adeel, Muhammad Saeed (Mathematics/SSC) Web of Science JCR Listed (IF: 2.154)**

Abstract: This paper studies the collapse of stellar filaments in the presence of dark matter (DM). We use f(R) gravity to involve DM in the collapse. We apply Darmois junction conditions (DJCs) on the surface of collapsing boundary Σ and obtain the collapse equation. The radial pressure associated with the seen matter is found to be nonzero at Σ. We then use Starobinsky model, f(R) = R + αR2, as a candidate of DM to obtain stability criteria (SC) of the collapsing body. It is found that the stability of filamentary structure relates radial pressure of baryonic directly with the gravitational effects of DM. Stability of polytropic family of filaments are studied by applying polytropic equation of state to baryonic contribution. For all polytropic stable filaments, it turns out that the visible matter density is exponentially linked to effects of DM. Finally, we discuss connection between exotic terms and gravitational waves (GW). It is theoretically indicated that the presence of DM can affect the GW propagation.

Keywords: *f(R) theory, dark matter, galactic filament, gravitational collapse, gravitational waves.*

18. **Idrees, B., Zafar, S., Rashid, T.,** & Gao, W. (2020). Image encryption algorithm using S-box and dynamic Hénon bit level permutation. *Multimedia Tools and Applications, 79*(9), 6135-6162. doi: 10.1007/s11042-019-08282-w.**(Bazgha Idrees, Sohail Zafar, Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 2.313)**

Abstract: For the secure transmission of data through the medium of internet, images have significant importance. Image encryption provides secure transmission of images by converting recognizable form of image

into an unrecognizable form. Chaos is considered as a natural required ingredient for cryptography applications, by providing unpredictability, sensitivity of initial state and erogodicity. Therefore from the last decade, a number of chaos-based cryptosystems have been developed for the protection of transmitted images' content. In this paper, a chaos based algorithm is developed and experimented on six different standard empirical images. The proposed cryptosystem is based on substitution-permutation network (SPN) with cipher block chaining (CBC) mode of operation. A novel algorithm is proposed for the construction of substitution box by using chaotic sine map, which is applied on a block-input of bytes, followed by a permutation based on discretized Hénon map, which is applied on a block-input of bits instead of bytes. The hyper chaotic Lü system, which is nonlinear and produces discrete values with long orbits, is used as pseudorandom generator to set new values to control parameters of discretized Hénon map for bit-permutation for each block. Moreover, proposed bit-permutation is applied by a matrix formulation which accelerates the bit permutation process for a block-input. Security analysis and results obtained from simulations show that cryptosystem is good resistant to various well-known attacks and have good key space therefore is reliable for secure transmission of images.

Keywords: *image encryption . s-box . bit-permutation . hénon map.*

19. **Riaz, M. B.,** & Iftikhar, N. (2020). A comparative study of heat transfer analysis of MHD Maxwell fluid in view of local and nonlocal differential operators. *Chaos, Solitons & Fractals, 132*, 109556. doi: https://doi.org/10.1016/j.chaos.2019.109556. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

    Abstract: In this paper, a comparative analysis is carried out to study the unsteady flow of a MHD Maxwell fluid in the presence of Newtonian heating near a vertical plate. Maxwell fluid is modeled for integer order derivative, Caputo (C), Caputo-Fabrizio (CF) and Atangana-Baleanu (ABC) fractional-time derivatives. The Laplace transform, inversion algorithm and the convolution theorem are used in this paper to derive solutions to predict the behavior of temperature and velocity. To see the effectiveness of the differential operator, especially the effect of each fractional order, graphical study is carried out in order to show effect of magnetic effect (M) and Maxwell fluid parameter (λ) on temperature and velocity profiles for C, CF and ABC. A comparison is made for C, CF and ABC models for temperature and velocity in tabular form.

    Keywords: *fractional-time derivatives, inversion algorithm, laplace transform, local and nonlocal kernels, maxwell fluid, magnetic effect, newtonian heating.*

20. Bashir, Z., Malik, M. G. A., Afridi, F., & **Rashid, T.** (2020). The algebraic and lattice structures of type-2 intuitionistic fuzzy sets. *Computational and Applied Mathematics, 39*(1), 26. doi: 10.1007/s40314-019-1008-0. **(Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 2.037)**

    Abstract: Type-2 intuitionistic fuzzy sets are proposed as functions from non empty set U to TTTT where $T=\{(\mu,\nu):\mu+\nu\leq 1,\mu\geq 0,\nu\geq 0\}T=\{(\mu,\nu):\mu+\nu\leq 1,\mu\geq 0,\nu\geq 0\}$ and TTTT is the set of all mappings from TT to TT. The members of TTTT are called intuitionistic fuzzy values (IFV). In this paper, we develop a mathematical framework for IFVs by defining a set of generalized operations on TTTT and proved it to be an algebra. The other important properties like convexity, normality of IFVs and many important subalgebras are also explored and studied. Furthermore, two partial orders based on generalized operations are defined, which enable us to study the lattices in TTTT.

    Keywords: *type-2 fuzzy sets, type-2 intuitionistic fuzzy sets, intuitionistic fuzzy values, algebra.*

21. **Ahmed, N.,** Ali, M., Baleanu, D., Rafiq, M., & **Aziz-ur Rehman, M.,** (2020). Numerical analysis of diffusive susceptible-infected-recovered epidemic model in three space dimension. *Chaos, Solitons & Fractals, 132*, 109535. doi: https://doi.org/10.1016/j.chaos.2019.109535. **(Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

Abstract: In this article, numerical solution of three dimensional susceptible-infected-recovered (SIR) reaction-diffusion epidemic system is furnished with a time efficient operator splitting nonstandard finite difference (OS-NSFD) method. We perform the comparison of proposed OS-NSFD method with popular forward Euler explicit finite difference (FD) method and time efficient backward Euler operator splitting finite difference (OS-FD) implicit method. The proposed OS-NSFD method is implicit in nature but computationally efficient as compared to forward Euler explicit (FD) scheme. The numerical stability and bifurcation value of transmission coefficient for SIR reaction-diffusion epidemic system is also investigated with the aid of Routh–Hurwitz method. At the end, we give two numerical experiments and simulation. In first experiment, all the numerical schemes are compared with the help of simulations. In second experiment we show the simulations of proposed NSFD technique at different values of parameters. Also we discuss the importance of transmission rate to control the spread of disease with the help of simulations.

Keywords: *operator splitting methods, nonstandard finite difference schemes, positivity, sir epidemic model, numerical stability, bifurcation value.*

22. Karapınar, E., Abbas, M., & **Farooq, S.** (2020). A Discussion on the Existence of Best Proximity Points That Belong to the Zero Set. *Axioms, 9*(1), 19. doi: https://doi.org/10.3390/axioms9010019. **(Sadia Farooq (Mathematics/SSC) SJR**

Abstract: In this paper, we investigate the existence of best proximity points that belong to the zero set for the αp -admissible weak (F,ϕ) -proximal contraction in the setting of M-metric spaces. For this purpose, we establish ϕ -best proximity point results for such mappings in the setting of a complete M-metric space. Some examples are also presented to support the concepts and results proved herein. Our results extend, improve and generalize several comparable results on the topic in the related literature.

Keywords: *m-metric space, proximal αp-admissible, αp-admissible weak (F,φ)-proximal contraction, G-proximal graphic contraction, φ-best proximity point.*

23. **Mardan, S. A., Rehman, M., Noureen, I., & Jamil, R. N.** (2020). Impact of generalized polytropic equation of state on charged anisotropic polytropes. *The European Physical Journal C, 80*(2), 119. doi: 10.1140/epjc/s10052-020-7647-x. **(Syed Ali Mardan, Mudasar Rehman, Ifra Noureen, Raja Noshad Jamil (Mathematics/SSC) SJR**

Abstract: In this paper, generalized polytropic equation of state is used to get new classes of polytropic models from the solution of Einstein-Maxwell field equations for charged anisotropic fluid configuration. The models are developed for different values of polytropic index n=1, 12, 2n=1, 12, 2. Masses and radii of eight different stars have been regained with the help of developed models. The speed of sound technique and graphical analysis of model parameters is used for the viability of developed models. The analysis of models indicates they are well behaved and physically viable.

Keywords: *not available.*

24. **Ali, A.**, Milovanović, E., Matejić, M., & Milovanović, I. (2020). On the Upper Bounds for the Degree Deviation of Graphs. *Journal of Applied Mathematics and Computing, 62*(1), 179-187. doi: 10.1007/s12190-019-01279-6. **(Akbar Ali (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.242) (SKT Campus)**

Abstract: Let *G* be a simple connected non-trivial graph of order *n*, size *m*, and vertex degree sequence (d1,d2,…,dnd1,d2,…,dn). The first Zagreb index M1M1, forgotten index *F* and inverse degree *ID* are the graph invariants defined as M1(G)=∑ni=1d2iM1(G)=∑i=1ndi2, F(G)=∑ni=1d3iF(G)=∑i=1ndi3 and ID(G)=∑ni=11diID(G)=∑i=1n1di, respectively. A graph is said to be regular if all of its vertices have the same degree and otherwise, it is called a nonregular graph. For the quantitative topological characterization of the nonregularity of graphs, the graph

invariants s(G)=∑ni=1||di−2mn||s(G)=∑i=1n|di−2mn| and Var(G)=1n∑ni=1(di−2mn)2Var(G)=1n∑i=1n(di−2mn)2 may be used. In this paper, some upper bounds for $s(G)$ that reveal connections between $s(G)$ and M1(G)M1(G), $F(G)$, $ID(G)$, $Var(G)$ are obtained.

Keywords: *irregularity of graph, degree deviation, first zagreb index, forgotten topological index, inverse degree.*

25. **Ahmed, N.,** Fatima, M., Baleanu, D., Nisar, K. S., Khan, I., **Aziz-ur Rehman, M.**, . . . Ahmad, M. O. (2020). Numerical Analysis of the Susceptible Exposed Infected Quarantined and Vaccinated (SEIQV) Reaction-Diffusion Epidemic Model. *Frontiers in Physics, 7*(220). doi: 10.3389/fphy.2019.00220.**(Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: In this paper, two structure-preserving nonstandard finite difference (NSFD) operator splitting schemes are designed for the solution of reaction diffusion epidemic models. The proposed schemes preserve all the essential properties possessed by the continuous systems. These schemes are applied on a diffusive SEIQV epidemic model with a saturated incidence rate to validate the results. Furthermore, the stability of the continuous system is proved, and the bifurcation value is evaluated. A comparison is also made with the existing operator splitting numerical scheme. Simulations are also performed for numerical experiments.

Keywords: *splitting methods, NSFD schemes, positivity, epidemic model, stability, bifurcation value.*

26. **Jawaz, M., Ahmed, N.,** Baleanu, D., Rafiq, M., & **Aziz-ur Rehman, M.**, (2020). Positivity Preserving Technique for the Solution of HIV/AIDS Reaction Diffusion Model With Time Delay. *Frontiers in Physics, 7*(229). doi: 10.3389/fphy.2019.00229. **(Muhammad Jawaz, Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: This study is concerned with finding a numerical solution to the delay epidemic model with diffusion. This is not a simple task as variables involved in the model exhibit some important physical features. We have therefore designed an efficient numerical scheme that preserves the properties acquired by the given system. We also further develop Euler's technique for a delayed epidemic reaction–diffusion model. The proposed numerical technique is also compared with the forward Euler technique, and we observe that the forward Euler technique demonstrates the false behavior at certain step sizes. On the other hand, the proposed technique preserves the true behavior of the continuous system at all step sizes. Furthermore, the effect of the delay factor is discussed graphically by using the proposed technique.

Keywords: *epidemic model with diffusion, time delay, HIV/AIDS (acquired immunodeficiency syndrome), positivity, finite difference method, simulations.*

27. **Ali, U., Javaid, M., & Kashif, A.** (2020). Modified Zagreb connection indices of the T-sum graphs. *Main Group Metal Chemistry, 43*(1), 43-55. doi: DOI: https://doi.org/10.1515/mgmc-2020-0005. **(Usman Ali, Muhammad Javaid, Agha Kashif (Mathematics/SSC) Web of Science JCR Listed (IF: 0.558)**

Abstract: The quantitative structures activity relationships (QSAR) and quantitative structures property relationships (QSPR) between the chemical compounds are studied with the help of topological indices (TI's) which are the fixed real numbers directly linked with the molecular graphs. defined the first degree based TI to measure the total π-electrone energy of a molecular graph. Recently, restudied the connection based TI's such as first Zagreb connection index, second Zagreb connection index and modified first Zagreb connection index to find entropy and accentric factor of the octane isomers. In this paper, we study the modified second Zagreb connection index and modified third Zagreb connection index on the T-sum (molecular) graphs obtained by the operations of subdivision and product on two graphs. At the end, as the applications of the obtained results for the modified Zagreb connection indices of the T-sum graphs of the particular classes of alkanes are also included. Mainly, a comparision among the Zagreb indices, Zagreb connection indices and modified Zagreb connection indices of the T-sum graphs of the particular classes of alkanes is performed with the help of numerical tables,

3D plots and line graphs using the statistical tools.
Keywords: *modified Zagreb indices, connection number, T-sum graphs.*

28. **Siddique, I., & Bukhari, S. M.** (2020). Analysis of the effect of generalized fractional Fourier's and Fick's laws on convective flows of non-Newtonian fluid subject to Newtonian heating. *The European Physical Journal Plus, 135*(1), 45. doi: 10.1140/epjp/s13360-019-00013-2. **(Imran Siddique, Syeda Mahwish Bukhari (Mathematics/SSC) Web of Science JCR Listed (IF: 3.228)**
Abstract: The aim of this report is to study an unsteady mixed convection flow of an incompressible differential type fluid occurrence of chemical reaction that is first order, heat source and radiative heat source with fractional mass diffusion and thermal transports over an infinite vertical plate. The fractional derivative Caputo–Fabrizio which is defined recently with non-singular kernel is used in constitutive laws for the mass and thermal flux, respectively. Semi analytical solutions of the dimensionless concentration, temperature, and velocity fields in addition the rates of heat and mass transfer from the plate to the fluid are established by virtue of the Laplace inversion numerical algorithms Stehfest's and Tzou's. Some solutions for ordinary case and obvious results from articles are retrieved as limiting cases. Finally, an impact of flow and fractionalize parameters α and β on concentration, temperature and velocity profiles is tabularly and graphically underlined and discussed . We present a valuation between second grade (fractional and ordinary) and viscous (fractional and ordinary) fluids is also interpreted. It is identified that the ordinary fluid has high velocity as comparable to fractional fluids.
Keywords: *not available.*

29. **Mardan, S. A., Siddiqui, A. A., Noureen, I., & Jamil, R. N.** (2020). New models of charged anisotropic polytropes with radiation density. *The European Physical Journal Plus, 135*(1), 3. doi: 10.1140/epjp/s13360-019-00077-0. **(Syed Ali Mardan, Ahsan Ali Siddiqui, Ifra Noureen, Raja Noshad Jamil (Mathematics/SSC) Web of Science JCR Listed (IF: 3.228)**
Abstract: In this manuscript, new classes of polytropic models have been developed by using polytropic equation of state (PEoS) for spherically symmetric gravitating sources in isotropic coordinates. The inner fluid configuration is charged anisotropic and models are developed for different values of polytropic index n=1, 12, 2, 23n=1, 12, 2, 23. Mass and radii of eight stars 4U 1820-30, Cen X-3, EXO 1785-248, SMC X-4, LMC X-4, SAX J1808.4-3658, 4U 1538-52 and Her X-1 have been regained with the help of developed models. The stability of models is discussed by using speed of sound technique and graphical analysis of model parameters. It is concluded that all models are well behaved and physically acceptable.
Keywords: *not available.*

30. **Awais, H. M.,** Jamal, M., & **Javaid, M. (**2020). Topological properties of metal-organic frameworks. *Main Group Metal Chemistry, 43*(1), 67-76. doi: https://doi.org/10.1515/mgmc-2020-0007. **(Hafiz Muhammad Awais, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 0.558)**
Abstract: Metal-organic frameworks (MOFs) are porous materials formed by strong bonds between metal ions and organic ligands to represent very high surface area, large pore volume, excellent chemical stability and unique morphology. Work on synthesis, structures and characteristics of many MOFs shows the importance of these frameworks with versatile applications, such as energy storage devices of excellent electrode materials, gas storage, heterogeneous catalysis, environmental hazard, assessment of chemicals and sensing of different gases. A topological property or index is a numerical invariant that predicts the physicochemical properties of the chemical compounds of the underlying molecular graph or framework. Wiener (1947) created the practice of the topological indices (TI's) in organic molecules with the reference of boiling point of paraffin. In this paper, we study the two different metalorganic frameworks with respect to the number of increasing layers with metal and organic ligands as well. We also compute the generalized Zagreb index and generalized Zagreb connection

index of these frameworks. Moreover, the various indices and connection indices are obtained by using the aforesaid generalized versions. At the end, a comparison is also included between the indices and connection indices with the help of numerical values and their 3D plots.

Keywords: *metal-organic frameworks, zagreb index, zagreb connection index.*

31. **Ashraf, K., Siddique, I.,** & Hussain, A. (2020). Impact of thermophoresis and brownian motion on non-Newtonian nanofluid flow with viscous dissipation near stagnation point. *Physica Scripta, 95*(5), 055217. doi: 10.1088/1402-4896/ab72c1. **(Kaleem Ashraf, Imran Siddique (Mathematics/SSC) Web of Science JCR Listed (IF: 1.985)**

Abstract: In present manuscript, we have explored three dimensional non-Newtonian nanofluid flow with radiation impact considering dissipation in a vertical cylinder. The flow analysis is made in the existence of stagnation point. Radiative heat flux is estimated by Rosseland model. Thermophoresis and Brownian motion are the glamorous features for the delineation of nanofluids. Appropriate similarity transformations are applied to reduce the governing system of (PDE'S) together with boundary conditions into dimensionless form by taking boundary layer approximation. Arising coupled system of nonlinear (ODE'S) accompanied by boundary conditions are set about by powerful bvp4c method in Matlab software. Graphs and tables are drawn to present the influence of physical parameters. Skin friction and Nusselt number are contemplated for several parameters. Mounting the Eyring-Powel fluid parameter M_1 quickens the fluid velocity and enhance the temperature.

Keywords: *dissipation effect, Rosseland model, vertical cylinder, eyring-powel fluid, bvp4c, stagnation point.*

32. **Sana, A., Muhammad, J.,** & Muhammad, J. (2020). Bounds on F-index of tricyclic graphs with fixed pendant vertices. *Open Mathematics, 18*(1), 150-161. doi: https://doi.org/10.1515/math-2020-0006. **(Sana Akram, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 0.773)**

Abstract: The *F*-index *F*(*G*) of a graph *G* is obtained by the sum of cubes of the degrees of all the vertices in *G*. It is defined in the same paper of 1972 where the first and second Zagreb indices are introduced to study the structure-dependency of total π-electron energy. Recently, Furtula and Gutman [J. Math. Chem. **53** (2015), no. 4, 1184–1190] reinvestigated *F*-index and proved its various properties. A connected graph with order *n* and size *m*, such that $m = n + 2$, is called a tricyclic graph. In this paper, we characterize the extremal graphs and prove the ordering among the different subfamilies of graphs with respect to *F*-index in Ωαn, where Ωαn is a complete class of tricyclic graphs with three, four, six and seven cycles, such that each graph has $\alpha \geq 1$ pendant vertices and $n \geq 16 + \alpha$ order. Mainly, we prove the bounds (lower and upper) of *F*(*G*), i.e $8n+12\alpha+76 \leq F(G) \leq 8(n-1)-7\alpha+(\alpha+6)3$ for each $G \in \Omega\alpha n$.

Keywords: *extremal graphs, tricyclic graphs, F-index, 05C12, 05C50, 05C35.*

33. **Hussain, M. T.,** & Amjid, V. (2020). Finite groups with weakly m-σ-permutable subgroups. *Journal of Algebra and Its Applications, 0*(0), 2150056. doi: 10.1142/s0219498821500560. **(Muhammad Tanveer Hussain (Mathematics/SSC) Web of Science JCR Listed (IF: 0.610)**

Abstract: Let GG be a finite group, $\sigma=\{\sigma i \mid i \in I\}\sigma=\{\sigma i \mid i \in I\}$ be a partition of the set of all primes $P\mathbb{P}$ and $\sigma(G)=\{\sigma i \mid \sigma i \cap \pi(G) \neq \emptyset\}\sigma(G)=\{\sigma i \mid \sigma i \cap \pi(G) \neq \emptyset\}$. A set $H\mathcal{H}$ of subgroups of GG is said to be a *complete Hall*σσ*-set* of GG if every non-identity member of $H\mathcal{H}$ is a Hall σiσi-subgroup of GG and $H\mathcal{H}$ contains exactly one Hall σiσi-subgroup of GG for every $\sigma i \in \sigma(G)\sigma i \in \sigma(G)$. A subgroup HH of GG is said to be σσ-*permutable* in GG if GG possesses a complete Hall σσ-set $H\mathcal{H}$ such that $HAx=AxHHAx=AxH$ for all $A \in HA \in \mathcal{H}$ and all $x \in Gx \in G$. Let HH be a subgroup of GG. HH is: mm-σσ-*permutable* in GG if $H=\langle A,B\rangle H=\langle A,B\rangle$ for some modular subgroup AA and σσ-permutable subgroup BB of GG; *weakly*mm-σσ-*permutable* in GG if there are an mm-σσ-permutable subgroup SS and a σσ-subnormal subgroup TT of GG such that $G=HTG=HT$ and $H \cap T \leq S \leq HH \cap T \leq S \leq H$.

In this paper, we investigate the influence of weakly mm-σσ-permutable subgroups on the structure of finite groups.

Keywords: *Finite group, σ-permutable subgroup, modular subgroup, m-σ-permutable subgroup, weakly m-σ-permutable subgroup, soluble group.*

34. **Aslam, M. K., Javaid, M.,** & Raheem, A. (2020). M-polynomial based topological properties of Sudoku graphs. *Journal of Discrete Mathematical Sciences and Cryptography*, 1-14. doi: 10.1080/09720529.2019.1677310. **(Muhammad Kamran Aslam, Muhammad Javaid (Mathematics/SSC) SJR**

Abstract: Geo [J. Appl. Math. Comput, 99-117, 117, (2017)] computed exactly three degreebased topological indices of the Sudoku graphs. As an extention of this study, we prove the M-polynomial of the Sudoku graphs and obtain the mathematical expressions for various topological indices which base on the M-polynomial.

Keywords: *M-polynomial, degree-based topological indices, sudoku graphs.*

35. Faizi, S., **Rashid, T., & Zafar, S.** (2020). TODIM approach based on score function under hesitant 2-tuple linguistic environment. *Journal of Intelligent & Fuzzy Systems, 38*, 663-673. doi: 10.3233/JIFS-179439. **(Tabasam Rashid, Sohail Zafar (Mathematics/SSC) Web of Science JCR Listed (IF: 1.851)**

Abstract: The hesitant 2-tuple linguistic set (H2TLS) as an important extension of the 2-tuple linguistic model, can effectively express the judgments of the decision makers (DMs) not only in qualitative aspects but also reflect the vagueness and hesitancy by assigning more than one translation parameters to every linguistic variable of the linguistic term set (LTS). The aim of this study is to extend the TODIM (an acronym in Portuguese of interactive and multi-criteria decision making) method, to solve multi-criteria group decision making (MCGDM) problems in the context of H2TLSs with completely unknown criteria weights. The TODIM method is developed on the basis of prospect theory which can effectively capture the psychological behavior of DMs during the decision analysis. In order to enhance the suitability and applicability of H2TLSs, this paper investigates first the generalized distance measure between hesitant 2-tuple linguistic elements (H2TLEs). Furthermore, a score function for H2TLEs is proposed and the dominance relations are defined by using this function. A TODIM method is established that can greatly help in solving MCGDM problems in which alternatives are assessed in the form of H2TLEs in the presence of certain criteria. A procedure for determining the criteria weights is also established as a follow up. Finally, a numerical example is offered and a comparison analysis of proposed extended TODIM method is made with other methods to check the validity and practicality of the proposed study.

Keywords: *hesitant 2-tuple linguistic set, score function, generalized distance measure, multi-criteria group decision making, todim method.*

36. **Farhan Tabassum, M., Saeed**, M., Ahmad Chaudhry, N., **Ali, J.,** Farman, M., & **Akram, S.** (2020). Evolutionary simplex adaptive Hooke-Jeeves algorithm for economic load dispatch problem considering valve point loading effects. *Ain Shams Engineering Journal*. doi: https://doi.org/10.1016/j.asej.2020.04.006. **(Muhammad Farhan Tabassum, Muhammad Saeed, Javaid Ali, Sana Akram (Mathematics/SSC) Web of Science JCR Listed (IF: 1.949)**

Abstract: Economic load dispatch problems are most important in operation and management of the electric power systems which are formulated as optimization problems. Modern deterministic and stochastic optimization techniques are efficient in solving economic load dispatch problems without any limitation because of their capability to seek the global optimal solution. Economic load dispatch problems involve linear equality constraints which are difficult to handle along with discontinuous, non-differentiable and highly non-linear objective functions. The problem becomes challenging for optimization techniques, especially for deterministic methods. This study presents a new approach based on a hybrid algorithm consisting of Genetic algorithm and modified Hooke and Jeeves method to solve the economic load dispatch problems with equality constraints. The performance of proposed Algorithm is tested on five generating systems with valve-point effects. Test results of

proposed technique are quite promising and effective, with good convergence property and generation cost to produce better quality solution compared with several state-of-the-art methods.

Keywords: *Economic load dispatch, Hybrid method, Hooke and Jeeves method, Genetic algorithm, Valve-point effects.*

37. **Ali, A.,** Matejic, M., Milovanovic, E., & Milovanovic, I. (2020). Some new upper bounds for the inverse sum indeg index of graphs. *Electronic Journal of Graph Theory and Applications, 8*(1), 59–70. **(Akbar Ali (Mathematics/Knowledge Unit of Science) SJR (SKT Campus)**

Abstract: Let $G = (V,E)$ be a simple connected graph with the vertex set $V = \{1,2,...,n\}$ and sequence of vertex degrees $(d_1,d_2,...,d_n)$ where d_i denotes the degree of a vertex $i \in V$. With $i \sim j$, we denote the adjacency of the vertices i and j in the graph G. The inverse sum indeg (ISI) index of the graph G is defined as $ISI(G)=\sum_{i\sim j}(d_i d_j)/(d_i+d_j)$. Some new upper bounds for the ISI index are obtained in this paper.

Keywords: *Vertex-degree-based topological indices, inverse sum indeg index, Zagreb indices, multiplicative Zagreb indices.*

38. **Danish Ikram, M., Imran Asjad, M.,** Ahmadian, A., & Ferrara, M. (2020). A new fractional mathematical model of extraction nanofluids using clay nanoparticles for different based fluids. *Mathematical Methods in the Applied Sciences, n/a*(n/a). doi: 10.1002/mma.6568. **(Muhammad Danish Ikram, Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 1.626)**

Abstract: In this paper, the heat transfer analysis of viscous (clay water-based) nanofluid over an exponentially moving vertical plate is discussed. When clay nanoparticles are mixed to water-based fluids, the thermal conductivity, thickness stages, and danger level of the fluid increase, which deliver hardy to extraordinary temperatures and controller the fluid charge. Clay nanoparticles show a vigorous rule in the drilling techniques of oils and gases from stuns and acreage. More accurately, clay nanoparticles are suspended in three different based fluids (water, kerosene, and engine oil). The governing PDE of nanofluids has been modeled by appealing ABC fractional derivative. The dimensionless temperature and velocity fields are attained as the solutions of the governing equations by Laplace transformation technique. The reported results are expressed in terms of ML function. To validate the results, the impact of several flow parameters and some comparison with the exiting results from the literature are made using Mathcad and designed in different figures. In some cases, our outputs are reduced to the results obtained in the literature. In comparison, we found that our results decay better than the classical approach proposed in existing research works. We also have compared the presents results based on ABC derivative, Caputo and CF derivatives. As a consequence, we have implied that ABC derivative decays better than C and CF derivatives and velocity of engine oil-based fluid decays near the plate in comparison with other based fluids.

Keywords: *ABC fractional derivative, analytical solutions, clay nanoparticles, different base fluids, viscous fluid.*

39. Sarwar, S., Nazar, M., & **Imran, M. A.** (2020). Influence of slip over an exponentially moving vertical plate with Caputo-time fractional derivative. *Journal of Thermal Analysis and Calorimetry*. doi: https://doi.org/10.1007/s10973-020-09700-0. **(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 2.731)**

Abstract: In this article, the impact of a MHD is analyzed on a VF accompanying double convection, because of the transfer inducted by temperature and concentration gradients along with the slip at the boundary. Furthermore, impacts of chemical reaction and heat generation are also taken into account. The concept of non-integer Caputo time fractional derivative is utilized for a generalized VF model comprising three PDEs of momentum, heat and mass transfer accompanying initial and boundary constraints. The LT technique and Stf.A and Tzu.A are acquired to utilize the desirable outcomes of velocity, temperature and concentration. The

infuence of physical parameters and fow is graphically analyzed via computational software (MathCad). The outcomes attained as specifc cases are also marvelously agree with the published results from the literature. Finally, it has been seen that the rising values of the slip coefcient reduces the fuid velocity. This represents the impact of slip at the boundary on the fuid fow.

Keywords: *slip, heat absorption, mhd fow, caputo fractional derivative, double convection, exponentially moving plate.*

40. Noureen, S., Bhatti, A. A., & **Ali, A.** (2020). Extremum Modified First Zagreb Connection Index of -Vertex Trees with Fixed Number of Pendent Vertices. *Discrete Dynamics in Nature and Society, 2020*, 3295342. doi: 10.1155/2020/3295342. **(Akbar Ali (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 0.870) (SKT Campus)**

Abstract: The modified first Zagreb connection index is a graph invariant that appeared about fifty years ago within a study of molecular modeling, and after a long time, it has been revisited in two papers ((Ali and Trinajstić, 2018) and (Naji et al., 2017)) independently. For a graph , this graph invariant is defined as , where is the degree of the vertex and is the connection number of (that is, the number of vertices having distance 2 from). In this paper, the graphs with maximum/minimum value are characterized from the class of all -vertex trees with fixed number of pendent vertices (that are the vertices of degree 1).

Keywords: *not available.*

41. Liu, J., **Aslam, M. K., & Javaid, M.** (2020). Local Fractional Metric Dimensions of Rotationally Symmetric and Planar Networks. *IEEE Access, 8*, 82404-82420. doi: 10.1109/ACCESS.2020.2991685. **(Muhammad Kamran Aslam, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 3.745)**

Abstract: Mathematical modeling, coding or labeling with the help of numeric numbers based on the parameter of distance plays a vital role in the studies of the structural properties of the networks such as accessibility, centrality, clustering, complexity, connectivity, modularity, robustness and vulnerability. In particular, various distance based dimensions of the networks are used to rectify the problems in different strata of computer science and chemistry such as navigation, image processing, pattern recognition, integer programming problem, drug discovery and formation of different chemical compounds. In this note, we consider a family of rotationally symmetric and planar networks called by circular ladders consisting of different faced triangles, quadrangles and pentagons. We compute local fractional metric dimensions of the aforesaid networks and study their boundedness. Moreover, our findings at the closure of this note have been summarized in the form of tables and 3-D plots.

Keywords: *fractional metric dimension, symmetric networks, resolving neighbourhoods.*

42. **Saleem, N., Habib, I.,** & Sen, M. D. l. (2020). Some New Results on Coincidence Points for Multivalued Suzuki-Type Mappings in Fairly Complete Spaces. *Computation, 8*(1), 17. doi: https://doi.org/10.3390/computation8010017. **(Naeem Saleem, Iqra Habib (Mathematics/SSC) SJR**

Abstract: In this paper, we introduce Suzuki-type (α,β,γg)− generalized and modified proximal contractive mappings. We establish some coincidence and best proximity point results in fairly complete spaces. Also, we provide coincidence and best proximity point results in partially ordered complete metric spaces for Suzuki-type (α,β,γg)− generalized and modified proximal contractive mappings. Furthermore, some examples are presented in each section to elaborate and explain the usability of the obtained results. As an application, we obtain fixed-point results in metric spaces and in partially ordered metric spaces. The results obtained in this article further extend, modify and generalize the various results in the literature.

Keywords: *coincidence best proximity point, suzuki-type (α,β,γg)-generalized proximal contraction, suzuki-type (α,β,γg)-modified proximal contraction, fairly complete space, fixed point, partially ordered metric space.*

43. Hong, G., Gu, Z., **Javaid, M., Awais, H. M.,** & Siddiqui, M. K. (2020). Degree-Based Topological Invariants of Metal-Organic Networks. *IEEE Access, 8*, 68288-68300. doi: 10.1109/ACCESS.2020.2985729. **(Muhammad Javaid, Hafiz Muhammad Awais (Mathematics/SSC) Web of Science JCR Listed (IF: 3.745)**

Abstract: Metal-organic networks (MONs) is a family of chemical compounds consisting of clusters or metal ions and organic ligands. These are studied as one, two or three dimensional structures of porous materials and subclasses of coordination polymers. MONs are mostly used in catalysis for the separation & purification of gases and as conducting solids or super-capacitors. In some situations, these networks are found to be stable in the process of removal or solvent of the guest molecules and could be restored with some other chemical compounds. The physical stability and mechanical properties of these networks have become a topic of great interest due to the aforesaid characteristics. Topological indices (TIs) are numeric quantities that are used to forecast the natural relationships among the physico-chemical characteristics of the chemical compounds in their fundamental network. During the studies of the MONs, TIs show an essential role in the theoretical & environmental chemistry and pharmacology. In this paper, we compute various latest developed degree-based TIs for two different metal-organic networks with increasing number of layers consisting on both metal and organic ligands vertices as well. A comparison among the computed different versions of the TIs with the help of the numerical values and their graphs is also included.

Keywords: *Topological indices, chemical compounds, metals-organic networks.*

44. **Javaid, M., Ali, A.,** Milovanović, I., & Milovanović, E. (2020). On the extremal cactus graphs for variable sum exdeg index with a fixed number of cycles. *AKCE International Journal of Graphs and Combinatorics*, 1-4. doi: 10.1016/j.akcej.2019.08.007. **(Mubeen Javaid, Akbar Ali (Mathematics/Knowledge Unit of Science) SJR (SKT Campus)**

Abstract: The variable sum exdeg index, introduced by Vukičević [Croat. Chem. Acta 84 (2011) 87–91] for predicting the octanol-water partition coefficient of certain chemical compounds, of a graph G is defined as where a is any positive real number different from 1, V(G) is the vertex set of G and dv denotes the degree of a vertex v. A connected graph G is a cactus if and only if every edge of G lies on at most one cycle. For n > 3 and let be the class of all n-vertex cacti with k cycles. The present paper is devoted to find the graphs with minimal and maximal values among all the members of the graph class for a > 1.

Keywords: *Topological index, variable sum exdeg index, extremal problem, cactus graph.*

45. Cao, J., **Ali, U., Javaid, M.,** & Huang, C. (2020). Zagreb Connection Indices of Molecular Graphs Based on Operations. *Complexity, 2020*, 7385682. doi: 10.1155/2020/7385682. **(Usman Ali, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 2.462)**

Abstract: Topological index (numeric number) is a mathematical coding of the molecular graphs that predicts the physicochemical, biological, toxicological, and structural properties of the chemical compounds that are directly associated with the molecular graphs. The Zagreb connection indices are one of the TIs of the molecular graphs depending upon the connection number (degree of vertices at distance two) appeared in 1972 to compute the total electron energy of the alternant hydrocarbons. But after that, for a long period, these are not studied by researchers. Recently, restudied the Zagreb connection indices and reported that the Zagreb connection indices comparatively to the classical Zagreb indices provide the better absolute value of the correlation coefficient for the thirteen physicochemical properties of the octane isomers (all these tested values have been taken from the website http://www.moleculardescriptors.eu). In this paper, we compute the general results in the form of exact formulae & upper bounds of the second Zagreb connection index and modified first Zagreb connection index for the resultant graphs which are obtained by applying operations of corona, Cartesian, and lexicographic product. At the end, some applications of the obtained results for particular chemical structures such as alkanes,

cycloalkanes, linear polynomial chain, carbon nanotubes, fence, and closed fence are presented. In addition, a comparison between exact and computed values of the aforesaid Zagreb indices is also included.
Keywords: *not available.*

46. **Asif, F., Zahid, Z., Zafar, S.**, Farahani, M., Gao, W. (2020). On topological properties of some convex polytopes by using line operator on their subdivisions . *Hacettepe Journal of Mathematics and Statistics,* 49 (1) , 136-146 . DOI: 10.15672/HJMS.2019.671. **(Fatima Asif, Zohaib Zahid, Sohail Zafar (Mathematics/SSC) Web of Science JCR Listed (IF: 0.679)**
Abstract: In this paper, we give theoretical results for some topological indices such as Zagreb indices M1(G), M2(G), M3(G), R(G), M1(G), M2(G), Zagreb coindices M1(G), M2(G), M2(G) hyper-Zagreb index HM(G), atom-bond connectivity index ABC(G), sum connectivity index χ(G) and geometric-arithmetic connectivity index GA(G), by considering G as line graph of subdivision of some convex polytopes and G denotes its complement.
Keywords: *topological indices, line graph, subdivision, convex polytopes.*

47. Bashir, Z., **Rashid, T.,** Sałabun, W., & **Zafar, S**. (2020). Certain convergences for intuitionistic fuzzy sets. *Journal of Intelligent & Fuzzy Systems, 38*, 553-564. doi: 10.3233/JIFS-179429. **(Tabasam Rashid, Sohail Zafar (Mathematics/SSC) Web of Science JCR Listed (IF: 1.851)**
Abstract: In this paper, the characterization of Γ-convergence for the first countable topological spaces, characterization of convergence in supremum metric in general setting and some mutual relation between these convergences are discussed. The Γ-convergence is defined as the Kuratowaski-Painlevé convergence of the endographs of the intuitionistic fuzzy sets. The supremum metric is the supremum of Hausdroff distance among the η-cuts of the intuitionistic fuzzy sets. To study these convergences is an important part of the theoretical fundamentals for intuitionistic fuzzy set theory. Some results are given as an application to variational analysis.
Keywords: *intuitionistic fuzzy sets, pointwise convergence, γ-convergence, hausdroff metric, supremum metric.*

48. Bashir, Z., Abbas Malik, M. G., Asif, S., & **Rashid, T.** (2020). The topological properties of intuitionistic fuzzy rough sets. *Journal of Intelligent & Fuzzy Systems, 38*, 795-807. doi: 10.3233/JIFS-179449. **(Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 1.851)**
Abstract: In this paper, an in depth study is done on topological properties of intuitionistic fuzzy rough sets in light of different conditions like serial, strongly serial, left continuity, transitivity on intuitionistic fuzzy relations, t-norms, implicators by adopting a axiomatic approach with the ingredients of intuitionistic fuzzy logic. Numerous intuitionistic fuzzy topologies based on many different kinds of intuitionistic fuzzy relations are explored. Also, a special class of intuitionistic fuzzy relations known as T-similarity class has been studied algebraically and found interesting lattices to model real life problems for better applications of intuitionistic fuzzy rough sets.
Keywords: *Intuitionistic fuzzy rough sets, intuitionistic fuzzy topologies, intuition fuzzy logic, lattices.*

49. **Siddique, I.,** Tlili, I., **Bukhari, S. M.,** & Mahsud, Y. (2020). Heat transfer analysis in convective flows of fractional second grade fluids with Caputo–Fabrizio and Atangana–Baleanu derivative subject to Newtonion heating. *Mechanics of Time-Dependent Materials*, 1-21. **(Imran Siddique, Syeda Mahwish Bukhari (Mathematics/SSC) Web of Science JCR Listed (IF: 1.574)**
Abstract: Unsteady free convection flows of an incompressible differential type fluid over an infinite vertical plate with fractional thermal transport are studied. Modern definitions of the fractional derivatives in the sense of Atangana–Baleanu (ABC) and Caputo Fabrizio (CF) are used in the constitutive equations for the thermal flux. Exact solutions in both cases of the (ABC) and (CF) derivatives for the dimensionless temperature and velocity fields are established by using the Laplace transform technique. Solutions for the ordinary case and some well-known results from the literature are recovered as a limiting case. Expressions for Nusselt number and Skin

friction coefficient are also determined. The influence of the pertinent parameters on temperature and velocity fields are discussed graphically. A comparison of ordinary model, and (ABC) and (CF) models are also depicted. It is found that memory of the physical aspects of the problem is well explained by fractional order (ABC) and (CF) models as compared to ordinary one. Further it is noted that the (ABC) model is the best fit to explain the memory effect of the temperature and velocity fields.

Keywords: *ABC and CF fractional derivatives, free convection, thermal flux, newtonian heating, differential type fluid, laplace transforms, numerical inversion.*

50. **Aleem, M., Asjad, M. I.,** Shaheen, A., & Khan, I. (2020). MHD Influence on different water based nanofluids (TiO2, Al2O3, CuO) in porous medium with chemical reaction and newtonian heating. *Chaos, Solitons & Fractals, 130*, 109437. doi: https://doi.org/10.1016/j.chaos.2019.109437. **(Maryam Aleem, Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

Abstract: The present study is aimed to provide the unsteady MHD nanofluid's flow passing through an accelerating infinite vertical plate situated in porous medium. The flow is effected by thermal radiation, Newtonian heating and chemical reaction. Water is considered as conventional base fluid comprising of five different types of nano particles such as Titanium oxide (TiO_2), Aluminium Oxide (Al_2O_3), Copper Oxide (CuO), Silver (Ag) and Copper (Cu). By using dimensional analysis, the governing equations for temperature, velocity and concentration are reduced to dimensionless and after that these classical equations of present model are generalized to Caputo and Caputo-Fabrizio fractional derivatives. Semi-exact solutions for these equations are obtained via Laplace transform method. Inversion algorithms (Tzou's and Stehfest's) are applied to find the inverse Laplace transform. At last the comparison of water based nanofluids suspended with five different types of nano particles is drawn and effect of nanoparticles as well as fractional parameters (α, β, γ) on temperature and velocity can be seen by software Mathcad. We concluded that Ag-water nanofluid has greater temperature due to its greater value of thermal conductivity as compare to others. Whereas Al_2O_3-water has greater velocity because these particles are less denser than TiO_2, Cu, Ag, CuO. Further we can see that by increasing the value of fractional parameters velocity as well as temperature decreases. Fluid flow can be enhanced with Caputo fractional model while Caputo-Fabrizio decays faster than Caputo and hence well suited in exhibiting the memory of the flow problem at certain time.

Keywords: *MHD, nanofluids, Newtonian heating, free convection, accelerated platecaputo & caputo–fabrizio fractional derivative operators, porous medium, chemical reaction.*

51. Ahmed, N., Korkamaz, A., **Rehman, M. A.,** Rafiq, M., Ali, M., & Ahmad, M. O. (2020). Computational modelling and bifurcation analysis of reaction diffusion epidemic system with modified nonlinear incidence rate. *International Journal of Computer Mathematics*, 1-19. doi: 10.1080/00207160.2020.1759801. **(Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 1.600)**

Abstract: The aim of this work is to design two novel implicit and explicit finite difference (FD) schemes to solve SIR (susceptible, infected and recovered) epidemic reaction–diffusion system with modified saturated incidence rate. Since this model is based on population dynamics, therefore solution of the continuous system possesses the positivity property. The proposed finite difference schemes retain the positivity property of sub population which is an essential feature in population dynamics. Von Neumann stability analysis reveals that proposed FD schemes are unconditionally stable. It is verified with the help of Taylor's series expansion that proposed FD schemes are consistent. The proposed implicit scheme is unconditionally consistent, i.e. for h=τh=τ. On the other hand the proposed explicit scheme gives conditional consistency for h=τ3h=τ3. The proposed FD schemes are compared with two other FD schemes, i.e. forward Euler and Crank Nicolson scheme. Simulations are performed for the verification of all the attributes for the underlying FD schemes. Furthermore, stability of the reaction

diffusion system is discussed by applying Routh–Hurwitz criteria. Bifurcation values of infection coefficient are also obtained from Routh–Hurwitz condition.

Keywords: *FD schemes, SIR reaction–diffusion model with modified incidence rate, positivity, convergence, bifurcation value.*

52. Akram, T., Abbas, M., **Riaz, M. B.,** Ismail, A. I., & Ali, N. M. (2020). An efficient numerical technique for solving time fractional Burgers equation. *Alexandria Engineering Journal*. doi: https://doi.org/10.1016/j.aej.2020.01.048. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.460)**

Abstract: A finite difference scheme which depends on a new approximation based on an extended cubic B-spline for the second order derivative is used to calculate the numerical outcomes of time fractional Burgers equation. The presented scheme uses Caputo's formulation for the time derivative. Finite difference method will be used to discretize the Caputo's fractional derivative. The proposed scheme will be shown to be unconditionally stable by Von-Neumann method. The convergence analysis of the numerical scheme will be presented of order O(h2+τ2-α). The presented scheme is tested on four numerical examples. The numerical results are compared favorably with other computational schemes.

Keywords: *nonlinear time fractional burgers equation, extended cubic b-spline basis functions, caputo's derivative, stability, convergence.*

53. **Javaid, M., Raza, M.,** Rehman, M. U., Teh, W. C., & Cao, J. (2020). Minimum algebraic connectivity of graphs whose complements are bicyclic with two cycles. *Journal of Discrete Mathematical Sciences and Cryptography*, 1-20. doi: 10.1080/09720529.2019.1668144. **(Muhammad Javaid, M. Raza (Mathematics/SSC) SJR**

Abstract: For a graph $G = (G(V), G(E))$, algebraic connectivity $a(G) \geq 0$ is the second smallest e-value (eigenvalue) of the Laplacian matrix of G. It is used to find the connectivity, analyze the diffusion processes, measure the robustness and synchronize the stability of the graphs or networks. In the study of interconnected networks it is necessary to design the interlayers links for the assessment and improvement of the realistic constraints optimally. In this paper, we compute the minimum algebraic connectivity and characterize the corresponding extremal graph in the set of the connected graphs such that the complement of each graph is a bicyclic graph with exactly two cycles.

Keywords: *bicyclic graphs, laplacian matrix, algebraic connectivity.*

54. Ghalib, M. M., Zafar, A. A., Hammouch, Z., **Riaz, M. B.,** & Shabbir, K. (2020). Analytical results on the unsteady rotational flow of fractional-order non-Newtonian fluids with shear stress on the boundary. *Discrete & Continuous Dynamical Systems-S, 13*(3), p683-693. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 1.233)**

Abstract: The objective of this paper is to study the unsteady rotational flow of some non Newtonian fluids with Caputo fractional derivative through an infinite circular cylinder by means of the finite Hankel and Laplace transform. The novelty of the work is that motion is produced by applying tangential force not a specific but general function of time on the boundary. Initially the cylinder is at rest and after time to=0+to=0+ it begins to rotate about its axis with an angular velocity τog(t)τog(t). The obtained solutions of velocity field and shear stress have been presented under series form in terms of generalized GG-function, satisfying all imposed initial and boundary conditions. The corresponding solutions can be easily particularized to give similar solutions from existing literature for Oldroyd-B fluids, Maxwell fluids, Second grade fluids and Newtonian fluids with/without fractional derivatives performing similar motions.

Keywords: *caputo fractional derivative, unsteady flow, analytical solution, hankel transform.*

55. **Riaz, M. B.,** Atangana, A., & Iftikhar, N. (2020). Heat and mass transfer in Maxwell fluid in view of local and non-local differential operators. *Journal of Thermal Analysis and Calorimetry*, 1-17. doi: https://doi.org/10.1007/s10973-020-09383-7. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.731)**

Abstract: Study of heat and mass transfer in Maxwell fuid is carried out near a vertical plate. It is proven in many already published articles that the heat and mass transfer does not really or always follow the classical mechanics process that is known as memoryless process. Therefore, the model using classical diferentiation based on the rate of change cannot really replicate such dynamical process very accurately; thus, a diferent concept of diferentiation is needed to capture such process. Very recently, new classes of diferential operators were introduced and have been recognized to be efcient in capturing processes following the power law, the decay law and the crossover behaviors. For the study of heat and mass transfer, we applied the newly introduced diferential operators to model such fow. The Laplace transform, inversion algorithm and convolution theorem were used to derive the exact and semi-analytical solutions for all cases. The obtained analytical solutions were plotted for diferent values of fractional order 훼, Maxwell fuid parameter 훽, thermal Grashof number Gr, mass Grashof number Gm, Prandtl number Pr and Schmidt number Sc on concentration and velocity felds. In comparison, velocity of Atangana–Baleanu fractional derivative is greater than that of Caputo and Caputo–Fabrizio for 훼, 훽, Gr and Gm. With the increase in Pr and Sc, there is a decrease in velocity. For fractional parameter, the efect of concentration feld for ABC model is more than for C and CF. Moreover, from the present solutions already published results were found as limiting cases.

Keywords: *Maxwell fuid, integer- and non-integer-order derivatives, temperature, concentration, laplace transformation, inversion algorithm.*

56. **Aleem, M., Asjad, M. I.,** Ahmadian, A., Salimi, M., & Ferrara, M. (2020). Heat transfer analysis of channel flow of MHD Jeffrey fluid subject to generalized boundary conditions. *The European Physical Journal Plus, 135*(1), 26. doi: 10.1140/epjp/s13360-019-00071-6. **(Maryam Aleem, Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 3.228)**

Abstract: Free convective, unsteady flow of Jeffrey liquid under the influence of magnetic field between two hot upright parallel plates fixed in porous medium is investigated in this paper. First plate is moving with time-dependent velocity Uo f (t) in its own plane while other is fixed. Mathematical model is developed using law of conservation of momentum, Fourier's law of heat transfer. Equations for temperature and velocity fields are reduced to dimensionless form by applying suitable dimensionless variables. The Laplace transform method is used to find exact solutions of temperature and velocity. Finally, we have presented the effects of material and flow parameters and illustrated graphically. As a result, through this study, we found that coefficient of heat transfer shows dual behavior for small and large time. Also, the obtained results are reduced to the recently published work.

Keywords: *not available.*

57. Zafar, A. A., Kudra, G., Awrejcewicz, J., Abdeljawad, T., & **Riaz, M. B.** (2020). A comparative study of the fractional oscillators. *Alexandria Engineering Journal*. doi: https://doi.org/10.1016/j.aej.2020.04.029. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.460)**

Abstract: In this work, we have investigated the fractional differential equation to describe the motion of a linear oscillator using fractional derivative operators with or without singular kernels. In order to be consistent with the physical systems the value of the fractional parameter that characterizes the existence of fractional structures in the system, lies within unit interval. The solutions of the non-integer order differential equation are obtained and expressed in terms of generalized G function depending upon the fractional parameter. The classical cases

could be recovered by making the limit of fractional parameter approaches to unity. Moreover, we will analyse and compare the behaviour of the oscillator with different definitions of the fractional operators via graphical illustrations, phase portraits and Poincare maps.

Keywords: *linear oscillator, fractional derivative, power law kernel, non-singular kernel, phase portraits.*

58. Saeed, S. T., **Riaz, M. B.,** Baleanu, D., & Abro, K. A. (2020). A mathematical study of natural convection flow through a channel with non-singular kernels: An application to transport phenomena. *Alexandria Engineering Journal*. doi: https://doi.org/10.1016/j.aej.2020.02.012. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.460)**

Abstract: In this manuscript, we have obtained closed form solution using Laplace transform, inversion algorithm and convolution theorem. The study of mass transfer flow of an incompressible fluid is carried out near vertical channel. Recently, new classes of differential operators have been introduced and recognized to be efficient in capturing processes following the decay law and the crossover behaviors. For the study of heat and mass transfer, we applied the newly differential operators say Atangana-Baleanu (ABC) and Caputo-Fabrizio (CF) to model such flow. This model for temperature, concentration and velocity gradient is presented in dimensionless form. The obtained solutions have been plotted for various values physical parameters like α,Df,Gm,Gr,Sc and Pr on temperature and velocity profile. Our results suggest that for the variation of time the velocity behavior for *CF* and *ABC* are reversible. Finally, an incremental value of prandtl number is observed for decrease in the velocity field which reflects the control of thickness of momentum and enlargement of thermal conductivity. Further, dynamical analysis of fluid with memory effect are efficient for *ABC* as compared to *CF*.

Keywords: *modern fractional operator, inversion algorithm, dufour effectmass transfer, convolution, convection flow.*

59. Ghalib, M. M., Zafar, A. A., **Riaz, M. B.,** Hammouch, Z., & Shabbir, K. (2020). Analytical approach for the steady MHD conjugate viscous fluid flow in a porous medium with nonsingular fractional derivative. *Physica A: Statistical Mechanics and its Applications, 554*, 123941. doi: https://doi.org/10.1016/j.physa.2019.123941. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.924)**

Abstract: This study investigates the unsteady magnetohydrodynamics (MHD) flow of a viscous fluid. The fluid is passing over a vertical plate through porous medium. Additionally conjugate effects of heat and mass transfer with ramped temperatures, slip effect and influence of thermal radiation in the energy equation are taken into account. The dimensionless fractional-order governing equations, in the Caputo–Fabrizio sense, are solved with the help of Laplace transformation. Moreover, semi analytical technique is used to investigate the velocity field. Some results which present in literature are recovered as limiting cases. Influences of different parameters on the velocity profiles for the case of f(t)=t and f(t)=sinωt are highlighted. The novelty of the manuscript is the use of the most recent definition of the non integer order derivative operator i.e. Caputo–Fabrizio derivative operator, the use of generalized boundary conditions in terms of general function f(t), from our general results, several particular cases for instance when f(t) is a linear or sinusoidal function could be recovered.

Keywords: *nonsingular-kernel derivative, unsteady mhd flow, porous medium, ramped wall temperature, closed-form solution.*

60. **Shahid, N., Ahmed, N.,** Baleanu, D., Alshomrani, A. S., Iqbal, M. S., **Aziz-ur Rehman, M.,** . . . Rafiq, M. (2020). Novel numerical analysis for nonlinear advection–reaction–diffusion systems. *Open Physics, 18*(1), 112-125. **(Naveed Shahid, Nauman Ahmed, Muhammad Aziz-ur Rehman (Mathematics/SSC) Web of Science JCR Listed (IF: 0.963)**

Abstract: In this article, a numerical model for a Brusselator advection–reaction–diffusion (BARD) system by using an elegant numerical scheme is developed. The consistency and stability of the proposed scheme is demonstrated. Positivity preserving property of the proposed scheme is also verified. The designed scheme is

compared with the two well-known existing classical schemes to validate the certain physical properties of the continuous system. A test problem is also furnished for simulations to support our claim. Prior to computations, the existence and uniqueness of solutions for more generic problems is investigated. In the underlying system, the nonlinearities depend not only on the desired solution but also on the advection term that reflects the pivotal importance of the study.

Keywords: *advection, diffusion, reaction, consistency, stability, structure preserving, equi-continuity.*

61. **Ahmed, S.,** Ahmad, I., & **Nawaz, K.** (2020). Stability of Anisotropic Spheres. *Canadian Journal of Physics*. doi: 10.1139/cjp-2019-0620. **(Shahzad Ahmad, K. Nawaz (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.032) (SKT Campus)**

Abstract: This work is devoted to understand the dynamical instability of spherically symmetric spacetime in the background of Einstein-Λ gravity. For this purpose, we have considered a spherical geometric distribution and assumed that it is filled with an anisotropic fluid content. In order to proceed our analysis, we have calculated the corresponding field as well as mass function. We found non-linear behavior of physical variables. In order to dealt with that situation, we have subjected our system into the radial perturbations. We assume that after a particular era, our structural quantities are having the same time dependence parameter. After linearizing the basic expressions, we have studied the impact of cosmological constant in the modeling of relativistic stars. It is concluded that Λ tends to slow down the rate of spherical anisotropic collapse.

Keywords: *gravitation, anisotropic fluids, relativistic fluids.*

62. **Saleem, M.,** Al-Mdallal, Q. M., Chaudhry, Q. A., Noreen, S., & **Haider, A.** (2020). Partial slip effects on the peristaltic motion of an upper-convected Maxwell fluid through an irregular channel. *SN Applied Sciences, 2*(5), 976. doi: 10.1007/s42452-020-2457-1. **(Musharafa Saleem(Mathematics/Knowledge Unit of Science) Aun Haider (Electrical Engineering) MJL(SKT Campus)**

Abstract: A theoretical investigation was carried out in this paper by taking the partial slip result in an irregular wavy channel for the incompressible upper-convected Maxwell fuid. Due to peristaltic motion, asymmetric waves with diferent amplitudes are produced. This fow is driven in an irregular channel due to the pressure gradient, where the perturbation technique applied to tackle the stream function and the pressure gradient. A numerical integration technique was used to fnd out the diferent expressions of the frictional rise per wavelength and pressure rise per wavelength and presented their graphs. The graphical results for the partial slip parameter, small wave number, phase diference, Reynolds number, Weissenberg number, wave amplitudes a and b, and channel width d are included. The pressure gradient is an increasing function of the wave number, but the slip parameter is vice versa. The velocity profle u is increased by a small increase in the wave number while it is decreased by a rise in the slip parameter. The frictional forces have the same behavior for the lower and upper wall. According to the slip efects, the bolus has improved behavior. Moreover, the relaxation parameter enhanced the strength of the bolus.

Keywords: *irregular channel, non-newtonian fuid model, weissenberg number, slip parameter.*

63. **Saleem, N.,** Abbas, M., Bin-Mohsin, B., & Radenovic, S. (2020). Pata type best proximity point results in metric spaces. *Miskolc Mathematical Notes, 21*(1), 365-384. **(Naeem Saleem (Mathematics/SSC) Web of Science JCR Listed (IF: 0.677)**

Abstract: The aim of this paper is to initiate the study of best proximity point and optimal coincidence point results of some α−Pata-proximal admissible contraction of type-I and type-II in the framework of complete metric space. Some examples are presented to support the results obtained herein. Our results unify, extend and generalize various existing results in literature.

Keywords: *Metric space and α−Pata-proximal admissible contraction of type-I and type-II and Generalized α−Pata-proximal contraction and Optimal coincidence best proximity point.*

64. Khan, I., Saeed, S. T., **Riaz, M. B.,** Abro, K. A., Husnine, S. M., & Nisar, K. S. (2020). Influence in a Darcy's medium with heat production and radiation on MHD convection flow via modern fractional approach. *Journal of Materials Research and Technology, 9*(5). **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 5.289)**
Abstract: This theoretical study explores MHD convection flow confined to an unbounded vertical plate embedded in a permeable surface under the effect of heat generation and ramp temperature. Solutions of concentration, temperature, and velocity profiles are derived symmetrically by applying non-dimensional parameters along with Laplace transformation (*LT*) and numerical inversion algorithm. The graphical results for different physical constraints are produced for the velocity profiles. Our results suggest that an incremental value of the *M* is observed for a decrease in the velocity field, which reflects to control resistive force. Additionally, Atangana-Baleanu (*ABC*) model is good to explain the dynamics of fluid with better memory effect as compared to other fractional operators.
Keywords: *MHD convection flow, fractional differential operator, chemical reaction, thermal effect, heat production,non-singular kernels.*

65. **Riaz, M. B.,** Atangana, A., & Abdeljawad, T. (2020). Local and nonlocal differential operators: A comparative study of heat and mass transfer in MHD Oldroyd-B fluid with ramped wall temperature. *Fractals, 28*(8). doi: DOI: 10.1142/S0218348X20400332**. (Muhammad Bilal Riaz (Mathematics/SSC) SJR**
Abstract: Study of heat and mass transfers is carried out for MHD Oldroyd-B fluid (OBF) over an infinite vertical plate having time-dependent velocity and with ramped wall temperature and constant concentration. It is proven in many already published articles that the heat and mass transfers do not really or always follow the classical mechanics process that is known as memoryless process. Therefore, the model using classical differentiation based on the rate of change cannot really replicate such dynamical process very accurately, thus, a different concept of differentiation is needed to capture such process. Very recently, a new class of differential operators were introduced and have been recognized to be efficient in capturing processes following the power-law, the decay law and the crossover behaviors. For the study of heat and mass transfers, we applied the newly introduced differential operators to model such flow and compare the results with integer-order derivative. Laplace transform and inversion algorithms are used for all the cases to find analytical solutions and to predict the influences of different parameters. The obtained analytical solutions were plotted for different values of fractional orders αα and ββ, λλ, λrλr, MM, GrGr and PrPr on the velocity field. In comparison, Atangana–Baleanu (ABC) fractional derivatives are found to be the best to explain the memory effects than the classical, Caputo (C) and Caputo–Fabrizio (CF) fractional derivatives. Some calculated values for Nusselt number and Sherwood number are presented in tables. Moreover, from the present solutions, the already published results were found as limiting cases.
Keywords: *Oldroyd-B Fluid, Power-Law, Decay Law, Crossover Behaviors, Local and Nonlocal Kernels, Ramped Wall Temperature, Concentration, Laplace Transformation, Inversion Algorithm.*

66. Akram, T., Abbas, M., **Riaz, M. B.,** Ismail, A. I., & Ali, N. M. Development and analysis of new approximation of extended cubic B-spline to the non-linear time fractional Klein-Gordon equation. *Fractals, 0*(ja), null. doi: 10.1142/s0218348x20400393. **(Muhammad Bilal Riaz (Mathematics/SSC) SJR**
Abstract: A new extended cubic B-spline approximation is formulated, analysed and applied to obtain the numerical solution of the time fractional Klein-Gordon equation. The temporal fractional derivative is estimated using Caputo's discretization and the space derivative is discretized by extended cubic B-spline basis functions. A combination of the Caputo's fractional derivative and the new approximation of extended cubic B-spline together

with θ−weighted scheme is utilized to obtain the solution. The method is shown to be unconditionally stable and convergent. Numerical examples indicate that the obtained results compare well with other numerical results available in the literature.

Keywords: *Non-linear time fractional Klein-Gordon equation, Extended cubic B-spline, Caputo's fractional derivative, Stability, Convergence.*

67. Arshad, M. S., Baleanu, D., **Riaz, M. B.,** & Abbas, D. M. (2020). Novel 2-Stage Fractional Runge Kutta Method for Time-Fractional Logistic Growth Model. *Discrete Dynamics in Nature and Society, 2020*. doi: 10.1155/2020/1020472. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 0.870)**

Abstract: In this paper, the fractional Euler method has been studied, and the derivation of the novel 2-stage fractional Runge–Kutta (FRK) method has been presented. (e proposed fractional numerical method has been implemented to find the solution of fractional differential equations. (e proposed novel method will be helpful to derive the higher-order family of fractional Runge–Kutta methods. (e nonlinear fractional Logistic Growth Model is solved and analyzed. (e numerical results and graphs of the examples demonstrate the effectiveness of the method.

Keywords: *not available.*

68. Arshad, M. S., Mardan, S. A., **Riaz, M. B.,** & Altaf, S. (2020). Analysis of Time-Fractional Semi-Analytical Solutions of Strong Interacting Internal Waves in Rotating Ocean. *Punjab University Journal of Mathematics, 52*(3), 99-111. **(Muhammad Bilal Riaz (Mathematics/SSC) HEC X CAT**

Abstract: In this paper, time-fractional Gardner's Ostrovsky equation is considered which represents the shallow water wave phenomena of strong interacting internal Waves with rotational effects. Using the novel perturbation technique, we found the semi-analytical solutions of such obscure phenomena for the rotational parameters introduced in fractional time domain. The Homotopy Perturbation Method is implemented in conjunction with Laplace transformation. Caputo's time fractional derivative has been used to obtain the upcoming solutions on the basis of all previous backgrounds.

Keywords: *fractional ostrovsky equation, fractional gardner's equation, laplace transforms, nonlinear fractional differential equations, homotopy perturbation transform method.*

69. **Riaz, M. B.,** Saeed, S. T., BALEANU, D., & Ghalib, M. M. (2020). Computational results with non-singular & non-local kernel flow of viscous fluid in vertical permeable medium with variant temperature. *Frontiers in Physics, 8*, 275. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: This present article explores the transversal magnetized flow of a viscous fluid. The flow is confined to a vertical wall saturated in permeable medium along with ramped wall temperature. In this study, the conjugate impact of heat and mass transfer with slip and non-slip conditions are considered in the velocity field and energy equation. The dimensionless Atangana-Baleanu fractional governing equations are derived with Laplace transformation. Computational results are expressed graphically with the effect of various physical parameters. Comparative graphical analysis of Atangana-Baleanu derivative for temperature, concentration and velocity field with slip and non-slip impact shows that the memory effects of Atangana-Baleanu derivative are better than the results existing in literature.

Keywords: *not available.*

70. **Imran, M. A.,** Shaheen, A., Sherif, E.-S. M., Rahimi-Gorji, M., & Seikh, A. H. (2020). Analysis of peristaltic flow of Jeffrey six constant nano fluid in a vertical non-uniform tube. *Chinese Journal of Physics, 66*, 60-73. doi: https://doi.org/10.1016/j.cjph.2019.11.029. **(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: Peristaltic flow of non-Newtonian nano fluid through a non-uniform surface has been investigated in this paper. The fluid motion along the wall of the surface is caused by the sinusoidal wave traveling with constant speed. The governing equations are converted into cylindrical coordinate system and assuming low Reynolds number and long wave length partial differential equations are simplified. Analytically solutions of the problem are obtained by utilizing the homotopy perturbation method (HPM). In order to insight the impact of embedded parameters on temperature, concentration and velocity some graphs are plotted for different peristaltic waves. At the end, some observations were made from the graphical presentation that velocity, pressure rise and nano particle concentration are increasing function of thermophoresis parameter N_t while temperature and frictional forces show opposite trend.

Keywords: *peristaltic flow, nanoparticles, jeffrey six constant fluid, homotopy perturbation method.*

71. **Asjad, M. I., Aleem, M.,** Ahmadian, A., Salahshour, S., & Ferrara, M. (2020). New trends of fractional modeling and heat and mass transfer investigation of (SWCNTs and MWCNTs)-CMC based nanofluids flow over inclined plate with generalized boundary conditions. *Chinese Journal of Physics, 66*, 497-516. doi: https://doi.org/10.1016/j.cjph.2020.05.026. **(Muhammad Imran Asjad, Maryam Aleem (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: In this paper, we have considered unsteady MHD viscous fluid flow of Carboxyl methyl cellulose (CMC) as based fluid and Carbon nanotubes CNTs (SWCNTs, MWCNTs) nanoparticles passing through an inclined plate of infinite length. Furthermore, the effects of heat source, chemical reaction, porosity and MHD are considered. Fractional model is developed by Caputo time fractional derivatives though recent trends of fractional modeling. The semi exact solutions are obtained for the governing equations in dimensionless form by Laplace transform method. Influence of fractional and other flow parameters on temperature, concentration and velocity fields are graphically illustrated. The Nusselt number, Sherwood number and skin friction are computed for fixed values of flow parameters and presented in tabular form. As a result, for larger values of fractional parameters temperature, concentration and velocity fields can be enhanced. A comparison has been drawn between SWCTs-CMC and MWCTs-CMC based nanofluids and found that MWCTs based nanofluids are more efficient in heat transfer than SWCTs-CMC based nanofluids. Further, in the absence of nanoparticles the obtained results are reduced to recently published results and this fact have been proved graphically and they are in good agreement.

Keywords: *MHD flow, CMC based CNTs (SWCNTSMWCNTs) nanofluids, fractional flow, generalised boundary conditions, free convection, inclined plate, porous medium.*

72. Rubbab, Q., Mahsud, Y., Irshad, S., **Asjad, M. I.,** Ahmadian, A., Salahshour, S., & Ferrara, M. (2020). Numerical simulations of unsteady flows in a rotating channel using a novel eigenfunction expansion method. *AIP Advances, 10*(6), 065035. doi: 10.1063/5.0012874. **(Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 1.337)**

Abstract: Starting flows of a viscous incompressible fluid, modeled by the time-fractional derivatives, within a rotating channel due to an impulsive pressure gradient are studied. Using the eigenfunction expansion, the analytic solutions in series form are obtained. The flow of the ordinary fluid is studied as a special case of the time-fractional problem. The convergence of series solutions is proved. In addition, using the classical analytical method, coupled with the Laplace transform and Stehfest's algorithm, an approximate solution is found. The flow rates in x- and y-directions are determined. In the case of the ordinary fluid, the steady-state and transient components of velocities are obtained. The numerical calculations are carried out by using the Mathcad software. It is found that, for fractional fluids, the reversal flow is much attenuated if the values of the fractional parameter are less than 1.

Keywords: *not available.*

73. Rafique, K., Anwar, M. I., Misiran, M., & **Asjad, M. I.** (2020). Energy and mass transport of micropolar nanofluid flow over an inclined surface with Keller-Box simulation. *Heat Transfer, n/a*(n/a). doi: 10.1002/htj.21843. **(Muhammad Imran Asjad (Mathematics/SSC) SJR**

Abstract: In this article, micropolar nanofluid boundary layer flow over a slanted stretching surface with Soret and Dufour effect is studied. The inclined stretching surface in this study is considered permeable and linear. In this problem, the Buongiorno model is considered for thermal efficiencies of fluid flow in the existence of Brownian movement and thermophoresis properties. The nonlinear problem for Micropolar Nanofluid flow over the slanted channel is developed to think about the heat and mass exchange phenomenon by incorporating portent flow factors to strengthened boundary layers. In this study, nonlinear partial differential equations are converted to nonlinear ordinary differential equations by utilizing appropriate similarity transformations then elucidated the numerical outcomes by the Keller-Box technique. An examination of the set-up results is performed with accessible outcomes and perceived in a good settlement without involved impacts. Numerical and graphical outcomes are additionally displayed in tables and charts.

Keywords: *dufour, inclined surface, mhd, micropolar nanofluid, permeable, soret.*

74. Saqlain, M., Moin, S., **Jafar, M. N., Saeed, M.,** & Smarandache, F. (2020). Aggregate Operators of Neutrosophic Hypersoft Set. *Neutrosophic Sets and Systems, 32*(1), 18. **(Muhammad Naveed Jafar, Muhammad Saeed (Mathematics/SSC) SJR**

Abstract: Multi-criteria decision making (MCDM) is concerned about organizing and taking care of choice and planning issues including multi-criteria. When attributes are more than one, and further bifurcated, neutrosophic softset environment cannot be used to tackle such type of issues. Therefore, there was a dire need to define a new approach to solve such type of problems, So, for this purpose a new environment namely, Neutrosophic Hypersoft set (NHSS) is defined. This paper includes basics operator's like union, intersection, complement, subset, null set, equal set etc., of Neutrosophic Hypersoft set (NHSS). The validity and the implementation are presented along with suitable examples. For more precision and accuracy, in future, proposed operations will play a vital role is decision-makings like personal selection, management problems and many others.

Keywords: *MCDM, uncertainty, soft set, neutrosophic soft set, hyper soft set.*

75. Saqlain, M., Jafar, N., Moin, S., **Saeed, M.,** & Broumi, S. (2020). Single and Multi-valued Neutrosophic Hypersoft set and Tangent Similarity Measure of Single valued Neutrosophic Hypersoft Sets. *Neutrosophic Sets and Systems, 32*(1), 20. **(Muhammad Saeed (Mathematics/SSC) SJR**

Abstract: In this paper, we present a single-valued Neutrosophic Hypersoft set, multi-valued Neutrosophic Hypersoft set and tangent similarity measure for single-valued neutrosophic hypersoft sets and its properties. Then we use this technique in an application namely selection of cricket players for different types of matches (ODI, T20, and test) based on Neutrosophic Hypersoft set in decision making of single-valued neutrosophic hypersoft sets. This technique will help us to decide the best option for the players.

Keywords: *Neutrosophic hypersoft set (NHSS), single-valued neutrosophic hypersoft set (SVNHSS), multi-valued Neutrosophic Hypersoft set (MVNHSS), tangent similarity measure (TSM), multiple attribute decision making, cricket player set.*

76. Muhammad, R., **Saeed, M.,** Ali, B., Ahmad, N., Ali, L., & Abdal, S. (2020). Application of Interval Valued Fuzzy Soft Max-Min Decision Making Method in Medical Diagnosis. *International Journal of Mathematical Research, 9*(1), 11-19. **(Muhammad Saeed (Mathematics/SSC) Not HEC Recognized**

Abstract: In this paper, we study some basic concepts of fuzzy sets, soft sets, fuzzy soft sets, and interval-valued fuzzy soft sets. Secondly, we study the interval-valued fuzzy soft maxmin decision-making function and developed the graphical model for the Intervalvalued fuzzy soft max-min decision making (IVFSMmDM) method by using

Intervalvalued fuzzy soft max-min decision-making function. Finally, we used IVFSMmDM for faculty selection in the education department and observed that is the best teacher for teaching by using hypothetical data.
Keywords: *Fuzzy set, Soft set, Interval-valued fuzzy soft set, IvfsMmDM function.*

77. Zulqarnain, R. M., **Saeed, M.,** Ahmad, N., **Dayan, F.,** & Ahmad, B. (2020). Application of TOPSIS Method for Decision Making. *International Journal of Scientific Research in Mathematical and Statistical Sciences, 7*(2), 76-81. **(Muhammad Saeed, Fazal Dayan (Mathematics/SSC) Not HEC Recognized**
Abstract: —In this paper, we discuss the order preference by similarity ideal solution (TOPSIS) method with basic concepts and determine the TOPSIS algorithm. Secondly, we construct a graphical model for the TOPSIS method by using the TOPSIS algorithm. Finally, we use the developed method for decision making in our daily life. In this work, we use the TOPSIS method for the selection of a car by using hypothetical data and examined that the civic is the best automotive car according to given parameters.
Keywords: *Multiple Criteria Decision Making (MCDM), TOPSIS, Positive Ideal Solution (PIS), Negative Ideal Solution (NIS).*

78. **Saeed, M.,** Saqlain, M., **Mehmood, A., Naseer, K., & Yaqoob, S.** (2020). Multi-Polar Neutrosophic Soft Sets with Application in Medical Diagnosis and Decision-Making. *Neutrosophic Sets and Systems, 33*(1), 13. **(Muhammad Saeed, Asad Mehmood, Khushbakht Naseer, Sonia Yaqoob (Mathematics/SSC) SJR**
Abstract: A Similarity measure for Neutrosophic function performs a fundamental role in tackling the problems that include blurred and hazed information but is not able to handle the fuzziness and vagueness of the problems which have numerous information. The objective of this research paper is to generalize neutrosophic soft set to the multi-polar neutrosophic soft set (mNS set), aggregation operators and their properties on mNS sets. It also discusses the distance-based similarity measures that rely on between two mNS sets. It explains with the help of examples that the intended similarity measures of mNS sets are applicable in the field of medical diagnosis and decision-making problem for selection of lecturer in universities. Eventually, this proposed method is concluded as an algorithm in the application.
Keywords: *mNS Set; Operators on mNS; Properties; Distance and Similarity Measure; Medical Diagnosis; Decision-Making.*

79. **Rana, S., Saeed, M.,** Qayyum, M., & Smarandache, F. (2020). Plithogenic Subjective Hyper-Super-Soft Matrices with New Definitions & Local, Global, Universal Subjective Ranking Model. *International Journal of Neutrosophic Science (IJNS), 6*(2), 56-79. **(Shazia Rana, Muhammad Saeed (Mathematics/SSC) Not HEC Recognized**
Abstract: In this paper, we initially introduce a novel type of matrix representation of Plithogenic Crisp/Fuzzy/Intuitionistic/Neutrosophic Hypersoft Set named as Plithogenic Crisp/Fuzzy/Intuitionistic/Neutrosophic Hypersoft Matrix, which is generated by multiple parallel sheets of matrices. Furthermore, these parallel sheets are representing parallel universes or parallel realities (a combination of attributes and sub-attributes w.r.t. subjects). We represent cross-sectional cuts of these hyper-soft matrices as parallel sheets (images of the expanded universe). Later, we utilize these Hypersoft matrices to formulate Plithogenic Subjective Crisp/Fuzzy/Intuitionistic/Neutrosophic Hyper-Super-Soft Matrix. These matrices are framed by the generalization of Whole Hyper-Soft Set to Subjective Whole Hyper-Soft Set and then their representation in such hyper-super-soft-matrix (parallel sheets of matrices) whose elements are matrices. The Hypersoft matrices and hyper-super-soft matrices are tensors of rank three and four, respectively, having three and four indices of variations. Later we provide an application of these Plithogenic Hyper super soft matrices in the form of Local, Global, Universal Subjective Ranking Model. The specialty of this model is that it offers precise classification of the universe from micro-universe to macro-universe levels by observing them through several angles of visions in many environments having several ambiguities and hesitation levels. This

model provides optimal and neutral values of universes and can compact the expanded universe to a single point in such a way that the compacted universe reflects the cumulative effect of the whole universe. It further offers a transparent ranking by giving a percentage authenticity measure of the ranking. Finally, we provide an application of the model as a numerical example.

Keywords: *plithogenic hyper-super-soft matrices, sheets of matrices, expanded universe, compacted universe, subjective, local, global, universal ranking.*

80. Zulqarnain, R. M., Xin, X. L., **Saeed, M., Ahmad, N., Dayan, F.,** & Ahmad, B. (2020). Recruitment of Medical Staff in Health Department by Using TOPSIS Method. *International Journal of Pharmaceutical Sciences Review and Research, 62*(1), 1-7. **(Muhammad Saeed, Nadeem Ahmad, Fazal Dayan (Mathematics/SSC) SJR**

Abstract: In this paper, we debate the order preference by similarity ideal solution (TOPSIS) method and develop a model for the TOPSIS method. The selection of medical staff is a very significant portion of our life to promote the quality of health in our society. We select the more appropriate medical staff for the health department by using the TOPSIS method in the following research.

Keywords: *Multiple Criteria Decision Making (MCDM), TOPSIS, Positive Ideal Solution (PIS), Negative Ideal Solution (NIS).*

81. **Imtiaz, M.,** Saqlain, M., **& Saeed, M**. (2020). TOPSIS for Multi Criteria Decision Making in Octagonal Intuitionistic Fuzzy Environment by Using Accuracy Function. *Journal of New Theory, 31*, 32-40. **(Madiha Imtiaz, Muhammad Saeed (Mathematics/SSC) Not HEC Recognized**

Abstract: Multi Criteria Decision Making (MCDM) enables a strong valid platform in domains where choosing the best of the best among various attributes is quite complicated. This paper provides a suitable methodology for solving MCDM problems in Intuitionistic Fuzzy region. In this paper we shall be dealing with the environment of octagonal intuitionistic fuzzy numbers. These numbers are more suitable to deal with uncertainties than other generalized form of fuzzy numbers. There are ways to solve MCDM in IF environment. Many have used -cuts of numbers which are complicated calculations usually ending up with deviation from the results. Despite of solving the problem using - cuts, we propose a new ranking technique in the procedure. This ranking technique is called an accuracy function for octagonal intuitionistic fuzzy numbers. Octagonal Intuitionistic fuzzy numbers are introduced along with its membership and non-membership values. For application, a numerical example is solved at the end of this paper.

Keywords: *Fuzzy Numbers (FN's), Intuitionistic Fuzzy Numbers (IFN's), Octagonal Intuitionistic Fuzzy Number (OIFN's), Accuracy Function (AF), TOPSIS.*

82. **Saeed, M., Ahmad, M. R.,** Saqlain, M., & Riaz, M. (2020). Rudiments of N-framed soft sets. *Punjab University Journal of Mathematics, 52*(5), 15-30. **(Muhammad Saeed, Muhammad Rayees Ahmad (Mathematics/SSC) HEC X CAT**

Abstract: Uncertainty is a human instinct that prevails on the mind of a person while making an important decision. Decision making is the most integral part of human life which has a potential to change an entire life of a man. Soft set theory is an important tool which deals with uncertainty and helps to make the appropriate decision. This paper covers the generalization of soft sets including double framed and triple framed soft sets and discusses its extension to N-framed soft sets. By defining significant aggregative operations including union, intersection, not set, complement, relative complement, difference of double framed, triple framed and in general N-framed soft sets and some other laws, this paper provides an imperative insight for studying N-framed soft sets.

Keywords: *Uncertainties, Decision making,soft sets, Double framed soft sets (DFSS),Triple framed soft sets (TFSS), N-framed soft sets (NFSS).*

83. **Ali, U., & Javaid, M.** (2020). Zagreb connection indices of disjunction and symmetric difference operations on graphs. *Journal of Prime Research in Mathematics, 16*(2), 1-15. **(Usman Ali, Muhammad Javaid (Mathematics/SSC) HEC Y CAT**

Abstract: In this paper, we compute the general results in the form of the upper bounds of the Zagreb indices based on connection number called as first Zagreb connection index, second Zagreb connection index and modified first Zagreb connection index for the resultant graphs which are obtained by applying the product-related operations such as disjunction (co-normal product) and symmetric difference. At the end, some applications of the obtained results with a comparison between exact and computed values of the aforesaid Zagreb connection indices for the particular classes of alkanes are also included.

Keywords: *Zegreb indices, connection number, disjunction, symmetric difference.*

84. **Awais, H., Javaid, M.,** & Raheem, A. (2020). Hyper-Zagreb index of graphs based on generalized subdivision related operations. *Punjab University Journal of Mathematics, 52*(5), 89-103. **(H. M. Awais, Muhammad Javaid (Mathematics/SSC) HEC X CAT**

Abstract: Mathematical modeling of the molecular graphs plays a fundamental part in the analysis of the quantitative structures activity relationship (QSAR) and quantitative structures property relationship models (QSPR models). In 2013, Shirdel et. al. [IJMC; 4(2013); 213-220] defined the new topological index of a graph (Γ) named as hyper-Zagreb index [HM(Γ)] is HM(Γ) = P yz²E(Γ) [dΓ(y) + dΓ(z)]2 Liu et al. [IEEE Access; 7(2019); 105479-105488] defined the concept of the generalized subdivision operations on graphs and obtained the generalized F-sum graphs. In this paper, the hyper-Zagreb index is calculated for the generalized F-sum graphs in terms of their factor graphs. In fact, the obtained results are the general extension of the results Anandkumar et al. [IJPAM; 112(2017); 239-252]

Keywords: *molecular graph, cartesian product, generalized f-sum graph.*

85. **Ali, U., & Javaid, M.** (2020). Upper bounds of Zagreb connection indices of tensor and strong product on graphs. *Punjab University Journal of Mathematics, 52*(2), 89-100. **(Usman Ali, Muhammad Javaid (Mathematics/SSC) HEC X CAT**

Abstract: A topological index (TI) is a function from P to the set of real numbers, where P is the set of finite simple graphs. In fact, it is a final outcome of a logical, systematical and mathematical process that transforms feature encoded in a molecular graph to a fixed real number. Gutman and Trinajstic (1972) first time defined degree based TI named as first Zagreb index to compute the total π-electron energy of a molecular graph. They also exposed another TI that is renamed as modified first Zagreb connection index in [Ali and T rinajstic, Mol. Inform. 37(2018), 1 − 7]. In this paper, we compute the upper bounds for the Zagreb connection indices i.e. first Zagreb connection index, second Zagreb connection index and modified first Zagreb connection index of the resultant graphs which are obtained by applying the tensor and strong product of two graphs.

Keywords: *zagreb indices, connection number, tensor product and strong product.*

86. Raheem, A., **Javaid, M.,** Hasni, R., & Shah, N. (2020). On SEMT Labeling of Disjoint Union of Subdivided Stars and Stars. *Southeast Asian Bulletin of Mathematics, 44*(4), 587–596. **(Muhammad Javaid (Mathematics/SSC) MJL**

Abstract: An edge magic total (EMT) labeling on a graph Γ = (V (Γ),E(Γ)) with |V (Γ)| = p and |E(Γ)| = q is a bijective function ψ : V (Γ) ∪ E(Γ) → {1,2,..., p + q} with the property that for each edge uv ∈ E(Γ), ψ(u) + ψ(uv) + ψ(v) = c, where c is a constant. An edge magic total (EMT) labeling is called super edge magic total (SEMT) labeling if the smallest numbers are given to the vertices. In this paper, we study the existence of SEMT labeling of disjoint union of stars and subdivided stars.

Keywords: *subdivided star, star, SEMT labeling.*

87. Raheem, A., & **Javaid, M.** (2020). ON (a; d)-EAT LABELING OF SUBDIVISION OF TREES. *TWMS Journal of Applied and Engineering Mathematics, 10*(3), 574. **(Muhammad Javaid (Mathematics/SSC) SJR**
Abstract: An (a, d)-edge antimagic total (EAT) labeling on a graph Γ with p vertices and q edges is a one-to-one function ψ from V (Γ)∪E(Γ) onto the set of integers 1, 2, ...p+q with the property that for each edge uv, the set {ψ(u) +ψ(uv) +ψ(v) : uv ∈ E(Γ)} form an arithmetic progression (A. P.) starting with a and having common difference d, where a > 0 and d ≥ 0 fixed integers. A (a, d)-EAT labeling is called super (a, d)-EAT labeling if the smallest numbers are labels to the vertices. In this paper, we have to show that the graph of the subdivided star and subdivided caterpillar are super (a, d)-EAT labeling.
Keywords: *subdivided stars, subdivided caterpillars, super (a, d)-EAT labeling.*

88. Raheem, A., Hasni, R., **Javaid, M.,** & Umar, M. A. (2020). On cordial related labeling of isomorphic copies of paths and subdivision of star. *Journal of Discrete Mathematical Sciences and Cryptography*, 1-10. doi: 10.1080/09720529.2019.1698802. **(Muhammad Javaid (Mathematics/SSC) SJR**
Abstract: In this paper, we investigate the cordiality of the isomorphic copies of paths mP_n . We also give sufficient condition for mP_n to admit the prime cordial labeling, product cordial labeling and total product cordial labeling. Furthermore, we also determine the prime cordial labeling, product cordial labeling and total product cordial labeling for subdivision of star under certain conditions.
Keywords: *cordial labeling, paths, subdivision of star.*

89. **Afzal, H. U., & Javaid, M.** (2020). Further results regarding super edge-magic graphs and solution to an open problem. *Journal of Discrete Mathematical Sciences and Cryptography*, 1-14. doi: 10.1080/09720529.2020.1776938. **(H. U. Afzal, Muhammad Javaid (Mathematics/SSC) SJR**
Abstract: Graph labeling admits a distinct place in Discrete Mathematics and Combinatorics. In 1998, Hikoe Enomoto et al. brought out the idea of super edge-magic (SEMC) labelling of graphs. In this article, we shall provide a complete solution to an open problem, regarding double stars $S_{t,t}$, proposed by W. D. Wallis & A. M. Marr [9], by exhibiting a super edge-magic labeling of $S_{t,t}$, for all possible values of *t* and *t*. We will also provide a SEMC labelling of union of cycles C_r being disjoint and various trees and exhibit super edge-magicness of some cases of Usmanian Ladders and planar graphs involving chains of C_5.
Keywords: *super edge-magic graph, tree, star, cycle.*

90. Raheem, A., **Javaid, M.,** Hasni, R., Hanif, A., & Shah, N. (2020). RSEMT labeling of union of paths and subdivided star. *Journal of Discrete Mathematical Sciences and Cryptography*, 1-13. doi: 10.1080/09720502.2020.1756046. **(Muhammad Javaid (Mathematics/SSC) SJR**
Abstract: A reverse edge magic total (REMT) labeling for the graph Γ = (*V*(Γ), *E*(Γ)) along with cardinality of *p* = |*V*(G)| and *q* = |*E*(G)| respectively. A one-one map *π*: *V*(Γ) ∪ *E*(Γ) → {1, 2, … , |*V*(Γ)|+|*E*(Γ)|} having a rule that for every edge, *uv* ϵ *E*(Γ), then *π* (*uv*) − {*π* (*u*) + *π* (*v*)} = *c*, where *c* is a magic number. A reverse edge magic total (REMT) labeling is called a reverse super edge magic total (RSEMT) labeling if vertex-set receive natural numbers. In present paper, we compute the RSEMT labeling on the forest of paths and subdivided star.
Keywords: *subdivided star, paths, RSEMT labeling.*

91. **Ali, U., Javaid, M.,** & Alanazi, A. M. (2020). Computing Analysis of Connection-Based Indices and Coindices for Product of Molecular Networks. *Symmetry, 12*(8), 1320. **(Usman Ali, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 2.645)**
Abstract: Gutman and Trinajstić (1972) defined the connection-number based Zagreb indices, where connection number is degree of a vertex at distance two, in order to find the electron energy of alternant hydrocarbons.

These indices remain symmetric for the isomorphic (molecular) networks. For the prediction of physicochemical and symmetrical properties of octane isomers, these indices are restudied in 2018. In this paper, first and second Zagreb connection coindices are defined and obtained in the form of upper bounds for the resultant networks in the terms of different indices of their factor networks, where resultant networks are obtained from two networks by the product-related operations, such as cartesian, corona, and lexicographic. For the molecular networks linear polynomial chain, carbon nanotube, alkane, cycloalkane, fence, and closed fence, first and second Zagreb connection coindices are computed in the consequence of the obtained results. An analysis of Zagreb connection indices and coindices on the aforesaid molecular networks is also included with the help of their numerical values and graphical presentations that shows the symmetric behaviour of these indices and coindices with in certain intervals of order and size of the under study (molecular) networks.

Keywords: *connection number, Zagreb indices, coindices, product of networks.*

92. Li, X., **Ahmad, M., Javaid, M., Saeed, M.,** & Liu, J.-B. (2020). Bounds on General Randić Index for F-Sum Graphs. *Journal of Mathematics, 2020*, 9129365. doi: 10.1155/2020/9129365. **(Maqsood Ahmad, Muhammad Javaid, Muhammad Saeed (Mathematics/SSC) Web of Science JCR Listed (IF: 0.712)**

Abstract: analysis of quantitative structure activity/property relationships (QSAR/QSPR). 'e correlation between the entire π-electron energy and the structure of a molecular graph was explored and understood by the first Zagreb index. Recently, Liu et al. (2019) calculated the first general Zagreb index of the F-sum graphs. In the same paper, they also proposed the open problem to compute the general Randi´c index Rα(Γ) ◆ ⍰uv∈E(Γ)[dΓ(u) × dΓ(v)]α of the F-sum graphs, where α ∈ R and dΓ(u) denote the valency of the vertex u in the molecular graph Γ. Aim of this paper is to compute the lower and upper bounds of the general Randi´c index for the F-sum graphs when α ∈ N. We present numerous examples to support and check the reliability as well as validity of our bounds. Furthermore, the results acquired are the generalization of the results offered by Deng et al. (2016), who studied the general Randi´c index for exactly α ◆ 1.

Keywords: *not available.*

93. **Saeed, M., Ali, U., Ali, J., & Dayan, F.** (2020). Fuzzy Soft Relative Method and its Application in Decision Making Problem. *Proceedings of the Pakistan Academy of Sciences: A. Physical and Computational Sciences, 57*(1), 21-30. **(Muhammad Saeed, Usman Ali, Javaid Ali, Fazal Dayan (Mathematics/SSC) HEC Y CAT**

Abstract: In day to day problems, so many situations are faced which are full of dissatisfaction and uncertainties. Fuzzy soft set theory has evolved as an effective decision making tool to cope with problems with uncertainties. This work develops a new technique, Fuzzy Soft relative (FS-relative) method for solving such problems. Underlying concept is inspired from fuzzy soft set aggregate approach. We find maximal set and apply it to FS-set to get a relative set which contains relative fuzzy approximation functions values. Then FS-relative operator is generated and the values are applied with maximal set by FS-relative operator to get a single relative fuzzy set. The proposed FS-relative method has been effectively applied to find the optimum solution for selecting the best teacher in a High School according to the teacher specific characteristics.

Keywords: *soft sets, fuzzy sets, fuzzy soft sets, fs-relative method.*

94. **Saeed, M., Hussain, M., Mughal, A. A. (**2020). A Study of Soft Sets with Soft Members and Soft Elements: A New Approach. *Punjab University Journal of Mathematics, 52*(8), 1-15. **(Muhammad Saeed, Manzoor Hussain, Abdul Aleem Mughal (Mathematics/SSC) HEC X CAT**

Abstract: Soft set theory has gained significant worth since its emergence. Soft algebraic structures have been discussed in numerous researches with the help of sub algebraic structures. Properties of soft algebraic structures, somehow, are hard to study in parallel to the study of the classical approach of algebraic structures. In this study, we perform an extensive inspection of the concept of soft elements and soft members in soft sets.

By using soft members and soft elements, soft sets operations and soft sets relations are discussed which enables us to study the concept of soft algebraic structures with this new approach. To elaborate on the new introduced concept, Cayley's table for the soft group has been constructed from where some properties of the soft groups are verified.

Keywords: *soft member, soft element, isolated soft element, sub soft member, soft relations, soft binary operations, soft identity member, soft inverse.*

95. Chu, Y.-M., **Javed, S., Javaid, M.,** & Kamran Siddiqui, M. (2020). On bounds for topological descriptors of ϕ-sum graphs. *Journal of Taibah University for Science, 14*(1), 1288-1301. doi: 10.1080/16583655.2020.1819026. **(Saira Javed, Muhammad Javaid (Mathematics/SSC) Web of Science JCR Listed (IF: 1.863)**

Abstract: The properties of chemical compounds are very important for the studies of the non-isomorphism phenomenon's related to the molecular graphs. Topological indices (TIs) are one of the mathematical tools which are used to study these properties. Gutman and Trinajsti [Graph theory and molecular orbitals. Total π-electron energy of alternant hydrocarbons. Chem Phys Lett. 1972;17(4):535–538] defined the Zagreb indices (descriptors) to find correlation value between a molecular graph and its total π-electron energy. Later on, Bollobás and Erdös [Graphs of extremal weights. Ars Comb; 1998;50:225–233] defined the most general form of these indices (descriptors) called by general Randić index (GRI) and first general Zagreb index (FGZI), respectively. In this paper, we computed the bounds for FGZI and GRI of φ-sum graphs, obtained by the strong product of the graph ϕ(G)ϕ(G) with another graph Γ, where ϕ(G)ϕ(G) is constructed using four subdivision operations on the graph *G*. At the end, we also include the results for some particular families of graphs as the applications of the obtained results.

Keywords: *topological descriptors, φ-sum graphs, strong product.*

96. **Javaid, M., Raza, M.,** Kumam, P., & Liu, J. B. (2020). Sharp Bounds of Local Fractional Metric Dimensions of Connected Networks. *IEEE Access, 8*, 172329-172342. doi: 10.1109/ACCESS.2020.3025018. **(Muhammad Javaid, Mohsin Raza (Mathematics/SSC) Web of Science JCR Listed (IF: 3.745)**

Abstract: Metric dimension is a distance based parameter which is used to determine the locations of machines (or robots) with respect to minimum consumption of time, shortest distance among the destinations and lesser number of the utilized nodes as places of the objects. It is also used to characterize the chemical compounds in the molecular networks in the form of their unique presentations. These are problems worth investigating in different strata of computer science and chemistry such as navigation, combinatorial optimization, pattern recognition, image processing, integer programming, network theory and drugs discovery. In this paper, a general computational criteria is established to compute the local fractional metric dimension (LFMD) of connected networks in the form of sharp lower and upper bounds. A complete characterization of the connected networks whose LFMDs attain the exactly lower bound is obtained and some particular classes of networks (complete networks, generalized windmill and h -level windmill) whose LFMDs attain the exactly upper bound are also addressed. In the consequence of the main obtained criteria, LFMDs of wheel-related networks (anti-web gear, m -level wheel, prism, helm and flower) are computed and their boundedness (or un-boundedness) is also illustrated with the help of 2D and 3D graphical presentations.

Keywords: *distance in networks, metric dimension, resolving neighborhood sets, fractional metric dimension, connected networks, wheel-related networks.*

97. **Ali, R.,** Akgül, A., & **Asjad, M. I.** (2020). Power law memory of natural convection flow of hybrid nanofluids with constant proportional Caputo fractional derivative due to pressure gradient. *Pramana, 94*(1), 131. doi: 10.1007/s12043-020-01997-8. **(Rizwan Ali, Muhammad Imran Asjad (Mathematics/SSC) SJR**

Abstract: In this work, influence of hybrid nanofluids on heat transfer flow of a viscous fluid due to pressure gradient is discussed with innovative constant proportional Caputo fractional derivative. For this purpose, we consider an infinite vertical wall which is exponentially moving in the *x*-direction with variable temperature. Nanosized particles of Cu and Al2O3Al2O3 are suspended in water, the base fluid. The governing equations of the problem are converted into dimensionless form. Further, we develop the constant proportional Caputo fractional model with a new operator with power law kernel which can be used to study the fluid behaviour for different values of fractional parameter at the present time. We applied the Laplace transform method to obtain the solutions and to see the impact of hybrid nanofluids and fractional parameter αα respectively. We compared the present results with the recently published work (Nehad *et al*, *Adv. Mech. Eng.* **11(7)**: 1 (2019)) with Caputo fractional derivative. As a result, we have found that the present solutions are best to describe the memory concept of temperature and velocity. For small values of fractional parameter, temperature and velocity have maximum values and for larger values of fractional parameter, temperature and velocity have minimum values. Further, rate of heat transfer and skin friction are also computed in tabular forms and it is found that Nusselt number with CPC is much less than that is computed with Caputo fractional derivative for greater values of fractional parameter αα.

Keywords: *hybrid nanofluids, Newtonian fluid, pressure gradient, channel flow, power law kernel.*

98. Saleem, N., Iqbal, I., **Iqbal, B.,** & Radenovíc, S. (2020). Coincidence and fixed points of multivalued F-contractions in generalized metric space with application. *Journal of Fixed Point Theory and Applications, 22*(4), 81. doi: 10.1007/s11784-020-00815-3. **(Bilal Iqbal (Mathematics/SSC) Web of Science JCR Listed (IF: 1.741)**

Abstract: The aim of the paper was to prove some new fixed point theorems, coincidence point theorems and common fixed point theorems for multivalued *F*-contractions involving a binary relation that is not necessarily a partial order, in the context of generalized metric spaces (in the sense of Jleli and Samet). We also prove existence of common solutions to integral inclusions.

Keywords: *fixed point, common fixed point, coincidence point, periodic point, f-contraction, js-generalized metric space.*

99. Jhangeer, A., Munawar, M., **Riaz, M. B.,** & Baleanu, D. (2020). Construction of traveling waves patterns of (1+n)-dimensional modified Zakharov-Kuznetsov equation in plasma physics. *Results in Physics, 19*, 103330. doi: https://doi.org/10.1016/j.rinp.2020.103330. **(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 4.019)**

Abstract: In this research, we examine the modified model of (1+n)-dimensional Zakharov-Kuznetsov (ZK) equation, which will be used to analyze the nature of weakly nonlinear traveling waves in the existence of a constant magnetic area in a plasma comprising in cold ions and hot isothermal electrons. The modified Zakharov-Kuznetsov (mZK) equation will have solutions describing the traveling solitary waves, using the extended (G'G2)-expansion method and extended direct algebraic method gives way to the mZK equation regulating the transmission of ion dynamics for nonlinear traveling waves in a plasma. The sufficient conditions for the stability and existence of the traveling wave solutions are reported. Semi-dark, rational, and singular solitary wave solutions are computed. Graphical interpretations of certain practical solutions for specific values of parameters have also been available. The research findings reported throughout this evaluation are fresh and from which this model is employed to analyze waves in numerous plasmas, could be valuable and important. Subsequently, there are concluding remarks mentioned.

Keywords: *modified zakharov-kuznetsov equation, soliton solutions, cubic duffing equation, the extended -expansion method, new extended algebraic method.*

100. **Iqbal, S.,** Adil Khan, M., Abdeljawad, T., Samraiz, M., Rahman, G., & Nisar, K. S. (2020). New general Grüss-type inequalities over σ-finite measure space with applications. *Advances in Difference Equations, 2020*(1), 468. doi: 10.1186/s13662-020-02933-1. **(Sajid Iqbal (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 2.421) (SKT Campus)**

Abstract: In this paper, we establish some new integral inequalities involving general kernels. We obtain the related broad range of fractional integral inequalities. Also, we apply the Young inequality to find new forms of inequalities for generalized kernels. These new and motivated results generalize the results for fractional integrals such that fractional integral of a function with respect to an increasing function, Riemann–Lioville fractional integrals, Erdélyi–Kober fractional integrals, Hadamard fractional integrals, generalized factional integral integrals in addition to the corresponding *k*-fractional integrals.

Keywords: *grüss-type inequalities, kernel, fractional integrals, young's inequality.*

101. **Siddique, I.,** & Akgül, A. (2020). Analysis of MHD generalized first problem of Stokes' in view of local and non-local fractal fractional differential operators. *Chaos, Solitons & Fractals, 140*, 110161. doi: https://doi.org/10.1016/j.chaos.2020.110161. **(Imran Siddique (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

Abstract: In this work, we investigate the unsteady MHD generalized first problem of Stokes' for an incompressible viscous fluid under isothermal conditions. The developed governing equations for the problem are formulated with the newly introduced fractal fractional operators with power law, exponential decay law and the Mittag-Leffler law kernels. For every operator, we give a point by point examination including, numerical arrangement and stability investigation. Likewise, we present some numerical recreation.

Keywords: *fractal fractional derivative, mittag-leffler kernel, stability analysis, discretization.*

102. Awrejcewicz, J., Zafar, A. A., Kudra, G., & **Riaz, M. B.** (2020). Theoretical study of the blood flow in arteries in the presence of magnetic particles and under periodic body acceleration. *Chaos, Solitons & Fractals, 140*, 110204. doi: https://doi.org/10.1016/j.chaos.2020.110204.**(Muhammad Bilal Riaz (Mathematics/SSC) Web of Science JCR Listed (IF: 3.764)**

Abstract: In this article, the dynamics of blood with suspended magnetic particles in coronal and femoral arteries are investigated. The flow of blood is examined in the presence of external magnetic field, periodic body acceleration and a pressure gradient of an oscillating type. Expressions for the velocity of blood and velocity of magnetic particles will be yielded by employing integral transforms. The analytical results will be expressed in terms of steady-state and transient parts. Moreover, to get insight of the control of the material parameters such as amplitude, the lead angle, frequency of body acceleration, magnetic field and particles' concentration parameter, numerical simulations and graphical illustrations will be used and useful consequences will be summarized.

Keywords: *bio fluid, body acceleration, magnetic field, integral transforms.*

103. Rauf, A., Mahsud, Y., & **Siddique, I.** (2020). Multi-layer flows of immiscible fractional Maxwell fluids in a cylindrical domain. *Chinese Journal of Physics, 67*, 265-282. doi: https://doi.org/10.1016/j.cjph.2019.09.015.**(Imran Siddique (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: Laminar unsteady multilayer axial flows of fractional immiscible Maxwell fluids in a circular cylinder are investigated. The flow of fluids is generated by a time-dependent pressure gradient in the axial direction and by the translational motion of a cylinder along his axis. The considered mathematical model is based on the fractional constitutive equation of Maxwell fluids with Caputo time-fractional derivatives. Analytical solutions for the fractional differential equations of the velocity fields with boundary and interfaces conditions have been

determined by using the Laplace transform coupled with the Hankel transform of order zero and the Weber transform of order zero. The influence of the memory effects on the motion of the fluid has been investigated for the particular case of three fractional Maxwell fluids. It is found that for increasing values of the fractional parameter the fluid velocity is decreasing. The memory effects have a stronger influence on the velocity of the second layer.

Keywords: *Maxwell fluid, Fractional constitutive equation, Multi-layer flow, Integral transforms, Velocity field.*

104. Kang, S., Chu, Y.-M., **Virk, Abaid-Ur-Rehman,** Nazeer, W., & Jia, J. (2020). Computing Irregularity Indices for Probabilistic Neural Network. *Frontiers in Physics, 8*(359). doi: 10.3389/fphy.2020.00359.**(Abaid-Ur-Rehman Virk (Mathematics/SSC) Web of Science JCR Listed (IF: 2.638)**

Abstract: A topological index (TI) is a quantity expressed as a number that help us to catch symmetry of network. With the help of quantitative structure property relationship (QSPR), we can guess physical and chemical properties of several networks. A neural network is a computer system based on the nerve system. There are numerous uses of these systems in different fields of studies but their most critical use to date is in Neurochemistry. In this paper, we will discuss thirteen irregularity indices for probabilistic neural networks (PNN).

Keywords: *irregularity indices, probabilistic neural network, graph, topological index, zagreb index.*

105. Faizi, S., Sałabun, W., **Tabasam, R., Zafar, S.,** & Wątróbski, J. (2020). Intuitionistic Fuzzy Sets in Multi-Criteria Group Decision Making Problems Using the Characteristic Objects Method. *Symmetry, 12*(9), 1382. doi: http://dx.doi.org/10.3390/sym12091382. **(Tabasam Rashid, Sohail Zafar(Mathematics/SSC) Web of Science JCR Listed (IF: 2.645)**

Abstract: Over the past few decades, several researchers and professionals have focused on the development and application of multi-criteria group decision making (MCGDM) methods under a fuzzy environment in different areas and disciplines. This complex research area has become one of the more popular topics, and it seems that this trend will be increasing. In this paper, we propose a new MCGDM approach combining intuitionistic fuzzy sets (IFSs) and the Characteristic Object Method (COMET) for solving the group decision making (GDM) problems. The COMET method is resistant to the rank reversal phenomenon, and at the same time it remains relatively simple and intuitive in practical problems. This method can be used for both symmetric and asymmetric information. The Triangular Intuitionistic Fuzzy Numbers (TIFNs) have been used to handle uncertain data. This concept can ensure the preference information about an alternative under specific criteria more comprehensively and allows for easy modelling of symmetrical or asymmetrical linguistic values. Each expert provides the membership and non-membership degree values of intuitionistic fuzzy numbers (IFNs). So this approach deals with a different kind of uncertainty than with hesitant fuzzy sets (HFSs). The proposed combination of COMET and IFSs required an adaptation of the matrix of expert judgment (MEJ) and allowed to capture the behaviour aspects of the decision makers (DMs). Therefore, we get more reliable solutions while solving MCGDM problems. Finally, the proposed method is presented in a simple academic example.

Keywords: *intuitionistic fuzzy sets, multi-criteria group decision making, the COMET method.*

106. Abbas, M., Shatanawi, W., **Farooq, S.,** & Mitrović, Z. D. (2020). On a JH-operators pair of type (A) with applications to integral equations. *Journal of Fixed Point Theory and Applications, 22*(3), 72. doi: 10.1007/s11784-020-00807-3. **(Sadia Farooq (Mathematics/SSC) Web of Science JCR Listed (IF: 1.741)**

Abstract: The aim of this paper is to introduce a new class of noncommuting mappings called JH-operator pairs of type (A). We obtain the unique point of coincidence point in generalized metric spaces and the common fixed point results of such pairs of mappings in the setting of metric spaces. Some examples are also presented to support the concepts and results proved herein. We prove the existence of solution of nonlinear integral equations as an application of our result. In the end, we give any open question.

Keywords: *Coincidence point, point of coincidence, common fixed point, weakly compatible mapping, JH-operator pair, JH-operator pair of type (R), JH-operator pair of type (A), generalized metric space, metric space.*

107. Mohammed, M. A., AL-Mayyahi, S. Y. A., Chu, Y.-M., **Virk, Abaid-Ur-Rehman,** Rehman, H. M. (2020). Irregularity indices for line graph of Dutch windmill graph. *Proyecciones (Antofagasta), 39*(4), 903-918. doi: http://dx.doi.org/10.22199/issn.0717-6279-2020-04-0056. **(Abaid-Ur-Rehman Virk (Mathematics/SSC) SJR**

Abstract: Among topological descriptors topological indices are significant and they have a conspicuous role in chemistry. Dutch Windmill graph D x y can be obtain by taking x copies of cycle C y with a vertex in common. In this paper, we will compute some irregularity índices that are useful in quantitative structure activity relationship for Line Graph of Dutch Windmill graph.

Keywords: *dutch windmill graph, irregularity indices.*

108. **Ahmed, N.,** Elsonbaty, A., Adel, W., Baleanu, D., & Rafiq, M. (2020). Stability analysis and numerical simulations of spatiotemporal HIV CD4+ T cell model with drug therapy. *Chaos: An Interdisciplinary Journal of Nonlinear Science, 30*(8), 083122. doi: 10.1063/5.0010541.**(Nauman Ahmed (Mathematics/SSC) SJR**

Abstract: In this study, an extended spatiotemporal model of a human immunodeficiency virus (HIV) CD4+ T cell with a drug therapy effect is proposed for the numerical investigation. The stability analysis of equilibrium points is carried out for temporal and spatiotemporal cases where stability regions in the space of parameters for each case are acquired. Three numerical techniques are used for the numerical simulations of the proposed HIV reaction–diffusion system. These techniques are the backward Euler, Crank–Nicolson, and a proposed structure preserving an implicit technique. The proposed numerical method sustains all the important characteristics of the proposed HIV model such as positivity of the solution and stability of equilibria, whereas the other two methods have failed to do so. We also prove that the proposed technique is positive, consistent, and Von Neumann stable. The effect of different values for the parameters is investigated through numerical simulations by using the proposed method. The stability of the proposed model of the HIV CD4+ T cell with the drug therapy effect is also analyzed.

Keywords: *not available.*

109. Faizi, S., Sałabun, W., Ullah, S., **Rashid, T.,** Więckowski, J. (2020). A New Method to Support Decision-Making in an Uncertain Environment Based on Normalized Interval-Valued Triangular Fuzzy Numbers and COMET Technique. *Symmetry*, 12(4), 516. doi: https://doi.org/10.3390/sym12040516. **(Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 2.645)**

Abstract: Multi-criteria decision-making (MCDM) plays a vibrant role in decision-making, and the characteristic object method (COMET) acts as a powerful tool for decision-making of complex problems. COMET technique allows using both symmetrical and asymmetrical triangular fuzzy numbers. The COMET technique is immune to the pivotal challenge of rank reversal paradox and is proficient at handling vagueness and hesitancy. Classical COMET is not designed for handling uncertainty data when the expert has a problem with the identification of the membership function. In this paper, symmetrical and asymmetrical normalized interval-valued triangular fuzzy numbers (NIVTFNs) are used for decision-making as the solution of the identified challenge. A new MCDM method based on the COMET method is developed by using the concept of NIVTFNs. A simple problem of MCDM in the form of an illustrative example is given to demonstrate the calculation procedure and accuracy of the proposed approach. Furthermore, we compare the solution of the proposed method, as interval preference, with the results obtained in the Technique for Order of Preference by Similarity to Ideal solution (TOPSIS) method (a certain preference number).

Keywords: *multi-criteria decision-making, the COMET method, triangular fuzzy number.*

110. **Nasir, R., Zahid, Z., & Zafar, S.** (2020). Edge version of metric dimension for the families of grid graphs and generalized prism graphs. *Discrete Mathematics, Algorithms and Applications, 12*(03), 2050037. doi: 10.1142/s1793830920500378. **(Ruby Nasir, Zohaib Zahid, Sohail Zafar (Mathematics/SSC) SJR**

Abstract: The minimum edge version of metric basis is the smallest set SESE of edges in a connected graph GG such that for every pair of edges e1,e2e1,e2∈∈EG,EG, there exists an edge ee∈∈SESE for which dE(e1,e)dE(e1,e)≠≠dE(e2,e)dE(e2,e) holds. In this paper, the families of grid graphs and generalized prism graphs have been studied for edge version of metric dimension. Edge version of metric dimension is found to be constant for both families of graphs.

Keywords: *line graph, grid graph, generalized prism graph, edge version of resolving sets, edge version of metric dimension.*

111. **Ali, A., & Rashid, T.** (2020). Best–worst method for robot selection. *Soft Computing*. doi: 10.1007/s00500-020-05169-z. **(Asif Ali, Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 3.050)**

Abstract: For different applications, there are different robots having capabilities and specifications accordingly. For a particular application and industrial requirement, proper and suitable selection of robot is a difficult task. Numerous robot selection methods are available. Considering the research works on industrial robot selection, group best–worst method is employed in this paper for the proper selection of robots. Weighing the decision makers by considering their past experience is an important factor considered for expert and reliable selection of robot. Objective weights to describe the importance of the attributes along with the decision maker subjective preferences to describe the weights of the attribute are considered. Two problems are discussed for a detailed description and results are compared with the well-known group analytical hierarchy process method. The results show that due to lower minimum violation and lower total deviation, the proposed method performs better.

Keywords: *group best–worst method (G-BWM), group analytic hierarchy process (G-AHP), multiple attribute group decision making, subjective weights, objective weights, integrated weights.*

112. **Ahmad, M., Ameen, N., Zahid, Z., & Zafar, S.** (2020). Computing edge version of metric and double metric dimensions of Kayak paddle graphs. *Discrete Mathematics, Algorithms and Applications, 12*(05), 2050070. doi: 10.1142/s1793830920500706. **(Muhammad Ahmad, Naeem Ameen, Zohaib Zahid, Sohail Zafar (Mathematics/SSC) SJR**

Abstract: Locating the source of diffusion in complex networks is an exciting but challenging task. It is critical for preventing and controlling the epidemic risks. Source localization has been studied under many feasible models. In this paper, we discuss the localization problem in Kayak paddle graphs KP(l,m,n)KP(l,m,n) for l,m≥3l,m≥3 and n≥2n≥2 by computing edge version of metric and double metric dimensions.

Keywords: *Edge version of resolving sets and metric dimension, edge version of doubly resolving sets and double metric dimension, Kayak paddle graphs.*

113. Guirao, J. L. G., **Sarwar Sindhu, M., Rashid, T., & Kashif, A**. (2020). Multiple Criteria Decision-Making Based on Vector Similarity Measures under the Framework of Dual Hesitant Fuzzy Sets. *Discrete Dynamics in Nature and Society, 2020*, 1425487. doi: 10.1155/2020/1425487. **(M. Sarwar Sindhu, Tabasam Rashid , Agha Kashif (Mathematics/SSC) Web of Science JCR Listed (IF: 0.870)**

Abstract: Similarity measures have a great importance in the decision-making process. In order to identify the similarity between the options, many experts have established several types of similarity measures on the basis of vectors and distances. The Cosine, Dice, and Jaccard are the vector similarity measures. The present work

enclosed the modified Jaccard and Dice similarity measures. Founded on the Dice and Jaccard similarity measures, we offered a multiple criteria decision-making (MCDM) model under the dual hesitant fuzzy sets (DHFSs) situation, in which the appraised values of the alternatives with respect to criteria are articulated by dual hesitant fuzzy elements (DHFEs). Since the weights of the criteria have a much influence in making the decisions, therefore decision makers (DMs) allocate the weights to each criteria according to their knowledge. In the present work, we get rid of the doubt to allocate the weights to the criteria by taking an objective function under some constraints and then extended the linear programming (LP) technique to evaluate the weights of the criteria. The Dice and Jaccard weighted similarity measures are practiced amongst the ideal and each alternative to grade all the alternatives to get the best one. Eventually, two practical examples, about investment companies and selection of smart phone accessories are assumed to elaborate the efficiency of the proposed methodology.
Keywords: *not available.*

114. Gao, W., **Idrees, B., Zafar, S., & Rashid, T.** (2020). Construction of Nonlinear Component of Block Cipher by Action of Modular Group PSL(2, Z) on Projective Line PL(GF(28)). *IEEE Access, 8*, 136736-136749. doi: 10.1109/ACCESS.2020.3010615. **(Bazgha Idrees, Sohail Zafar, Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 3.745)**

Abstract: Substitution box (S-Box) has a prominent significance being the fundamental nonlinear component of block cipher which fulfils confusion, one of the properties proposed by Claude Shannon in 1949. In this paper, we proposed an S-Box by using the action of modular group PSL (2,Z) on projective line PL (F257) over Galois field GF (28) . In the first step we obtained elements of GF (28) by using powers of α , where α is the primitive root of irreducible polynomial p(x) of order 8 over field Z2 , then applied the generators of PSL (2,Z) and followed steps to get rid of infinity from output. In the final step of proposed scheme, one of the permutations of S16 is applied which enhanced the possible number of S-Boxes obtained by any single specific irreducible polynomial p(x) over field Z2 of order 8. We analyzed performance of the proposed 8×8 S-Box under cryptographic properties such as strict avalanche criterion, bit independence criterion, nonlinearity, differential approximation probability, linear approximation probability; and compared obtained results with a number of renowned S-Boxes. Lastly, we performed statistical analysis (which comprises of contrast analysis, homogeneity analysis, energy analysis, correlation analysis, entropy analysis and mean of absolute deviation analysis) on our proposed S-Box and obtained results have been compared with adequate number of S-Boxes.
Keywords: *MS action of modular group, cryptographic properties' analyses, finite field, majority logic criterion, s-bo.*

115. Bashir, Z., Ali, J., & **Rashid, T.** (2020). Consensus-based robust decision making methods under a novel study of probabilistic uncertain linguistic information and their application in Forex investment. *Artificial Intelligence Review*. doi: 10.1007/s10462-020-09900-y. **(Tabasam Rashid (Mathematics/SSC) Web of Science JCR Listed (IF: 5.747)**

Abstract: The probabilistic uncertain linguistic terms set (PULTS) is an effective tool to depict uncertain linguistic opinions of individuals or groups in the procedure of decision making. Motivated by the power of PULTS and the linguistic scale function, this study aims to propose robust techniques to solve multi-attribute group decision making problems with uncertain linguistic evaluations. To enrich calculation and enhance the flexibility of PULTS, we first generalize the aggregation formula to fuse opinions of decision makers represented as PULTSs and secondly derive adjusting rule of probability to adjust the probability distribution of two or more than two probabilistic uncertain elements (PULEs) into the same probability distribution. Novel operations of PULTSs are designed based on the adjusting rule of probability distribution and linguistic scale function for the semantics of linguistic terms. Many related properties of these operations are also discussed. New score function and deviation degree of PULEs are also developed to compare PULEs. Two aggregation operators i.e., probabilistic

uncertain linguistic averaging (PULWA) operator and probabilistic uncertain linguistic geometric (PULWG) operator are also redefined in terms of novel operations. In addition, a series of distance measure is defined to overcome the shortcomings of existing ones. After defining a correlation measure, the probabilistic uncertain linguistic (PUL)-consensus reaching method (in which two specific consensus approaches are described separately) is put forward to refine the consensus level of a group. To suit the needs of different semantics, two robust decision making methods named as consensus-based PUL-gained and lost dominance score method and consensus-based PUL-aggregation method are proposed. Finally, a case study concerning the selection of the best commodity for investment in Forex is conducted to illustrate the practicality of the proposed methods. Lastly, a detailed comparative analysis is done with the existing technique to highlight the improvements and advantages of proposed work.

Keywords: *Multi-attribute group decision making, Probabilistic uncertain linguistic term set, Consensus measure, Consensus-based PUL-GLDS method, Consensus-basedPUL-aggregation method.*

116. **Tufail, M. N., Saleem, M.,** & Chaudhry, Q. A. (2020). An analysis of Maxwell fluid through a shrinking sheet with thermal slip effect: a Lie group approach. *Indian Journal of Physics*. doi: 10.1007/s12648-020-01745-z. **(Muhammad Nazim Tufail, Musharafa Saleem(Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.407) (SKT Campus)**

Abstract: Two-dimensional magnetohydrodynamic (MHD) boundary layer flow of an upper-convected Maxwell (UCM) fluid passing through the shrinking sheet is considered. With the impact of thermal slip, thermal radiation and heat source-sink conditions, the UCM fluid model is integrated. The method of the Lie scaling group is used to transform the strongly nonlinear governing partial differential equations (PDEs) into the ordinary differential equations (ODEs). The transformed ODEs are numerically solved using NDSolve command of MATHEMATICA and graphically presented with their results. The Deborah number's influence on the velocity profile $f'(\eta)$ is studied for different values and different behavior observed. The Hartmann number M and the mass transfer parameter S have decreased the boundary layer thickness. The Prandtl number has increased the temperature profile $\theta(\eta)$. In contrast, the thermal boundary layer thickness was decreased by the heat source-sink parameter Q , the radiation parameter R and the thermal slip parameter L. Table 1 shows the verification of the results.

Keywords: *upper-convected maxwell fluid, shrinking sheet, scale analysis, thermal slip, magnetic field.*

117. Qiang, X., **Siddique, I., Sadiq, K.,** & Shah, N. A. (2020). Double diffusive MHD convective flows of a viscous fluid under influence of the inclined magnetic field, source/sink and chemical reaction. *Alexandria Engineering Journal.* doi: https://doi.org/10.1016/j.aej.2020.07.023. **(Imran Siddique, Kashif Sadiq (Mathematics/SSC) Web of Science JCR Listed (IF: 2.460)**

Abstract: Unsteady magneto-hydrodynamic double-diffusive convection flows between two infinite vertical parallel plates have been investigated in the presence of the inclined magnetic field, heat generation or absorption, and chemical reaction. The dimensionless form of governing equations for momentum, energy and concentration has been solved using the integral transforms (Laplace and finite sine-Fourier transforms). The exact solutions for the velocity, temperature and concentration are obtained without any constraints. Semi analytical solutions of these problems are also established by using the Laplace inversion numerical algorithms Stehfest's and Tzou's. Further, we compare our obtained analytical and numerical results in graphical and tabular forms. Finally, the influence of pertinent parameters on the fluid velocity, temperature and concentration have been disused in detailed through graphs.

Keywords: *free convection, inclined magnetic field, Laplace and finite sine-fourier transforms, dufour effect, chemical reaction.*

118. Huo, C., **Bashir, H., Zahid, Z.,** & Chu, Y. M. (2020). On the 2-metric resolvability of graphs. *AIMS*

Mathematics, 5(6), 6609–6619. doi: DOI: 10.3934/math.2020425**. (Humera Bashir, Zohaib Zahid (Mathematics/SSC) Web of Science JCR Listed (IF: 0.882)**

Abstract: Let G=(V(G),E(G)) be a graph. An ordered set of vertices R={v1,v2,…,vl} is a 2−resolving set for G if for any distinct vertices s,w∈V(G), the representation of vertices r(s|R)=(dG(s,v1),…,dG(s,vl)) and r(w|R)=(dG(w,v1),…,dG(w,vl)) differs in at least 2 positions. A 2−resolving set of minimum cardinality is called a 2−metric basis of G and its cardinality is called the 2−metric dimension (fault-tolerant metric dimension). In this article, the exact value of the 2−metric dimension of the family circulant graph Cn(1,2) is computed and thereby disproving the conjecture given by H. Raza et al., [Mathematics. 2019, 7(1), 78]. The 2−metric dimension of the family generalized prism graph Pm×Cn and the Möbius ladder graph Mn is computed. Furthermore, we improved the result given by M. Ali et al., [Ars Combinatoria 2012, 105, 403-410].

Keywords: *k−metric dimension, circulant graph, the generalized prism graph, möbius ladder.*

119. **Yousaf, S.,** Bhatti, A. A., & **Ali, A.** (2020). Minimum Variable Connectivity Index of Trees of a Fixed Order. *Discrete Dynamics in Nature and Society, 2020*, 3976274. doi: 10.1155/2020/3976274. **(Akbar Ali (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 0.870) (SKT Campus)**

Abstract: The connectivity index, introduced by the chemist Milan Randić in 1975, is one of the topological indices with many applications. In the first quarter of 1990s, Randić proposed the variable connectivity index by extending the definition of the connectivity index. The variable connectivity index for graph is defined as , where is a nonnegative real number, is the edge set of , and denotes the degree of an arbitrary vertex in . Soon after the innovation of the variable connectivity index, its various chemical applications have been reported in different papers. However, to the best of the authors' knowledge, mathematical properties of the variable connectivity index, for, have not yet been discussed explicitly in any paper. The main purpose of the present paper is to fill this gap by studying this topological index in a mathematical point of view. More precisely, in this paper, we prove that the star graph has the minimum variable connectivity index among all trees of a fixed order, where.

Keywords: *not available.*

120. Li, Q.-Z., **Virk, Abaid-Ur-Rehman,** Nazar, K., Ahmed, I., & Tlili, I. (2020). Valency-Based Descriptors for Silicon Carbides, Bismuth(III) Iodide, and Dendrimers in Drug Applications. *Journal of Chemistry, 2020*, 8616309. doi: 10.1155/2020/8616309**. (Abaid-Ur-Rehman Virk (Mathematics/SSC) Web of Science JCR Listed (IF: 1.790)**

Abstract: Silicon carbide (SiC), also called carborundum, is a semiconductor containing silicon and carbon. Dendrimers are repetitively branched molecules that are typically symmetric around the core and often adopt a spherical three-dimensional morphology. Bismuth(III) iodide is an inorganic compound with the formula . This gray-black solid is the product of the reaction between bismuth and iodine, which once was of interest in qualitative inorganic analysis. In chemical graph theory, we associate a graph to a compound and compute topological indices that help us in guessing properties of the understudy compound. A topological index is the graph invariant number, calculated from a graph representing a molecule. Most of the proposed topological indices are related either to a vertex adjacency relationship (atom-atom connectivity) in the graph or to topological distances in the graph. In this paper, we aim to compute the first and second Gourava indices and hyper-Gourava indices for silicon carbides, bismuth(III) iodide, and dendrimers.

Keywords: *not available.*

121. Ahmad, M., **Imran, M. A.,** & Nazar, M. (2020). Mathematical modeling of (Cu−Al2O3) water based Maxwell hybrid nanofluids with Caputo-Fabrizio fractional derivative. *Advances in Mechanical Engineering, 12*(9), 1687814020958841. doi: 10.1177/1687814020958841**. (Muhammad Imran Asjad (Mathematics/SSC) Web of Science JCR Listed (IF: 1.161)**

Abstract: In this article, a free convection flow of Cu−$Al2O3$−$H2O$ hybrid Maxwell nanofluids through a channel formed by two infinite vertical plates have been studied. Together with the the energy balance and heat source, a fractional model of Maxwell fluid is considered. To develop an analytical exact solution for velocity field, only the Caputo-Fabrizio definition of non-integral derivative together with application of Laplace transform method has been used. Some graphical presentation and discussion are made to see the effects of hybrid nanofluids and non-dimensional parameters on velocity boundary layer. As a result, a dual behavior of velocity was exposed due to fractional parameter for large and small times. A comparison between two kind of non-Newtonian fluids has been made and found that Brinkman fluid is more viscous than Maxwell fluid. Also, by letting Brinkman and Maxwell parameters zero, they coincides and the results obtained for Newtonian fluid showed graphically. The obtained results are realistic from the fractional model as by adjusting the values of fractional parameter can be compared with some experimental data.

Keywords: *Caputo-Fabrizio, hybrid nanofluid, channel flow, boundary layer, heat source, Maxwell fluid.*

122. Samraiz, M., Nawaz, F., **Iqbal, S.,** Abdeljawad, T., Rahman, G., & Nisar, K. S. (2020). Certain mean-type fractional integral inequalities via different convexities with applications. *Journal of Inequalities and Applications, 2020*(1), 208. doi: 10.1186/s13660-020-02474-x. **(Sajid Iqbal (Mathematics/Knowledge Unit of Science) Web of Science JCR Listed (IF: 1.470) (SKT Campus)**

Abstract: In this paper, we establish certain generalized fractional integral inequalities of mean and trapezoid type for (s+1)(s+1)-convex functions involving the (k,s)(k,s)-Riemann–Liouville integrals. Moreover, we develop such integral inequalities for *h*-convex functions involving the *k*-conformable fractional integrals. The legitimacy of the derived results is demonstrated by plotting graphs. As applications of the derived inequalities, we obtain the classical Hermite–Hadamard and trapezoid inequalities.

Keywords: *Mean-type inequalities, h-convex; (s+1)-convex, k-conformable integral, (k,s)-Riemann–Liouville fractional integral, Conformable integral, Trapezoid inequalities.*

123. Saleem, M. U., Farman, M., Meraj, M., & **Tabassum, M. F.** (2020). Comparison of Glucose Insulin Model for Artificial Pancreas. *Proceedings of the Pakistan Academy of Sciences: A. Physical and Computational Sciences, 56*(4), 43–54-43–54**. (Muhammad Farhan Tabassum (Mathematics/SSC) HEC Y CAT**

Abstract: The controllability and observability of a glucose-insulin system are checked for Bergman's minimal model, Sandhya model, Hovorka model, Sturis Tolic model and their modified form for a type 1 diabetic patient. These models are to simulate the glucose-insulin system for the treatment of type 1 diabetes mellitus. Models take the only insulin as input and glucose as an output. A control system can only be used in the form of closed-loop control to stabilize the system. It would enable diabetic patients to control their disease. Currently, no fully automated artificial pancreas is available. Comparison of controllability and observability are measured for this purpose. These models can be used to simulate a glucose-insulin system for the treatment of type 1 diabetes. This may play an important role in the development of the fully automatic artificial pancreas and stabilize the control loop system for the Glucose Insulin pump.

Keywords: *ordinary differential equation models, artificial pancreas, observability, controllability, linear control.*

124. Bin Wahid, S., **Ain, Q. U., Quraishi, A., & Wahid, B.** (2020). Clinical correlation of liver function tests with suppression of cytokine signaling (SOCS1) gene expression in HCV infected patients: A real-world clinical experience. *Journal of Medical Virology, 92*(2), 257-259. doi: 10.1002/jmv.25596. **(Qurat Ul Ain (Mathematics/SSC) Azra Quraish, Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021)**

Abstract: Hepatitis C virus (HCV) is the leading cause of chronic liver complications globally and suppressor of cytokine signaling-1 (SOCS-1) is a gene triggered by cytokines that activates transcription of the JAK/STAT signal transduction pathway and negatively regulates Janus kinase-signal transducer. Several studies have shown that

the expression of SOCS1 and SOCS3 genes negatively regulate the response of HCV infection to interferon therapy and interferon-free regimens. It has been reported that liver function enzymes elevate in CHC patients but the association of SOCS1 gene expression with LFTs haven't been studied. This study recruited 114 CHC patients and 112 normal healthy participants and analyzed the correlation of SOCS1 gene expression and liver function enzymes (LFEs). Herein, we observed that the expression of SOCS1 gene had a positive correlation with LFEs.
Keywords: *ALP, ALT, AST, HCV, LFTs, SOCS1 gene.*

Conference Proceedings

1. Zafar, A. A., **Riaz, M. B.,** & Hammouch, Z. (2020). *A Class of Exact Solutions for Unsteady MHD Natural Convection Flow of a Viscous Fluid over a Moving Inclined Plate with Exponential Heating, Constant Concentration and Chemical Reaction.* Paper presented at the 4th International Conference on Computational Mathematics and Engineering Sciences (CMES-2019), Cham. **(Muhammad Bilal Riaz (Mathematics/SSC) SJR**
Abstract: The purpose of this article is to study analytically the hydromagnetic natural convection flow of an electrically conducting, incompressible viscous fluid over a moving infinite inclined plate. Moreover, the dynamic of fluid is studied under the influence of exponential heating and constant concentration. Porous effects are taken into consideration and in order to investigate the influence of the transverse magnetic field, two cases when the transverse magnetic field is held fixed to the fluid or to the plate are considered. The Laplace transform technique is used to obtain exact solutions for such motions. The dimensionless Latin symbols velocity, and also the corresponding skin friction, is presented as sum of mechanical, thermal and concentration components. Finally, for illustration, as well as for a check of results, some special cases with applications in engineering are considered and influence of the system parameters is graphically brought to light.
Keywords: *magnetohydrodynamic, inclined plate, natural convection, exponential heating, chemical reaction.*

Department of Life Sciences

Research Articles

1. **Raza, H., Wahid, B.,** Rubi, G., & Gulzar, A. (2020). Molecular epidemiology of SARS-CoV-2 in Faisalabad, Pakistan: A real-world clinical experience. *Infection, Genetics and Evolution, 84*, 104374. doi: https://doi.org/10.1016/j.meegid.2020.104374. **(Hassan Raza, Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.773)**
Abstract: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-2019 is a new global health challenge which causes severe respiratory complications. As of May 17th, 2020, SARS-CoV-2 has infected 4.6 million people and caused 310,000 deaths, worldwide. In order to study potential impact of infection, complete epidemiological information should be reported on regular basis however, data from Pakistan has not yet been published. This retrospective study is the first report of epidemiological trends of COVID-19 in Faisalabad, Pakistan. On April 4th, 2020, 128 nasopharyngeal swabs collected from city Faisalabad were transported to Postgraduate Research Institute, Lahore for further processing. RNA was extracted using QIAsymphony DSP Virus/Pathogen Midi Kit and real-time PCR was performed to quantify COVID-19. Our finding showed that overall prevalence of COVID-19 in Faisalabad on April 4th was 17.18% (22 of 128). Prevalence was higher in males (n = 17; 77.2%) as compared to females (n = 5; 22.8%) but this gender-wise difference was not statistically significant. Patients belonging to age group 37–47 years were found to be most (45.5%) infected with COVID-19.
Keywords: *CODID-19, SARS-CoV-2, Pakistan, epidemiology.*

2. Hanif, M. K., Malik, K. A., Hameed, S., Saddique, M. J., Ayesha, **Fatima, K.,** . . . Imran, A. (2020). Growth stimulatory effect of AHL producing Serratia spp. from potato on homologous and non-homologous host plants.

Microbiological Research, 238, 126506. doi: https://doi.org/10.1016/j.micres.2020.126506. **(Kaneez Fatima (Life Sciences/SSC) Web of Science JCR Listed (IF: 3.970)**

Abstract: Plant growth promoting rhizobacteria are known to improve plant performance by developing healthy and productive interactions with the host plants. These associations may be symbiotic or asymbiotic depending upon the genetic potential of the resident microbe and promiscuity of the host. Present study describes the potential of two *Serratia* spp. strains for promotion of plant growth in homologous as well as non-homologous hosts. The strains KPS-10 and KPS-14; native to potato rhizosphere belong to genus *Serratia* based on 16S rRNA gene sequences (accession no. LN831934 and LN831937 respectively) and contain multiple plant growth promoting properties along-with the production of quorum sensing acyl homoserine lactone (AHL) molecules. Both *Serratia* spp. strains showed solubilization of inorganic tri-calcium phosphate while KPS-14 also exhibited phytase activity (1.98 10^{-10} kcat). KPS-10 showed higher P-solubilization activity (128.5 µg/mL), IAA production (8.84 µg/mL), antifungal activity and also showed the production of two organic acids *i.e.*, gluconic acid and lactic acid. Both strains produced three common AHLs: C6-HSL, 3oxo-C10-HSL, 3oxo-C12-HSL while some strain-specific AHLs (3OH-C5-HSL, 3OH-C6-HSL, C10-HSL specific to KPS-10 and 3OH-C6-HSL, C8-HSL, 3oxo-C9-HSL, 3OH-C9-HSL specific to KPS-14). Strains showed roots and rhizosphere colonization of potato and other non-homologous hosts up to one month. *In planta* AHLs-detection confirmed a likely role of AHLs during seedling growth and development where both extracted AHLs or bacteria inoculated roots showed extensive root hair. A significant increase in root/shoot lengths, root/ shoot fresh weights, root/shoot dry weights was observed by inoculation in different hosts. PGP-characteristics along with the AHLs-production signify the potential of both strains as candidate for the development of bio-inoculum for potato crop in specific and other crops in general. This inoculum will not only reduce the input of chemical fertilizer to the environment but also improve soil quality and plant growth.

Keywords: *Serratia, AHLsHomologous host, IAA production, PGPR, Non-homologous host.*

3. Khan, A., Ahmed, H., Khan, H., Simsek, S., Kilinc, S. G., Kesik, H. K., . . . **Afzal, M. S.,** Budke, C. M. (2020). First report of Echinococcus canadensis (G6/G7) by sequence analysis from the Khyber Pakhtunkhwa province of Pakistan. *Acta Tropica, 209*, 105559. doi: https://doi.org/10.1016/j.actatropica.2020.105559. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.555)**

Abstract: Cystic echinococcosis (CE) is a zoonotic parasitic disease that can result in human and animal health problems globally. Although the disease is known to be endemic in Asia and the Middle East, there are few epidemiological studies on CE in Pakistan. The purpose of the present study was to identify the *Echinococcus granulosus sensu lato* species and genotypes contributing to human CE cases in the Khyber Pakhtunkhwa (KPK) province of Pakistan. A total of fifty-six formalin fixed paraffin embedded (FFPE) CE cyst samples of human origin were collected from the Pathology Department, Rehman Medical Institute (RMI), KPK for the years 2012-2017. Cyst samples came from the liver (26/56; 46.4%), lungs (3/56; 5.3%), spleen (3/56; 5.3%), pelvis (1/56; 1.8%), breast (1/56; 1.8%), and thigh (1/56; 1.8%). The organ location for 21 of the cysts was not recorded. World Health Organization-Informal Working Group on Echinococcosis (WHO-IWGE) ultrasound-based cyst staging was available for 17 of the 26 (65.4%) hepatic cysts. Five of these cysts (29.4%) were CE3 (transitional), nine (52.9%) were CE4 (inactive), and three (17.6%) were CE5 (inactive). Most of the cysts were obtained from CE patients that were ethnically Afghan Pashtuns (44/56; 78.6%), while 12.5% (7/56) were from patients that were Pakistani Pashtuns. The majority (41/56; 73.2%) of patients reported having close interactions with dogs. Using 12SrRNA primers, 33 cyst samples were identified as being caused by *E. granulosus sensu stricto (s.s.).* Mitochondrially encoded cytochrome C oxidase 1 (mt-CO1) was evaluated for the remaining 23 samples. PCR product was obtained from six of these 23 samples. Of these six samples, one was identified as *Echinococcus canadensis* (G6/7). Haplotype analysis showed high haplotype and low nucleotide diversity for the mt-CO1 gene. There were 26 polymorphic sites for the mt-CO1 sequence, of which 65.3% (17/26) were parsimony informative.

The *E. canadensis* mt-CO1 haplotype network consisted of 11 haplotypes, with a main central haplotype. In conclusion, it appears that *E. granulosus s.s*. and *E. canadensis* (G6/7) are circulating in the northwestern region of Pakistan. Further molecular epidemiological studies are needed to explore the local genetic diversity of the parasite.

Keywords: *Cystic Echinococcosis, FFPE tissue, Human, Genotyping, Echinococcus canadensis (G6/G7).*

4. Mahmood, M. S., Irshad, S., Butt, T. A., **Batool, H.,** Batool, S., & Ashraf, N. M. (2020). In-silico analysis of deleterious missense SNPs of human TYR gene associated with oculocutaneous albinism type 1 (OCA1). *Meta Gene, 24*, 100674. doi: https://doi.org/10.1016/j.mgene.2020.100674. **(Hina Batool (Life Sciences/SSC) SJR**

   Abstract: Single Nucleotide Polymorphisms (SNPs) are among the major genetic anomalies behind genetically rare disorders. The human *TYR* gene encodes a key regulatory enzyme, tyrosinase for melanin biosynthesis. Missense mutations in the *TYR* gene may disrupt the normal function of tyrosinase and cause oculocutaneous Albinism type 1 (OCA1). The present study involves the use of multiple computational tools based on different algorithms for the identification of potential deleterious missense SNPs from the *TYR* gene. In this study, we identified ten deleterious missense mutations which may be contributing factors for OCA1. The 3D modeling analysis of mutant models of tyrosinase also strengthen the hypothesis that these mutations may induce significant structural and conformational changes on the native tyrosinase enzyme.

   Keywords: *Oculocutaneous albinism type 1 (OCA1), Single Nucleotide Polymorphism (SNP), Missense SNPTyrosinase.*

5. Singh, G. C., Ahmed, **M., Zaid**, M., & Hasnain, S. (2020). Biochemical, serological, and genetic aspects related to gene HLA-DQB1 and its association with type 1 diabetes mellitus (T1DM). *Molecular Genetics & Genomic Medicine, 8*(5), e1147. doi: 10.1002/mgg3.1147. **(Muhammad Zaid (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.995)**

   Abstract: Background: Type 1 Diabetes Mellitus (T1DM) is the autoimmune disorder of destruction of β cells of pancreas, creating insulin deficiency condition, which leads to hyperglycemia, polyuria, polydipsia, ketoacidosis, and other metabolic disorder especially in children. Different genetic aspects and environmental factors are involved in pathophysiology of the disease. About 20 genes are associated with this disease in which the most common is the different combination of haplotype DRB1-DQA1-DQB1 present at HLA gene. At HLA-DQB1, there are some SNPs which are associated with T1DM. In T1DM, there are number of biochemical, serological parameters which show some abnormalities leading to some complications.

   Methods: Samples were subjected to all biochemical and serological techniques to get the measurement of concentration of glucose, lipid profile (cholesterol, triglycerides, and HDL and LDL cholesterol), urea, creatinine, albumin, insulin, anti-insulin antibodies, C-peptides, and leptin. All these values were compared with controls values and statistical analysis was also done on these values. At molecular level, two primers set which were allele specific at HLA-DQB1, were used to amplify the SNPs, homozygous and heterozygous conditions were stated.

   Results: PCR results for the studied population showed that most of samples have heterozygous condition for these SNPs of this allele specific region on HLA-DQB1. Very few of them have homozygous state for it. Even in the control sample have the same conditions.

   Conclusion: In Pakistan, there is dire need of studies about SNPs and haplotypes related to HLA-DQB1 which show association with T1DM.

   Keywords: *DQA1, DQB1, DRB1, HLA gene, hyperglycemia, type 1 diabetes mellitus (T1DM).*

6. Khan, A., Ahmed, H., Naz, K., Gul, S., Ishaque, S. M., Zaidi, **Afzal, M. S.,** S. S. A., . . . Budke, C. M. (2020). Surgically confirmed cases of cystic echinococcosis from Baluchistan Province, Pakistan for the years 2011–2018. *Acta Tropica, 205*, 105354. doi: https://doi.org/10.1016/j.actatropica.2020.105354. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.555)**

Abstract: Introduction: Cystic echinococcosis (CE) is a parasitic zoonotic disease caused by the larval stage of *Echinococcus granulosus* tapeworms. It has a worldwide geographic distribution and can threaten the livestock industry and human health in endemic areas, including Pakistan. CE prevalence is high in Pakistan due to lack of local knowledge about disease transmission and a lack of control measures. The Pakistan province of Baluchistan shares a border with Iran and Afghanistan and is largely agricultural. However, little is known about *E. granulosus* transmission in this region.

Methods: Information on surgically confirmed cases of CE in Baluchistan Province was obtained through evaluation of paraffin fixed cyst samples and patient records obtained from three local hospitals for the years 2011–2018.

Results: A total of 22 paraffin fixed samples were collected during the study period. The majority of cysts were obtained from the liver (9/22; 40.9%), with anatomical location not available for two of the cysts. Demographic information was available for 18 cases. Females made up 61.1% (11/18) of the cases. The largest numbers of cases were found in the 31–40 years age group (5/18; 22.7%).

Discussion: This study shows that *Echinococcus* spp. parasites are circulating in the study area. In order to control the disease, a comprehensive regional surveillance and control program is needed.

Keywords: *cystic echinococcosis, surgically managed cases, Baluchistan, Pakistan.*

7. **Wahid, B.** (2020). Clinical Correlation of Blood Cells with Suppression of Cytokine Signaling Gene Expression in Hepatitis C Virus-Infected Patients. *Journal of Interferon & Cytokine Research, 40*(4), 169-171. doi: 10.1089/jir.2019.0116. **(Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.032)**

Abstract: Both innate and adaptive immune responses of host are regulated by fine balance between negative and positive signals to ensure their termination and onset on entry of pathogens. Suppressor of cytokine signaling (SOCS) genes inhibit cytokine signaling pathways and regulate innate and adaptive immunity. SOCS genes perform their function by positive and negative regulation of macrophages, development and differentiation of T cells, and activation of dendritic cells. Although the role of SOCS1 and SOCS3 genes in hepatitis C virus (HCV) patients has been well studied, the correlation of SOCS1 gene expression with complete blood count in HCVpositive patients has not been established yet. We observed a weak positive correlation of SOCS1 gene expression with hemoglobin (Hb) and platelet count, whereas leukocytes were negatively correlated with the expression. This study also provides a comparative analysis of complete blood count between healthy subjects and HCV-positive subjects. The findings suggest that Hb and platelet count were significantly lower ($P < 0.0001$) in HCV patients than in healthy subjects.

Keywords: *SOCS1 gene, LFTs, HCV, ALP, ALT, AST.*

8. Aslam, M. S., Gull, I., Mahmood, M. S., Iqbal, M. M., Abbas, Z., **Tipu, I.,** . . . Athar, M. A. (2020). High yield expression, characterization, and biological activity of IFNα2-Tα1 fusion protein. *Preparative Biochemistry & Biotechnology, 50*(3), 281-291. doi: 10.1080/10826068.2019.1689509. **(Imran Tipu (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.415)**

Abstract: The use of interferon α-2 in combination with thymosin α-1 shows higher anti-cancer effect in comparison when both are used individually because of their synergistic effects. In this study we produced an important human interferon α-2-thymosin α-1 (IFNα2-Tα1) fusion protein with probable pharmaceutical properties coupled to its high-level expression, characterization, and study of its biological activity. The IFNα2-Tα1 fusion gene was constructed by over-lap extension PCR and expressed in *Escherichia coli* expression system. The expression of IFNα2-Tα1 fusion protein was optimized to higher level and its maximum expression was obtained in modified terrific broth medium when lactose was used as inducer. The fusion protein was refolded into its native biologically active form with maximum yield of 83.14% followed by purification with ~98% purity and 69% final yield. A band of purified IFNα2-Tα1 fusion protein equal to ~23 kDa was observed on 12 % SDS-

PAGE gel. The integrity of IFNα2-Tα1 fusion protein was confirmed by western blot analysis and secondary structure was assessed by CD spectroscopy. When IFNα2-Tα1 fusion protein was subjected to its biological activity analysis it was observed that it exhibits both IFNα2 & Tα1 activities as well as significantly higher anticancer activity as compared to IFNα-2 alone.

Keywords: *biological activity, expression optimization, fusion protein, high yield, overlap extension pcr, purification.*

9. Rahman Qureshi, U. U., Saleem, S., Khan, A., **Afzal, M. S.,** Ali, M. S., & Ahmed, H. (2020). Outbreak of novel Corona virus (2019-nCoV); implications for travelers to Pakistan. *Travel medicine and infectious disease, 34*, 101571-101571. doi: 10.1016/j.tmaid.2020.101571. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 4.589) (Letter to editor)**

   Abstract: Not available.

   Keywords: *not available.*

10. **Hussain, A.,** Tanveer, R., Azeem, F., Mustafa, G., Farooq, M., Amin, I., & Mansoor, S. (2020). Erratum to 'Comparative phylogenetic analysis of aquaporins provides insight into the gene family expansion and evolution in plants and their role in drought tolerant and susceptible chickpea cultivars' [Genomics, volume 112, issue 1(2020) Pages 263-275]. *Genomics, 112*(2), 2106. doi: https://doi.org/10.1016/j.ygeno.2020.01.018.**(Athar Hussain (Life Sciences/SSC) Web of Science JCR Listed (IF: 6.205)**

    Abstract: Not available.

    Keywords: *not available.*

11. Khan, A., Ahmed, H., Simsek, S., **Afzal, M. S.,** & Cao, J. (2020). Spread of Cystic Echinococcosis in Pakistan Due to Stray Dogs and Livestock Slaughtering Habits: Research Priorities and Public Health Importance. *Frontiers in Public Health, 7*(412). doi: 10.3389/fpubh.2019.00412. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.483)**

    Abstract: Background: Cystic echinococcosis (CE) is a global zoonotic parasitic disease caused by the larval stage of Echinococcus granulosus and it has been reported from both livestock and humans in Pakistan. The definitive host of E. granulosus is the dog, and the large number of stray dogs in Pakistan contributes to the spread of CE. However, there is little information between stray dogs and CE relation in the country.

    Methods: During the study, total 123 butcher's shops and abattoirs were included for collection of data relating to the hydatid cyst prevalence in slaughtered animals (sheep, goat, cattle, and buffaloes). The number of animals slaughtered in each butcher's shop during sampling period was also recorded, and the association of the shop environment with dogs was inspected.

    Results: Data was collected for CE from 123 butcher's shops in Rawalpindi and Islamabad, Pakistan. The slaughtering rate the in the butcher's shops was 2–10 animals/day including sheep/goat/cattle and buffaloes. The overall prevalence of CE in all examined animals was 2.77%. In buffaloes the higher prevalence was recorded as compared to other hosts. The findings showed that lung and liver were most affected organs and majority (59%) of the cysts were fertile in infected animals. The presence of a large number of stray dogs were an important factor in the spread of CE. They were rarely vaccinated, have easy access to infected offal at slaughtering site and had insufficient or inappropriate anthelmintic treatment.

    Conclusions: The most pressing need is to raise public awareness of this huge problem by considering CE a major ailment and promoting the collection and mapping of epidemiological data. Efficient CE control is required, especially treating dogs with antiparasitic drugs, for which government support and affiliation with the veterinary sector is essential.

    Keywords: *cystic echinococcosis, Echinococcus granulosus, livestock, dog, public health, Pakistan.*

12. **Ameen, A.** (2020). Comparison of Chemical Analysis of Compost Leachate and Commercial Fertilizer to check the quantity of heavy metals. *International Journal of Psychosocial Rehabilitation, 24*(8), 3398-3402. doi: DOI: 10.37200/IJPR/V24I8/PR280356. **(Ayesha Ameen (Life Sciences/SSC) SJR**

Abstract: Leachate can be defined as a possibly polluting liquidproduced during composting of organic waste that may lead to some harmful effects on soil, public safety and health, surrounding aquatic ecosystems, and groundwater resources. Solid waste Compost Leachate is a liquid that percolates through the organic solid waste and brings out dissolved or suspended materials of the process and normally contains a complex variety of organic compounds and materials such as heavy metals, fatty acids, humic substances, and many harmful chemicals. This study was designed to compare the concentration of heavy metals present in compost leachate and commercial fertilizer. Municipal solid waste compost leachate and commercial fertilizer were analysed for the physico-chemical parameters. Samples of municipal solid waste compost leachate were collected from the leachate collection tank of Lahore Compost Company. Samples were digested and analysed in duplicates for Temperature, pH, BOD, EC, TDS and COD. The metals (Ni, Cr, Zn, and Cu) quantity in the leachate was also determined using the Atomic Absorption technique with a flame photometer system. It was concluded from this study that the quantity of heavy metals (such as Cu, Ni, Zn, and Cr) present in leachate waswithin permissible limits and lower than the commercial fertilizer. It is safe to use compost leachate for plants and other crops.

Keywords: *compost, leachate, fertilizer, organic waste.*

13. **Wahid, B.** (2020). Worst outbreaks of leishmaniasis and HIV AIDS in Pakistan: An update from 2019. *Journal of Medical Virology,* 1–3. doi: https://doi.org/10.1002/jmv.25671. **(Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Commentary)**

Abstract: Not available.

Keywords: *AIDS, blood, blood-borne, HIV, immunity, KPK, leishmaniasis, outbreak, Pakistan, prevalence, sanitation, transmission.*

14. **Wahid, B.** (2020). Successful treatment of HBV, HCV, & HEV, with 12-week long use of tenofovir, sofosbuvir, daclatasvir, and ribavirin: A case report. *Journal of Infection and Public Health, 13*(1), 149-150. doi: https://doi.org/10.1016/j.jiph.2019.06.004. **(Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.447)**

Abstract: Hepatitis C virus (HCV) is the leading cause of morbidity and mortality worldwide. It causes both chronicand acute infections and it has been estimated that about 80% of HCV infected patients develop chronicHCV infection of which 15–30% develop liver complications specifically liver cirrhosis and hepatocellualarcarcinoma (HCC). Interferon therapy was previously used standard of care therapy associated with poorefficacy in major proportion of HCV infected population whereas, the recent development of interferon-free therapy or direct-acting antiviral (DAA) drugs are able to achieve sustained virological response (SVR)in 95% of patients. These new drugs are still not properly explored and currently there is minimal clinicalexperience regarding an efficacious treatment option suitable for triple infection i.e, Hepatitis B virus(HBV), HCV, and Hepatitis E virus (HEV). Here, we suggest well-tolerated sofsobuvir-based treatmentregimen in patient infected with HBV, HCV, and HEV. Twelve weeks long treatment with sofsobuvir,daclatasvir, ribavirin, and tenofovir resulted in sustained virological response (SVR) and cleared HBV,HCV, and HEV in diabetic and asthmatic patient.

Keywords: *HBV, HCV, HEV, Asthma, Diabetes, Sofosbuvir.*

15. **Kabir, M., Saqib, M. A. N., Zaid, M.,** Ahmed, H., **& Afzal, M. S.** (2020). COVID-19, economic impact and child mortality: A global concern. *Clinical nutrition (Edinburgh, Scotland), 39*(7), 2322-2323. doi:

10.1016/j.clnu.2020.05.027. **(Mahvish Kabir, Muhammad Arif Nadeem Saqib, Muhammad Zaid, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 6.360) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

16. **Ali, M., Zaid, M., Saqib, M. A. N.,** Ahmed, H., **& Afzal, M. S.** (2020). SARS-CoV-2 and the hidden carriers: Sewage, feline, and blood transfusion. *Journal of Medical Virology, n/a*(n/a). doi: 10.1002/jmv.25956. **(Muhammad Ali, Muhammad Zaid, Muhammad Arif Nadeem Saqib, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

17. **Kabir, M., Afzal, M. S.,** Khan, A., & Ahmed, H. (2020). COVID-19 pandemic and economic cost; impact on forcibly displaced people. *Travel medicine and infectious disease, 35*, 101661-101661. doi: 10.1016/j.tmaid.2020.101661. **(Mahvish Kabir, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 4.589) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

18. Hussain, W., **Amir, A.,** & Rasool, N. (2020). Computer-aided study of selective flavonoids against chikungunya virus replication using molecular docking and DFT-based approach. *Structural Chemistry*, 1-12. doi: https://doi.org/10.1007/s11224-020-01507-x. **(Anam Amir (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.081)**
Abstract: Chikungunya fever has a high morbidity rate in humans and is caused by chikungunya virus (CHIKV). Currently, there is no vaccination or treatment available to show an effective efficacy against this disease. This study targets four non-structural proteins of CHIKV using 650 flavonoids from various medicinal plants, inhabited in Pakistan and India. The compounds are initially screened on the basis of their effective pharmacological properties and are docked against the four proteins. A threshold of − 8.5 kcal/mol is applied to screen and reduce the number of flavonoids for further analysis. The reactivity of screened flavonoids is analyzed using the density functional theory (DFT). Cirsimaritin, apigenin, tamarixetin, and 5,7,3′,4′-tetrahydroxyflavone from Andrographis paniculata have shown a high binding affinity against nsP1. Rhamnetin, tamarixetin and medioresinol have shown a strong binding affinity against nsP2. Four flavonoids, i.e. 5,7,3′,4′-tetrahydroxyflavone, 5,7,4′-trihydroxyflavone, tamarixetin and rhamnetin, showed a high binding affinity for nsP3 while apigenin depicted a strong binding affinity for nsP4. Pharmacological properties of these flavonoids illustrate an effective disposition in humans. The results manifest that the screened eight flavonoids can be analyzed against CHIKV for in vitro and in vivo cell replication, due to their effective pharmacological properties, strong inhibition and high reactivity.
Keywords: *CHIKV, Flavonoids, In silico analysis, ADMET, Molecular docking, DFT.*

19. Rasool, N., **Akhtar, A.,** & Hussain, W. (2020). Insights into the inhibitory potential of selective phytochemicals against Mpro of 2019-nCoV: a computer-aided study. *Structural Chemistry*, 1. doi: https://doi.org/10.1007/s11224-020-01536-6. **(Ammara Akhtar (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.081)**
Abstract: At the end of December 2019, a novel strain of coronavirus, given the name of 2019-nCoV, emerged for exhibiting symptoms of severe acute respiratory syndrome. The virus is spreading rapidly in China and around the globe, affecting thousands of people leading to a pandemic. To control the mortality rate associated with the 2019-nCoV, prompt steps are needed. Until now there is no effective treatment or drug present to control its

life-threatening effects in the humans. The scientist is struggling to find new inhibitors of this deadly virus. In this study, to identify the effective inhibitor candidates against the main protease (Mpro) of 2019-nCoV, computational approaches were adopted. Phytochemicals having immense medicinal properties as ligands were docked against the Mpro of 2019-nCoV to study their binding properties. ADMET and DFT analyses were also further carried out to analyze the potential of these phytochemicals as an effective inhibitor against Mpro of 2019-nCoV.

Keywords: *2019-nCoV, main protease, phytochemicals, docking, ADMET, DFT.*

20. **Wahid, B.,** Shami, K., Joiya, S. A., Özuyar, S. E. G., & Idrees, M. (2020). Comparing the risk of hypothyroidism in HCV patients treated with different DAA drugs combinations (sofosbuvir + interferon + ribavirin and sofosbuvir + daclatasvir + ribavirin). *Journal of Medical Virology, n/a*(n/a). doi: 10.1002/jmv.25931. **(Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021)**

Abstract: The recent development of direct-acting antiviral (DAA) drugs has revolutionized the area of hepatitis C virus (HCV) therapeutics but the efficacy and clinical outcome of interferon (IFN)-free therapy have not been extensively studied yet. We observed a dramatic increase in hypothyroidism among patients treated with sofosbuvir, IFN, and ribavirin. This is the first prospective study of the thyroid dysfunction in DAA drugs treated patients. This study compared the risk of hypothyroidism in two different groups of HCV patients treated with different DAA drugs regimens that were sofosbuvir + pegylated-IFN-α + ribavirin and sofosbuvir + daclatasvir + ribavirin. Our findings highlight the periodic screening of serum thyroid-stimulating hormone and T4 levels in HCV infected patients during the treatment and posttreatment.

Keywords: *daclatasvir, HCV, hypothyroidism, peg-IFN-α, ribavirin, sofosbuvir.*

21. Ayub, R., Umer, M., Maan, A. A., Rasool, B., Younis, M. K. I. K. T., **Afzal, M. S., Shah, Z. H.,** . . . Afzal, M. I. (2020). Antibiotics, Acid and Heat Tolerance of Honey adapted Escherichia coli, Salmonella Typhi and Klebsiella pneumoniae. *Foods, 9*(3), 311. **(Muhammad Sohail Afzal (Life Sciences/SSC) Zaheer Hussain Shah (Physics/SSC) Web of Science JCR Listed (IF: 4.092)**

Abstract: The medicinal importance of honey has been known for many decades due to its antimicrobial properties against life-threatening bacteria. However, previous studies revealed that microorganisms are able to develop adaptations after continuous exposure to antimicrobial compounds. The present study was conducted to explore the impact of subinhibitory concentrations of branded honey (Marhaba) and unbranded honey (extracted from *Ziziphus mauritiana* plant) locally available in Pakistan on *Escherichia coli* ATCC 10536, *Salmonella* Typhi and *Klebsiella pneumoniae* by investigating the development of self- or cross-resistance to antibiotics (gentamicin, kanamycin and imipenem). Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of autoclaved honeys were determined. The bacterial cells of *E. coli* ATCC 10536, *S.* Typhi and *K. pneumoniae* were subjected to honey adaptation by exposing to ¼ × MIC (4 passages) and ½ × MIC (4 passages) of both honeys. Moreover, tolerance to low pH and high temperature was also studied in adapted and unadapted cells. The decreasing trend in growth pattern (OD_{600nm}) of *E. coli* ATCC 10536, *S.* Typhi and *K. pneumoniae* was observed with increases in the concentration of honeys (6.25–50% *v/v*) respectively. Our results showed that continuous exposure of both honeys did not lead to the development of any self- or cross-resistance in tested bacteria. However, percent survival to low pH was found to be significantly higher in adapted cells as compared to unadapted cells. The results indicate that both branded honey (Marhaba) and unbranded honey (extracted from *Ziziphus mauritiana* plant) were effective in controlling the growth of tested pathogenic bacteria. However, the emergence of tolerance to adverse conditions (pH 2.5, temperature 60 °C) deserves further investigation before proposing honey as a better antibacterial agent in food fabrication/processing, where low pH and high temperatures are usually implemented.

Keywords: *honey, escherichia coli, salmonella typhi, klebsiella pneumoniae, microbial adaptation, stress resistance.*

22. **Haqqi, A.,** Zahoor, S., Aftab, M. N., **Tipu, I., Rehman, Y.,** Ahmed, H., & **Afzal, M. S.** COVID-19 in Pakistan: Impact on global polio eradication initiative. *Journal of Medical Virology, n/a*(n/a). doi: 10.1002/jmv.26240. **(Aleena Haqqi, Imran Tipu, Yasir Rehman, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

23. **Afzal, M. S.,** Khan, A., Qureshi, U. U. R., Saleem, S., **Saqib, M. A. N.,** Shabbir, R. M. K., . . . Ahmed, H. (2020). Community-Based Assessment of Knowledge, Attitude, Practices and Risk Factors Regarding COVID-19 Among Pakistanis Residents During a Recent Outbreak: A Cross-Sectional Survey. *Journal of Community Health*. doi: 10.1007/s10900-020-00875-z. **(Muhammad Sohail Afzal, Muhammad Arif Nadeem Saqib (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.516)**
Abstract: Exceptional precautionary measures have been adopted to stop the transmission and control of COVID-19 through the world and Pakistan is facing lockdown in this scenario. Public loyalty to precautionary measures is affected by their knowledge, attitude, risk factors and practices (KAP) towards COVID-19. The present study was conducted among the Pakistani residents to observe the knowledge, attitude, practices and risk factors towards COVID-19 outbreak in Pakistan. A questionnaire was designed, and a cross-sectional survey was conducted among participants of the study area. Participants were asked the questions regarding knowledge, attitude, practices and risk factors towards COVID-19. Data were analyzed by SPSS and *t*/*F* test and correlation was applied among the knowledge, attitude, risk factors and practices. A total of 1060 questionnaires were received. 1004 were included while 56 were excluded. The highest representation was from Punjab province (65.6%), female (63%) and age group of 21–30 years (62.1%). Most participants were single (85%), Muslim (99.4%), Urdu speaking (45.6%) and were graduates (51.5%). Most of the participants were students (52.9%) and were from economically middle-class families (40.8%). The knowledge was positively correlated with attitude and practices whereas negatively correlated with risk factors ($P < 0.05$). The attitude was negatively correlated with risk factor and positively correlated with practices. The risk factors and practices were positively correlated with each other. Health education program to improve the COVID-19 knowledge, attitude, practices and risk factors should be initiated to combat current health challenge.
Keywords: *COVID-19, knowledge, attitude, practices, correlation, Pakistan.*

24. **Haqqi, A., Awan, U. A., Ali, M., Saqib, M. A. N.,** Ahmed, H., & **Afzal, M. S.** (2020). COVID-19 and dengue virus coepidemics in Pakistan: A dangerous combination for an overburdened healthcare system. *Journal of Medical Virology, n/a*(n/a). doi: 10.1002/jmv.26144. **(Aleena Haqqi, Usman Ayub Awan, Muhammad Ali, Muhammad Arif Nadeem Saqib, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

25. Tariq, A., **Mateen, R. M., Afzal, M. S.,** & Saleem, M. (2020). Paromomycin: a potential dual targeted drug effectively inhibits both Spike (S1) and Main Protease of COVID-19. *International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases, 98*, 166-175. doi: 10.1016/j.ijid.2020.06.063. **(Rana Muhammad Mateen, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 3.202)**

Abstract: bjectives: With the increasing number of people suffering from coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), there is a dire need to look for effective remedies against this pandemic. Drug repurposing seems to be the solution for the current situation.
Methods: In a quest to find a potential drug against this virus, 15 antimalarial drugs (including chloroquine) and 2413 US Food and Drug Administration-approved drugs were investigated for activity against both the protease and spike proteins of SARS-CoV-2 using an in silico approach. Molecular docking analysis followed by molecular dynamics simulation was performed to estimate the binding and stability of the complexes.
Results: This study identified a single drug – paromomycin – with activity against two targets of SARS-CoV-2, i.e., spike protein (S1) and protease domain. Paromomycin was found to have strong binding affinity for both targets of coronavirus. The results also showed that no antimalarial drug exhibited effective binding for either S1 or protease.
Conclusions: This study found that paromomycin may be an effective dual targeting drug against coronavirus, as it binds not only to the protease domain of the virion, but also to the spike domain, with high stability. Furthermore, none of the antimalarial drugs showed strong binding affinity for either protease or the receptor binding domain (RBD).
Keywords: *COVID-19, Drug repurposing, Chloroquine, Protease, Spike, MD simulation.*

26. **Haqqi, A., Khurram, M.,** Din, M. S. U., Aftab, M. N., **Ali, M.,** Ahmed, H., & **Afzal, M. S.** COVID-19 and Salmonella Typhi co-epidemics in Pakistan: A real problem. *Journal of Medical Virology, n/a*(n/a). doi: 10.1002/jmv.26293. **(Aleena Haqqi, Muhammad Khurram, Muhammad Ali, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Letter to editor)**
Abstract: Not available.
Keywords: *not available.*

27. Saqib, M. A. N., Rafique, I., Ullah, O., Irshad, R., Javed, N., **Raza, A., . . . Afzal, M. S.** (2020). Protection against Haemophilus influenzae Type B, Diphtheria, and Tetanus in Children from Major Cities of Pakistan: A Community-Based Study. *Journal of Pediatric Infectious Diseases, 15*(04), 163-168. **(Ali Raza, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 0.227)**
Abstract: Objective Pentavalent vaccine has been introduced in Pakistan against tetanus, diphtheria, Haemophilus influenzae type B (HiB), pertussis, and hepatitis B virus.
Methods This study was designed to determine protection against diphtheria, tetanus, and HiB in children of age 18 to 24 months from community which had received all three doses of pentavalent vaccine.
Results Overall, 97% were having immunity against HiB, 97% against tetanus, and 88% against diphtheria. Our study showed that children aged 18 to 24 months in Pakistan have high level of protection against HiB and tetanus. However, the protection for diphtheria was low in 40% of children which could be improved by adding a booster dose of diphtheria.
Conclusion By increasing the vaccine coverage among children, the burden of these diseases can be reduced in the future.
Keywords: *pentavalent vaccine - vaccine efficacy - vaccine coverage - Pakistan.*

28. Saleem, S., Ahmed, H., Siddiqui, T., Kilinc, S. G., Khan, A., **Afzal, M. S.,** & Simsek, S. (2020). Reduce Disease Burden of Human Schistosomiasis in Asia Through Biological Control. *Mini Reviews in Medicinal Chemistry, 20*(12), 1118-1132. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.733)**
Abstract: Schistosomiasis is a chronic parasitic disease caused by a trematode blood fluke of the genus Schistosoma that belongs to the Schistosomatidae family. It is a neglected disease in different regions of Asia. In this review, 218 articles (between 2000 and 2017) related to the topic were collected from PubMed and Google

scholar and reviewed. After thoroughly reading collected articles, due to irrelevant topic requirements, 94 articles were excluded. Articles that have data associated with Asian regions are considered. In Asia, the disease is prevalent in China, Philippines, Indonesia, Yemen, Nepal and Laos, etc. While in Pakistan, India and Bangladesh, the disease is not endemic and very few cases were reported. The disease was eliminated from Japan and Iran. The current review highlights the geographical distribution among Asian countries, transmission patterns, diagnosis, control strategies based on the use of anthelmintic plants and management practices implemented in Asia for the control of schistosomiasis. However, new implementations to treat schistosomiasis in humans should be proved to eliminate the disease finally in the future. This review emphasizes the biological control of schistosomiasis for the eradication of the disease from Asia in the near future.

Keywords: *Asia, schistosomiasis, biological control, distribution, plants.*

29. **Afzal, M. S**. (2020). Childhood Cancer in Pakistan. *Iranian Journal of Public Health*, *49*(8), 1579. https://doi.org/10.18502/ijph.v49i8.3908. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.291) (Letter to editor)**

Abstract: Not available.

Keywords: *not available.*

30. Shabbir, R. M. K., Saleem, S., Khan, A., **Afzal, M. S.,** Qureshi, U. M., & Ahmed, H. Hot spots, Risk Factors and Management of Polio virus in Pakistan. *Journal of Medical Virology*. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.021) (Letter to editor)**

Abstract: Not available.

Keywords: *not available.*

31. Iqbal, I., Aftab, M., **Afzal, M. S.,** & Kaleem, A. (2020). Characterization of Geobacillus stearothermophilus protease for detergent industry. *Revista Mexicana De Ingeniería Química*, *19*(Sup. 1), 267-279. https://doi.org/10.24275/rmiq/Bio1647. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.139)**

Abstract: Cloning of protease gene from a thermophilic strain of *Geobacillus stearothermophilus* (B-1172) was carried out in *E. coli* BL 21, and its expression was studied. The expressed protease was purified followed by its identification. A 16.9 folds purification with 55.68% recovery of the protease was achieved by ammonium sulfate precipitation and gel filtration chromatography. The protease specific activity was 120 U mg^{-1}. The purified enzyme remained stable at 90°C at a pH range 6-9. Its interaction with EDTA, different metal ions, inhibitors, surfactants and detergents was also mapped. Its interaction with EDTA showed no significant effect on the activity of the enzyme confirming its metaloprotease nature. Metal ions i.e. Ca^{2+}, Mg^{2+}, Ni^{2+}, Cd^{2+}, Cu^{2+}, Zn^{2+} showed no significant effect on the stability of protease. Its compatibility was checked with different commercial detergent (6 mg/mL) such as Surf Excel Arial, Bonus, wheel and Shine. It retained more than 80% proteolytic activity in all detergents after incubation at 50°C for 1 h. Wash performance analysis of the protease of *G. stearothermophilus* showed good results of de-staining of blood sample at various temperatures. Therefore, recombinant protease could prove as good candidate for commercial use in detergents.

Keywords: *Geobacillus stearothermophilus, protease, thermophile, detergent, purification.*

32. **Hussain, A.,** Farooq, M., Naqvi, R. Z., Amin, I., Pervaiz, K., Saeed, M., . . . Mansoor, S. (2020). Genome-wide identification and classification of resistance genes predicted several decoy domains in Gossypium sp. *Plant Gene, 24*, 100250. doi: https://doi.org/10.1016/j.plgene.2020.100250. **(Athar Hussain (Life Sciences/SSC) SJR**

Abstract: Resistance (R) genes are directly or indirectly involved in the activation of the plant immune systems. Despite their essential roles in defense against a variety of pathogens, very little is known about their

classification as well as associated decoy domains, particularly in crop plants. Using advanced bioinformatics strategies, this study provided a complete classification of all R genes in three cotton species, *G. arboreum (Ga), G. raimondii (Gr)* and *G. hirsutum (Gh)*). A total of 3085, 3024 and 5355 R genes were identified in *Ga, Gr* and *Gh*, respectively and these were classified into fifteen major classes based on R domains. Moreover, we identified several decoy domains associated with the R domains mainly comprising DUF, Lectin_legB, WRKY and Calmodulin_binding domains. Interestingly, most of the identified decoy domains belong to stress-responsive protein families. Furthermore, the comparison among the cotton genomes suggested the gain and loss of R gene classes displaying the evolutionary divergence of these three genomes. Finally, promoter analysis also predicted different *cis*-acting sites in different NBS-containing R gene classes. Overall this study provides in-depth genome-wide insights into R genes and their associated decoy domains in cotton, and potentially also appears as a reference study on R genes for other agronomically important crops.

Keywords: *resistance genes, genome-wide, cotton, classification, bioinformatics, comparative, genomics, R domains, Phylogenetic tree.*

33. **Batool, H.,** Mushtaq, N., Batool, S., Ullah, F. I., Hamid, A., Ali, M., . . . Ashraf, N. M. (2020). Identification of the potential type 2 diabetes susceptibility genetic elements in South Asian populations. *Meta Gene, 26*, 100771. doi: https://doi.org/10.1016/j.mgene.2020.100771. **(Hina Batool (Life Sciences/SSC) SJR**

Abstract: Currently, type 2 diabetes (T2D) is a significant health risk to humanity. Regardless of many comprehensive genetic studies, the potential role of many candidate genes involved in the pathogenesis of T2D remains unclear. Identification of disease-associated genes and their variants through conventional experimental techniques is an expensive and time-consuming job. In this data-driven study, we tried to predict novel T2D related genetic signatures in South Asian (SAS) populations which may make these population susceptible to the T2D. Gene expression and SNPs association data related to T2D was retrieved from the GWAS catalogue and GEO database for the predictions. After cleaning and fetching the most relevant genes related to diabetes from GWAS and GEO data, functional annotation of the selected genes was performed using DAVID, resulting in the core gene list. SAS-specific genes from the core gene list were selected based on minor allele frequency (MAF < 0.05). The list was further shortlisted for already reported genes in SAS populations. Finally, we were able to identify a total of seven unreported candidate genes and their associated gene variants. We presume our computational gene collection data using various bioinformatics tools would not only contribute towards a knowledge-base but also throw in ideas for the development of genotyping arrays for better-targeted therapeutics and management of the T2D.

Keywords: *not available.*

34. Zubair, M., Khan, M. Z., Rauf, I., **Raza, A.,** Shah, A. H., Hassan, I., . . . Mansoor, S. (2020). Artificial micro RNA (amiRNA)-mediated resistance against whitefly (Bemisia tabaci) targeting three genes. *Crop Protection, 137*, 105308. doi: https://doi.org/10.1016/j.cropro.2020.105308. **(Amir Raza (Biotechnology/Knowledge Unit of Science) Web of Science JCR Listed (IF: 2.381) (SKT Campus)**

Abstract: Whitefly (*Bemicia tabaci*) is an insect pest that causes severe losses in economically important crops by sucking the plant sap and transmitting plant viruses. We used the promising new approach of plant-mediated artificial miRNA (amiRNA) expression against three essential genes of whitefly. The *Arabidopsis thaliana* miR159 precursor was modified and engineered to express artificial miRNAs (amiRNAs) targeting three vital genes of whitefly, sex lethal (Sxl) protein, *acetylcholinesterase* (*AChE*) and *orcokinin* (*Orc*). The amiRNA^{WF} construct was transformed into the *Nicotiana tabacum* plants. Whiteflies were infested in separate cages on both control and transgenic plants. After four weeks of infestation, the nymphs were counted and real time quantitative PCR (RT-qPCR) was performed to assess the relative expression of whitefly genes. The transgenic *N. tabacum* plants showed resistance against whitefly and the number of whiteflies in the next generation were substantially reduced

on transgenic plants compared to control plants. Abnormal egg hatching and poor development was observed and only a small number of whitefly nymphs matured to adults. RT-qPCR results indicated that the expression of target genes (Sxl, *AChE* and *Orc*) in the nymphs was considerably down-regulated in whiteflies reared on transgenic plants. The amiRNA mediated resistance against whitefly in transgenic plants may pave the way for engineering resistance against whitefly in cotton plants.

Keywords: *Whitefly, RNA Silencing, amiRNA, Sxl, AChE, Orc.*

35. Jahejo, A. R., **Raza Bukhari, S. A.,** Jia, F.-J., Abbas Raza, S. H., Shah, M. A., Rajput, N., . . . Tian, W.-X. (2020). Integration of gene expression profile data to screen and verify immune-related genes of chicken erythrocytes involved in Marek's disease virus. *Microbial Pathogenesis, 148*, 104454. doi: https://doi.org/10.1016/j.micpath.2020.104454. **(Sayyad Ali Raza Bukhari (Biotechnology/Knowledge Unit of Science) Web of Science JCR Listed (IF: 2.914) (SKT Campus)**

Abstract: Chicken erythrocytes participated in immunity, but the role of erythrocytes in the immunity of Marek's disease virus (MDV) has not been reported related to the immunity genes. The purpose of this study was to screen and verify the immune-related genes of chicken erythrocytes which could be proven as a biomarker in MDV. The datasets (GPL8764-Chicken Gene Expression Microarray) were downloaded from the GEO profile database for control and MDV infected chickens to obtain differentially expressed genes (DEGs) through bioinformatics methods. Kyoto Encyclopedia of Genes and Genomes (KEGG) was performed to find enriched pathways, including Gene Ontology (GO). Based on enriched pathways, the top 19 immune-related genes were screened-out and process further to construct the protein-protein interaction (PPI) networks. The screened genes were validated on RT-PCR and qPCR. Results suggested that the mRNA transcription of Toll-like receptors 2, 3, 4, 6 (TLR2, TLR3, TLR4, TLR6), major histocompatibility complex-II (MHCII), interleukin-7 (IL-7), interferon-βeta (IFN-β), chicken myelomonocytic growth factor (cMGF) and myeloid differentiation primary response 88 (MyD88) were significantly up-regulated. The expression of toll-like receptor 5,7 (TLR5, TLR7) interleukin-12 (IL-12p40), interleukin-13 (IL-13), and interferon-αlpha (IFN-α) were significantly down-regulated in the erythrocytes of the infected group ($P < 0.05$). In contrast, the expression of toll-like receptor-1, 15, 21 (TLR1, TLR15, TLR21), major histocompatibility complex I (MHCI) and Tumor necrosis factor receptor (TNFR)-associated factor 6 (TRAF6) were not significant. In conclusion, it has been verified on qRT-PCR results that 19 immune-related genes, which included TLRs, cytokines and MHC have immune functions in MDV infected chickens.

Keywords: *Chicken, Erythrocytes, Immunity, MDV, TLRs.*

36. **Saqib, M. A. N.,** Siddiqui, S., Qasim, M., Jamil, M. A., Rafique, I., **Awan, U. A.,** . . . **Afzal, M. S.** (2020). Effect of COVID-19 lockdown on patients with chronic diseases. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14*(6), 1621-1623. doi: https://doi.org/10.1016/j.dsx.2020.08.028. **(Muhammad Arif Nadeem Saqib, Usman Ayub Awan, Muhammad Sohail Afzal (Life Sciences/SSC) MJL**

Abstract: Background and aims: We sought to measure the effect of lockdown, implemented to contain COVID-19 infection, on routine living and health of patients with chronic diseases and challenges faced by them.

Methods: A semi-structured online questionnaire was generated using “Google forms” and sent to the patients with chronic diseases using WhatsApp. Data were retrieved and analyzed using SPSS.

Results: Out of 181 participants, 98% reported effect of lockdown on their routine living while 45% reported an effect on their health. The key challenges due to lockdown were to do daily exercise, missed routine checkup/lab testing and daily health care.

Conclusion: It is important to strategize the plan for patients with chronic diseases during pandemic or lockdown.

Keywords: *COVID-19, chronic diseases, lockdown.*

37. Kanwal, F., Tahir, A., Qadir Shah, S. A., Tsuzuki, T., Nisbet, D., Chen, J., & **Rehman, Y.** (2020). Effect of phyto-fabricated nanoscale organic-iron complex on photo-fermentative hydrogen production by Rhodopseudomonas palustris MP2 and Rhodopseudomonas palustris MP4. *Biomass and Bioenergy, 140*, 105667. doi: https://doi.org/10.1016/j.biombioe.2020.105667. **(Yasir Rehman (Life Sciences/SSC) Web of Science JCR Listed (IF: 3.551)**

Abstract: Biosynthesis is a promising green method to produce hydrogen fuel. Different approaches have been used in this regard to enhance hydrogen yield, however, there is still a need to explore further. The current research is an effort to enhance hydrogen yield using nanoscale organic-iron (NO–Fe) complex. NO–Fe complex was synthesized using *Eucalyptus viminalis* leaf extract and was characterized by UV–Vis, FTIR, XRD, FESEM, TEM and EDS. The NO–Fe complex was used as an iron source for the newly isolated photo fermentative *Rhodopseudomonas palustris* MP2 and *Rhodopseudomonas palustris* MP4 bacterial strains. $FeSO_4 \cdot 7H_2O$ was also used as a source of iron and compared with the effects of NO–Fe complex. Both the strains responded well to the NO–Fe complex and production of hydrogen was increased with increasing concentrations of NO–Fe complex. Highest yield of hydrogen was achieved by *R. palustris* MP4 (0.08 ± 0.01 mol-H_2mol^{-1} of-succinate) when the NO–Fe complex was used at 5.0 mg L^{-1} concentration. The NO–Fe complex was more efficient than iron ions in enhancing bio-hydrogen production. The study revealed that phyto-fabricated NO–Fe complex is an efficient nutrient to improve hydrogen production by purple non-sulfur bacteria.

Keywords: *bio-hydrogen production, nanoscale organic-iron 'complex, eucalyptus viminalis, photo-fermentation bacteria, purple non-sulfur bacteria, rhodopseudomonas palustris.*

38. **Mateen, R. M.,** Tariq, A., **Ali, M., Afzal, M. S.,** Samra, Q. Z., & Athar, M. A. (2020). Cloning and Heterologous Expression of Hepatitis B Virus Pre-Surface Antigen 1. *Molecular Genetics, Microbiology and Virology, 35*(2), 112-116. doi: 10.3103/S089141682002007X. **(Rana Muhammad Mateen, Muhammad Ali, Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 0.250)**

Abstract: Hepatitis B causes major deathly infections in developing countries. The surface antigen preS1, hepatocytes attachment site, plays a crucial role in development and progression of disease. The present study was, therefore, an effort to develop an efficient expression system for PreS1 gene in *Esherishia coli*. *PreS1* gene was amplified and cloned in pTZ57R/T vector. Following confirmation through restriction enzyme digestion and sequencing, it was subcloned in pET22b(+). *E. coli* BL21 (DE3) CodonPlus cells were transformed with the recombinant plasmid. *PreS1* gene was induced using IPTG, the protein was expressed and quantified with Bradford assay and analyzed on SDS-PAGE. Enzyme Linked Immunosorbent Assay and Western Blot analysis were performed for protein integrity and conformation.

Keywords: *ELISA, recombinant plasmid, SDS PAGE, western blot.*

39. Mahmood, M. S., Bin-T-Abid, D., Irshad, S., & **Batool, H.** (2020). Analysis of Putative Epitope Candidates of Mycobacterium tuberculosis Against Pakistani Human Leukocyte Antigen Background: An Immunoinformatic Study for the Development of Future Vaccine. *International Journal of Peptide Research and Therapeutics*. doi: 10.1007/s10989-020-10111-w. **(Hina Batool (Life Sciences/SSC) Web of Science JCR Listed (IF: 1.500)**

Abstract: Tuberculosis (TB), a chronic disease caused by *Mycobacterium tuberculosis (Mtb)*, is a global health issue across the world. Pakistan ranks fifth among the countries, which are facing, a significantly great number of mortalities and morbidities due to TB. Unfortunately, all previously reported treatments are not successful for the eradication of TB. Here in this study, we report an emerging treatment option for this disease. We have applied immunoinformatics to predict highly conserved B and T-cell epitopes from *Mtb*, showing significant binding affinities to the frequent *HLA* alleles in the Pakistani population. A total of ten highly referenced and experimentally validated epitopes were selected from the Immune Epitope Database (IEDB), followed by their conservancy analysis using weblogos. The consensus sequences and variants derived from these sequences were

examined, for their binding affinities, with prevalent *HLA* alleles of Pakistan. Moreover, the antigenic and allergenic natures of these peptides were also evaluated via Vaxijen and AllerTOP, respectively. Consequently, all potentially allergenic and non-antigenic, peptide fragments, were excluded from the analysis. Among all putative epitopes, three CD8 + T-cell epitopes were selected, as ideal vaccine candidates and, population coverage analysis revealed that the combination of these three peptides was covering, 67.28% Pakistani Asian and 57.15% mixed Pakistani populations. Likewise, eleven linear and six conformational or discontinuous B-cell epitopes were also marked as potential vaccine candidates based on their prediction score, non-allergenic nature, and antigenic properties. These epitopes, however, need the final validation via wet-lab studies. After their approval, these epitopes would be effective candidates for the future designing of epitope-based vaccines against *Mtb* infections in Pakistan.

Keywords: *Epitope-based vaccines, Mycobacterium tuberculosis, Human leukocyte antigen, Pakistani population.*

40. **Mateen, R. M.,** Tariq, A., & **Hussain, M.** (2020). Generating DNA profile from low copy number DNA: Strategies and associated risks. *Acta Scientiarum. Biological Sciences*, *42*(1), e52239. https://doi.org/10.4025/actascibiolsci.v42i1.52239. **(Rana Muhammad Mateen, Mureed Hussain(Life Sciences/SSC) SJR**

Abstract: Many shreds of evidence found on the crime scenes contain a trace amount of DNA which results in insignificant profiling results for subsequent comparison. This can nullify the potential evidence material and hamper investigation process. Over the years, different strategies have been employed by various DNA testing laboratories to create interpretable DNA profiles generated from low template of DNA. This review highlights different strategies used by forensic laboratories worldwide for creating complete DNA profiles from low copy number template for comparison purposes along with its associated risks for forensic purposes.

Keywords: *TR profiling, forensic genetics, likelihood ratio, random match probability.*

41. **Arif, N., Subhani, A.,** Hussain, W., & Rasool, N. (2020). In Silico Inhibition of BACE-1 by Selective Phytochemicals as Novel Potential Inhibitors: Molecular Docking and DFT Studies. *Current drug discovery technologies,* 17(3), 397-411. doi: 10.2174/1570163816666190214161825. **(Nadia Arif, Andleeb Subhani (Life Sciences/SSC) SJR**

Abstract: Background: Alzheimer's Disease (AD) has become the most common age-dependent disease of dementia. The trademark pathologies of AD are the presence of amyloid aggregates in neurofibrils. Recently phytochemicals being considered as potential inhibitors against various neurodegenerative, antifungal, antibacterial and antiviral diseases in human beings.

Objective: This study targets the inhibition of BACE-1 by phytochemicals using in silico drug discovery analysis.

Methods: A total of 3150 phytochemicals were collected from almost 25 different plants through literature assessment. The ADMET studies, molecular docking and density functional theory (DFT) based analysis were performed to analyze the potential inhibitory properties of these phytochemicals.

Results: The ADMET and docking results exposed seven compounds that have high potential as an inhibitory agent against BACE-1 and show binding affinity >8.0 kcal/mol against BACE-1. They show binding affinity greater than those of various previously reported inhibitors of BACE-1. Furthermore, DFT based analysis has shown high reactivity for these seven phytochemicals in the binding pocket of BACE- 1, based on ELUMO, EHOMO and Kohn-Sham energy gap. All seven phytochemicals were testified (as compared to experimental ones) as novel inhibitors against BACE-1.

Conclusion: Out of seven phytochemicals, four were obtained from plant Glycyrrhiza glabra i.e. Shinflavanone, Glabrolide, Glabrol and PrenyllicoflavoneA, one from Huperzia serrate i.e. Macleanine, one from Uncaria rhynchophylla i.e. 3a-dihydro-cadambine and another one was from VolvalerelactoneB from plant Valeriana-officinalis. It is concluded that these phytochemicals are suitable candidates for drug/inhibitor against BACE-1, and can be administered to humans after experimental validation through in vitro and in vivo trials.

Keywords: *ADMET, BACE-1, Molecular Docking, DFT, phytochemicals, in silico inhibition.*

42. Rasool, N., Majeed, A., **Riaz, F.,** & Hussain, W. (2020). Identification of novel inhibitory candidates against two major Flavivirus pathogens via CADD protocols: in silico analysis of phytochemical binding, reactivity, and pharmacokinetics against NS5 from ZIKV and DENV. *Structural Chemistry*. doi: 10.1007/s11224-020-01577-x. **(Fareeha Riaz (Life Sciences/SSC) Web of Science JCR Listed (IF: 2.081)**
Abstract: Zika and dengue virus are flaviviruses which with the passage of time have become a serious challenge affecting millions of people around the world. To lessen the impact of these viral infections globally and to combat these virus-associated epidemics in the future, new medical findings and pharmacological approaches are needed. The phytochemicals extracted from a variety of various plants consist of amazing medicinal properties and can be used in the production of novel anti-viral drugs. The two domains of NS5 protein (NS5 MTase and NS5 RdRp) can be targeted in the clinical trials to produce effective novel inhibitors against Zika and dengue fever. Herein, we aim at using a wide variety of phytochemicals (n = 2035) as inhibitors against NS5 protein from DENV and ZIKV. Absorption, distribution, metabolism, excretion, and toxicity (ADMET) properties of the selected compounds were studied to evaluate the pharmacological characteristics. Molecular docking was carried out to determine the binding properties of these ligands with NS5 protein and reactivity was analyzed using molecular orbital energy descriptors. A total of 108 compounds were found suitable in ADMET and from 108 compounds, 35 compounds with the highest in the case of NS5 MTase from ZIKV and DENV were selected. While for NS5 RdRp, 29 compounds were selected. Those compounds, which exhibited remarkable binding affinities values against the proteins of both the ZIKV and 4 serotypes of DENV simultaneously, were predominantly selected in this study. It is concluded that these compounds can be used in clinical trials for the production of a mutual anti-viral drug against both DENV and ZIKV.
Keywords: *DENV, ZIKV, NS5, Phytochemicals, In silico analysis, CADD.*

43. **Wahid, B.** (2020). Forensic casework analysis and legal challenges during the coronavirus disease 2019 global pandemic: An update from Pakistan. *Medicine, Science and the Law*, 0025802420945912. doi: 10.1177/0025802420945912. **(Braira Wahid (Life Sciences/SSC) Web of Science JCR Listed (IF: 0.676) (Letter to Editor)**
Abstract: Not available.
Keywords: *not available.*

44. Khan, A., Tahir, A., **Afzal, M. S.,** Kamran Shabbir, R. M., Saleem, S., & Ahmed, H. (2020). HIV is an emerging health challenge in Pakistan: risk factors and management strategies. *Tropical Doctor*, 0049475520957897. doi: 10.1177/0049475520957897. **(Muhammad Sohail Afzal (Life Sciences/SSC) Web of Science JCR Listed (IF: 0.523) (Correspondence)**
Abstract: Not available.
Keywords: *not available.*

Conference Proceedings

1. Sarwar, N., Nasir, J., Shah, S. Z. H., Ahsan, A., Malik, S., Nasir, S., . . . **Irshad, A.** (2020). *Prediction and Analysis of Sun Shower Using Machine Learning.* Paper presented at the Intelligent Technologies and Applications, Singapore. **(Asma Irshad (Life Sciences/SSC) SJR**
Abstract: Climate is the absolute most occasions that influence the human life in each measurement, running from nourishment to fly while then again it is the most tragic wonders. In this manner, expectation of climate wonders is of significant enthusiasm for human culture to keep away from or limit the devastation of climate risks. Climate forecast is unpredictable because of clamor and missing qualities dataset. Various endeavors were

made to make climate forecast as precise as would be prudent, yet at the same time the complexities of commotion are influencing exactness. In this paper, the five-year rainfall record of weather is used for predicting the rainfall by calculating the performance and accuracy through 10 cross-fold validation technique. Its initial step is gathering, isolating, sorting, and detachment of datasets dependent on future vectors. Arrangement strategy has numerous calculations, some of them are Support Vector Machine (SVM), Naïve Bayes, Random Forest, and Decision Tree. Prior to the execution of each strategy, the model is made and afterward preparing of dataset has been made on that model. Learning the calculation created model must be fit for both the information dataset and estimate the records of class name. Various classifiers, for example, Linear SVM, Ensemble, Decision tree has been utilized and their precision and time broke down on the dataset. At last, all the calculation and results have been determined and analyzed in the terms of accuracy and execution time.

Keywords: *Classification, Naïve Bayes, Decision tree, SVM, Confusion matrix.*

2. Nasir, J., Ahsan, A., Sarwar, N., Rafique, W., Malik, S., Shah, S. Z. H., . . . **Irshad, A.** (2020). *Classification and Prediction Analysis of Diseases and Other Datasets Using Machine Learning.* Paper presented at the Intelligent Technologies and Applications, Singapore. **(Asma Irshad (Life Sciences/SSC) SJR**

Abstract: Classification is one of the most used machine learning technique especially in the prediction of daily life things. Its first step is grouping, dividing, categorizing, and separation of datasets based on future vectors. Classification procedure has many algorithms, some of them are Random Forest, Naïve Bayes, Decision Tree and Support Vector Machine. Before the implementation of every technique, the model is created and then training of dataset has been made on that model. Learning the algorithm-generated model must be fit for both the input dataset and forecast the records of class label. Many models are available for prediction of a class label from unknown records. In this paper, different classifiers such as Linear SVM, Ensemble, the Decision tree has been applied and their accuracy and time analyzed on different datasets. The Liver Patient, Wine Quality, Breast Cancer and Bupa Liver Disorder datasets are used for calculating the performance and accuracy by using 10 cross-fold validation technique. In the end, all the applied algorithm results have been calculated and compared in the terms of accuracy and execution time.

Keywords: *Classification, Naïve Bayes, DT, SVM, CM, Scattered plot.*

Department of Chemistry

Research Articles

1. Iqbal, S., Bahadur, A., Anwer, S., Ali, S., Saeed, A., Muhammad Irfan, R., . . . **Javed, M.**, Shoaib, M. (2020). Shape and phase-controlled synthesis of specially designed 2D morphologies of l-cysteine surface capped covellite (CuS) and chalcocite (Cu2S) with excellent photocatalytic properties in the visible spectrum. *Applied Surface Science, 526*, 146691. doi: https://doi.org/10.1016/j.apsusc.2020.146691. **(Mohsin Javed (Chemistry/SSC) Web of Science JCR Listed (IF: 6.182)**

Abstract: Two dimensional (2D) nanomaterials have interesting properties due to their lateral dimensions. Pure self-assembled l-cysteine stabilized covellite nanoplates (CuS@L-Cys NPs) and l-cysteine stabilized chalcocite nano leaves (Cu_2S@L-Cys NLs) were synthesized by using a template free, the facile hydrothermal route with the best control of size, phase purity structure, morphology, and electrochemical properties. Novel CuS@L-Cys NPs and Cu_2S@L-Cys NLs snowflakes dendrites were synthesized by varying synthetic parameters such as solvent, temperature (100–180 °C), reaction time (8–24 h), pH of reaction medium (7–14), the concentration of base (0.1–2.4 mL NH_3) and concentration of thiourea (1–4 mmol). By changing these factors, different morphologies such as irregular, regular, trigonal, hexagonal leaf and snowflakes dendrites like shapes were observed. CuS@L-Cys NPs and Cu_2S@L-Cys NLs were fabricated by using water and ethylenediamine (EDA) as solvent respectively. CuS@L-Cys NPs and Cu_2S@L-Cys NLs were investigated for potential photocatalytic applications in methyl orange

(MO) degradation under visible light with a detailed mechanism. The noteworthy, unique bandgap of 2 eV and the special morphology of CuS@L-Cys NPs increases the active sites for adsorption of dye, which causes extraordinary degradation activity. Furthermore, the l-cysteine (L-Cys) protective layer could efficiently alleviate the photocorrosion of CuS and Cu_2S, giving rise to excellent stability.

Keywords: *CuS, Snowflakes dendrites morphology, NanosheetDye degradation, Photocatalyst.*

2. **Kosar, N.,** Shehzadi, K., Ayub, K., & Mahmood, T. (2020). Nonlinear optical response of sodium based superalkalis decorated graphdiyne surface: A DFT study. *Optik, 218*, 165033. doi: https://doi.org/10.1016/j.ijleo.2020.165033. **(Naveen Kosar (Chemistry/SSC) Web of Science JCR Listed (IF: 2.187)**

Abstract: In the current study, structural, electronic, optical and nonlinear optical properties of superalkalis doped graphdiyne (GDY) complexes (Na_2Y@GDY, Y = SH, OCH_3, SCH_3, CN and N_3) are investigated. Our results show that superalkalis cluster preferably adsorb on the hollow cavity of GDY nanosheet. Na_2CN@GDY is thermodynamically stable among all considered complexes. NBO analysis reveals the transfer of charge from superalkalis to GDY is analyzed through. Doping of superalkalis on GDY significantly reduces the HOMO-LUMO gap of GDY. Na_2OCH_3@GDY complex has the lowest H-L gap (3.77 eV) with remarkable β_o (6.17×10^4 au) value. The doping of GDY with superalkali introduces excess electrons into the system which significantly reduces the HOMO-LUMO gap by generating new HOMO orbitals. The involvement of superalkalis in diffusion of excess electrons towards GDY is confirmed through PDOS spectral analysis. Furthermore, the two-level model and first hyperpolarizability (β_{vec}) justified NLO properties of superalkalis doped GDY. According to the two-level model, the ΔE is the key factor for the enhancement of first hyperpolarizability values of all newly designed complexes.

Keywords: *superalkalis, graphdiyne, nonlinear optical properties, hyperpolarizability.*

3. Shahid, M., Farooqi, Z. H., Begum, R., **Arif, M.,** Irfan, A., & Azam, M. (2020). Extraction of cobalt ions from aqueous solution by microgels for in-situ fabrication of cobalt nanoparticles to degrade toxic dyes: A two fold-environmental application. *Chemical Physics Letters, 754*, 137645. doi: https://doi.org/10.1016/j.cplett.2020.137645. **(Muhammad Arif (Chemistry/SSC) Web of Science JCR Listed (IF: 2.029)**

Abstract: Microgels were obtained by method of free radical precipitation polymerization and characterized by TEM, DLS and FTIR. Adsorption of Co^{2+} ions was studied under various conditions of pH, concentration of metal ions and that of microgels. Different adsorption isotherms were applied to study mechanism of adsorption process. Kinetics and mechanism of the adsorption process was investigated by pseudo 1st order, pseudo 2nd order and intra-particle diffusion modeling. In situ reduction of Co^{2+} ions loaded into the polymer microgel was carried out to get hybrid system for catalytic degradation of 4-nitrophenol, Eosin and Methylene blue.

Keywords: *polymer microgels, heavy metal ion recovery, cobalt nanoparticles, catalytic degradation of dyes.*

4. Iqbal, S., **Iqbal, M. M., Javed, M.,** Bahadur, A., Yasien, S., Najam ud, d., . . . **Naveed, A.,** Liu, G. (2020). Modified QuEChERS extraction method followed by simultaneous quantitation of nine multi-class pesticides in human blood and urine by using GC-MS. *Journal of Chromatography B, 1152*, 122227. doi: https://doi.org/10.1016/j.jchromb.2020.122227. **(Muhammad Muntazir Iqbal, Mohsin Javed, Naveed Ahmad (Chemistry/SSC) SJR**

Abstract: Organophosphate, carbamate and pyrethroid pesticides are the most common insecticides used worldwide. They may cause chronic poisoning in farmers and acute poisoning in homicidal or suicidal cases. The determination of trace levels of these pesticides in human blood and urine is very challenging. This study focuses on a simultaneous quantitation method that was developed and validated for multi-class nine pesticides belonging to organophosphate, carbamate and pyrethroid classes in human blood and urine. Target pesticides were extracted from blood and urine using a modified QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe)

extraction method. Capillary column DB-35 ms (15 m × 0.25 mm, 0.25 µm) was used for chromatography with a 0.079 ml/min flow rate of carrier gas at constant pressure mode. Quantitation of sulfotep, phorate, carbofuran, chlorpyriphos, profenophos, triazophos, pyriproxyfen, lambda-cyhalothrin and permethrin was performed by mass spectrometer equipped with electron impact ionization source using selected ion monitoring (SIM) mode. The lower and upper limits of quantitation for all nine pesticides were 0.01 mg/L and 2.0 mg/dL respectively. The proposed method was proved to be simple, fast, sensitive, and robust. It has been applied to the analysis of 9 pesticides samples.

Keywords: *multi-class pesticides, quantitation, QuEChERS extraction, GC-MSHuman blood and urine.*

5. Khan, S. A., **Shahid, S.,** & Lee, C.-S. (2020). Green Synthesis of Gold and Silver Nanoparticles Using Leaf Extract of Clerodendrum inerme; Characterization, Antimicrobial, and Antioxidant Activities. *Biomolecules, 10*(6), 835. **(Sammia Shahid (Chemistry/SSC) Web of Science JCR Listed (IF: 4.082)**

   Abstract: Due to their versatile applications, gold (Au) and silver (Ag) nanoparticles (NPs) have been synthesized by many approaches, including green processes using plant extracts for reducing metal ions. In this work, we propose to use plant extract with active biomedical components for NPs synthesis, aiming to obtain NPs inheriting the biomedical functions of the plants. By using leaves extract of *Clerodendrum inerme* (*C. inerme*) as both a reducing agent and a capping agent, we have synthesized gold (CI-Au) and silver (CI-Ag) NPs covered with biomedically active functional groups from *C. inerme*. The synthesized NPs were evaluated for different biological activities such as antibacterial and antimycotic against different pathogenic microbes (*B. subtilis*, *S. aureus*, *Klebsiella*, and *E. coli*) and (*A. niger*, *T. harzianum*, and *A. flavus*), respectively, using agar well diffusion assays. The antimicrobial propensity of NPs further assessed by reactive oxygen species (ROS) glutathione (GSH) and FTIR analysis. Biofilm inhibition activity was also carried out using colorimetric assays. The antioxidant and cytotoxic potential of CI-Au and CI-Ag NPs was determined using DPPH free radical scavenging and MTT assay, respectively. The CI-Au and CI-Ag NPs were demonstrated to have much better antioxidant in terms of %DPPH scavenging (75.85% ± 0.67% and 78.87% ± 0.19%), respectively. They exhibited excellent antibacterial, antimycotic, biofilm inhibition and cytotoxic performance against pathogenic microbes and MCF-7 cells compared to commercial Au and Ag NPs functionalized with dodecanethiol and PVP, respectively. The biocompatibility test further corroborated that CI-Ag and CI-Au NPs are more biocompatible at the concentration level of 1–50 µM. Hence, this work opens a new environmentally-friendly path for synthesizing nanomaterials inherited with enhanced and/or additional biomedical functionalities inherited from their herbal sources.

   Keywords: *green synthesis, C. inerme, gold, silver, antibacterial, antimycotic, antioxidant.*

6. Iqbal, S., **Javed, M.,** Bahadur, A., **Qamar, M. A., Ahmad, M.,** Shoaib, M., **Ahmad, N.,** . . . Li, H. (2020). Controlled synthesis of Ag-doped CuO nanoparticles as a core with poly(acrylic acid) microgel shell for efficient removal of methylene blue under visible light. *Journal of Materials Science: Materials in Electronics, 31*(11), 8423-8435. doi: 10.1007/s10854-020-03377-9.**(Mohsin Javed, Muhammad Azam Qamar, Madiha Ahmad, Naveed Ahmad (Chemistry/SSC) Web of Science JCR Listed (IF: 2.220)**

   Abstract: Nowadays, constructing a narrow bandgap nanocomposite photocatalyst that can degrade contamination under visible light is critical but challenging. In this report, poly (acrylic acid) microgel (PAA) based nanocomposites (Ag@CuO/PAA NC) were constructed via free radical solution polymerization by varying the concentration of silver-doped copper oxide nanoparticles (Ag@CuO NPs) from 0 to 12%. As prepared Ag@CuO and Ag@CuO/PAA were characterized by X-ray difraction spectroscopy, scanning electron microscopy, transmission electron microscopy, energy dispersive X-ray and X-ray photoelectron spectroscopy. The size of Ag@CuO NPs was found to be 30–50 nm. The photocatalytic activity of CuO is increased by Ag doping and C3 NPs show the best photodegradation of methylene blue (MB). Then, 4% of Ag@CuO nanoparticles were incorporated into PAA microgel, the resultant nanocomposite showed a drastic increase in photodegradation of

MB. Ag@ CuO/PAA NC completely degraded dye in only 30 min which was degraded up to 65% in 60 min. by Ag@CuO NPs. The successful combination of PAA with Ag@CuO boosts the photocatalytic activity because microgel provides a large surface to adsorb pollutants. Ag@CuO/PAA NC reused successfully for photodegradation of dye due to the recycling ability of microgels. This study gives a good insight into planning a signifcant visible-light-driven photocatalyst for environmental remediation.
Keywords: *not available.*

7. Khan, S. A., **Shahid, S., Shahid, B., Fatima, U.,** & Abbasi, S. A. (2020). Green Synthesis of MnO Nanoparticles Using Abutilon indicum Leaf Extract for Biological, Photocatalytic, and Adsorption Activities. *Biomolecules, 10*(5), 785. **(Sammia Shahid, Basma Shahid, Urooj Fatima (Chemistry/SSC) Web of Science JCR Listed (IF: 4.082)**
Abstract: We report the synthesis of MnO nanoparticles (AI-MnO NAPs) using biological molecules of *Abutilon indicum* leaf extract. Further, they were evaluated for antibacterial and cytotoxicity activity against different pathogenic microbes (*Escherichia coli*, *Bordetella bronchiseptica*, *Staphylococcus aureus*, and *Bacillus subtilis*) and HeLa cancerous cells. Synthesized NAPs were also investigated for photocatalytic dye degradation potential against methylene blue (MB), and adsorption activity against Cr(VI) was also determined. Results from Scanning electron microscope (SEM), X-ray powder diffraction (XRD), Energy-dispersive X-ray (EDX), and Fourier-transform infrared spectroscopy (FTIR) confirmed the successful synthesis of NAPs with spherical morphology and crystalline nature. Biological activity results demonstrated that synthesized AI-MnO NAPs exhibited significant antibacterial and cytotoxicity propensities against pathogenic microbes and cancerous cells, respectively, compared with plant extract. Moreover, synthesized AI-MnO NAPs demonstrated the comparable biological activities results to standard drugs. These excellent biological activities results are attributed to the existence of the plant's biological molecules on their surfaces and small particle size (synergetic effect). Synthesized NAPs displayed better MB-photocatalyzing properties under sunlight than an ultraviolet lamp. The Cr(VI) adsorption result showed that synthesized NAPs efficiently adsorbed more Cr(VI) at higher acidic pH than at basic pH. Hence, the current findings suggest that *Abutilon indicum* is a valuable source for tailoring the potential of NAPs toward various enhanced biological, photocatalytic, and adsorption activities. Consequently, the plant's biological molecule-mediated synthesized AI-MnO NAPs could be excellent contenders for future therapeutic applications.
Keywords: *green synthesis, plant extract, biological activities, photocatalysis, adsorption.*

8. Ashfaq, M., Anjum, M. A., Haider, M. S., Ali, M., Mubashar, U., **Aslam, H.M.U.**, . . . Sajjad, M. (2020). Association of Cladosporium cladosporioides brown leaf spot of lady palm in Pakistan. *JAPS, Journal of Animal and Plant Sciences, 30*(2), 371-376. doi: 10.36899/JAPS.2020.2.0060.**(Hafiz Muhammad Umer Aslam (Chemistry/SSC) Web of Science JCR Listed (IF: 0.481)**
Abstract: Ladies palm (*Rhapis excelsa* L.) also known as broad leaf Lady palm is unique looking palm because of its appearance and beauty and, therefore, is commonly used for landscape purposes. Various fungal diseases are the major threat to Lady's palm that affects its growth and beauty. In the year 2016, diseased leaf samples were collected from different locations i.e. Pattoki, Chunian, Kot Radha Kishan, Nathoki and Grinkot of district Kasur, Punjab, Pakistan to identify the pathogen. Based on various morphological characteristics, the casual organisms *Cladosporium cladosporioides* were isolated, purified and identified with FCBP 1562 from collected samples. The identified pathogen was further confirmed by using molecular analysis. For this purpose, Internal Transcribed Spacer (ITS) primer pairs were used i.e. ITS1 by using universal primer pair ITS1 reverse primer (3' - TCCTCCGCTTATTGATATGC-5') and ITS1 forward primer (5' - TCCGTAGGTGAACCTGCGG-3') for identification of casual organism from total genomic DNA of the isolated causal fungus. The pathogen was re-isolated and reconfirmed morphologically as *Cladosporium cladosporioides* from the artificially inoculated ladies palm plant leaves according to the Koch's postulates. To our knowledge *Cladosporium cladosporioides was* reported

first time in Pakistan and causes chlorosis and necrosis of the lady's palm. The current study will be equally beneficial both for scientists and growers for controlling and management of this disease.

Keywords: *ladies palm, cladosporium cladosporioides, brown spot, disease, Pakistan.*

9. **Khan, S. A.,** Rizwan, K., **Shahid, S.,** Noamaan, M. A., Rasheed, T., & **Amjad, H.** (2020). Synthesis, DFT, computational exploration of chemical reactivity, molecular docking studies of novel formazan metal complexes and their biological applications. *Applied Organometallic Chemistry, 34*(3), e5444. doi: 10.1002/aoc.5444. **(Shakeel Ahmad Khan, Sammia Shahid, Hira Amjad (Chemistry/SSC) Web of Science JCR Listed (IF: 3.140)**

Abstract: The computational exploration of chemical reactivity and molecular docking of the synthesized formazan compounds **(S1-S6)** were studied. Further, their antimicrobial activity against bacterial strains (*S. epidermidis* , *B. cereus* , *K. pneumoniae* and *P. aeruginosa*) and against fungal strains (*T. mentagrophytes* , *C. albicans* , *A. niger* , *S.* cerevisiae and *C. glabrata*) using agar diffusion method and antioxidant activity following DPPH inhibition assays were evaluated. Anticancer activity was executed in *vitro* model of human breast carcinoma (MCF-7) cell line. The superior and enhanced antibacterial and antimycotic activities were exhibited by formazan compound **(S4)** by presenting maximum ZOIs and MICs values. While enhanced antioxidant in terms of percentage inhibition of DPPH and cytotoxic effect on human breast carcinoma-cells demonstrated by formazan compound **(S1)** which was further validated by the results of molecular docking studies of **(S1)** with the human estrogen receptor protein. In order to compute quantum chemical reactivity descriptors from conceptual density functional theory (CDFT) point of view of this system, including chemical potential (μ), chemical hardness (η), electrophilicity (ω), condensed Fukui function and dual descriptors are calculated at the same level of calculation. The most active sites of these molecules are determined and correlated with experimental data. The present investigation displays that formazans compounds could be potential drug candidate that constrains the growth of microbial strains, possess ability to cause cytotoxic effect on carcinoma cells and act as effective scavenger for free radical species.

Keywords: *anticancer, antimicrobial, DFT studies, formazan, molecular docking.*

10. Ahmad, M. Z., Bhatti, I. A., **Qureshi, K.,** Ahmad, N., Nisar, J., Zuber, M., . . . Iqbal, M. (2020). Graphene oxide supported Fe2(MoO4)3 nano rods assembled round-ball fabrication via hydrothermal route and photocatalytic degradation of nonsteroidal anti-inflammatory drug. *Journal of Molecular Liquids, 301*, 112343. doi: https://doi.org/10.1016/j.molliq.2019.112343.**(Khizar Qureshi (Chemistry/SSC) Web of Science JCR Listed (IF: 5.065) (SKT Campus)**

Abstract: Graphene oxide (GO) supported iron molybdate (Fe2(MoO4)3) was prepared via hydrothermal route, which were characterized by X-rays diffraction technique (XRD), scanning electron microscopy (SEM), EnergyDispersive X-Ray (EDX), zeta sizer, UV–visible and atomic force microscopy (AFM) techniques. Photocatalytic activity (PCA) was evaluated by degrading the diclofenac sodium (DS) under solar light irradiation. Central composite design (CCD) was employed under response surface methodology (RSM) for the optimization of process variables such as pH, H2O2, DS concentration and catalyst load for maximum drug degradation. At optimum conditions, up to 96% DS degradation was achieved (2 h irradiation, 6% H2O2 concentration, 10 mg/L DS concentration, 0.45 g/L catalyst dose and 4.5 pH). The statistical analysis revealed the adequacy of developed model for the degradation of DS drug. The actual and predicted degradation values correlated well with each other with very low residual value. The model fitness was based on insignificant “lack of fit test” and higher value R2 . Results revealed that the hydrothermal route is an efficient route for the fabrication of GO/Fe2(MoO4)3 round-ball microstructures, which showed promising PCA and it could possibly be used for the degradation of DS drug in wastewater.

Keywords: *graphene oxideiron molybdate, hydrothermal route, round-ball microstructures, photocatalytic activity, response surface methodology.*

11. He, Q., **Shahid, M.,** Jiao, X., Gann, E., Eisner, F. D., Wu, T., . . . Heeney, M. (2020). Crucial Role of Fluorine in Fully Alkylated Ladder-Type Carbazole-Based Nonfullerene Organic Solar Cells. *ACS Applied Materials & Interfaces, 12*(8), 9555-9562. doi: 10.1021/acsami.0c00981.**(Munazza Shahid (Chemistry/SSC) Web of Science JCR Listed (IF: 8.758)**

    Abstract: Two fused ladder-type nonfullerene acceptors, DTCCIC and DTCCIC-4F, based on an electron-donating alkylated dithienocyclopentacarbazole core flanked by electron-withdrawing nonfluorinated or fluorinated 1,1-dicyanomethylene-3-indanone (IC or IC-4F), are prepared and utilized in organic solar cells (OSCs). The two new molecules reveal planar structures and strong aggregation behavior, and fluorination is shown to red-shift the optical band gap and downshift energy levels. OSCs based on DTCCIC-4F exhibit a power conversion efficiency of 12.6%, much higher than that of DTCCIC-based devices (6.2%). Microstructural studies reveal that while both acceptors are highly crystalline, bulk heterojunction blends based on the nonfluorinated DTCCIC result in overly coarse domains, while blends based on the fluorinated DTCCIC-4F exhibit a more optimal nanoscale morphology. These results highlight the importance of end group fluorination in controlling molecular aggregation and miscibility.

    Keywords: *organic solar cells, nonfullerene acceptors, carbazole, fluorine effect, fully alkylated side chains.*

12. **Qamar, M. A., Shahid, S., & Javed, M.** (2020). Synthesis of dynamic g-C3N4/Fe@ZnO nanocomposites for environmental remediation applications. *Ceramics International*. doi: https://doi.org/10.1016/j.ceramint.2020.05.294.**(Muhammad Azam Qamar, Sammia Shahid, Mohsin Javed (Chemistry/SSC) Web of Science JCR Listed (IF: 3.830)**

    Abstract: An effective g-C3N4/Fe@ZnO heterostructured photocatalyst was synthesized by a simple chemical co-precipitation method and characterized by X-ray diffraction, Fourier transform infrared spectroscopy, transmission electron microscopy and ultraviolet-visible spectroscopy. Transmission electron microscopy revealed that 7-8 nm-sized 1%Fe@ZnO nanoparticles were evenly distributed on g-C3N4 nanosheets to form a hybrid composite. The photocatalytic effectiveness of the composites was assessed against methylene blue dye, and it was found that the 50%g-C3N4/Fe@ZnO photocatalyst was more efficient in harvesting solar energy to degrade dye than the ZnO, 1%Fe@ZnO, g-C3N4, g-C3N4/ZnO and (25, 40, 50, 60 & 75 wt.%) g-C3N4/Fe@ZnO samples. The antibacterial competency of the samples was also explored against Gram-positive (Bacillus subtilis, Staphylococcus aureus and Streptococcus salivarius) and Gram-negative (Escherichia coli) bacteria through the well diffusion method. The 50%g-C3N4/Fe@ZnO nanocomposite exhibited a superior antibacterial action compared to that of the rest of the samples. The exceptionally improved photocatalytic and antimicrobial efficiency of the 50%g-C3N4/Fe@ZnO composite was primarily accredited to the synergic outcome of the interface established between Fe@ZnO nanoparticles and gC3N4 nanosheets.

    Keywords: *photocatalyst, graphitic carbon nitride, broad spectrum antibacterial, fe nanocomposite.*

13. **Arif, M., Javed, M., & Hamid, R**. (2020). Breast Cancer in Pakistan: Alarming Situation of Breast Cancer in Near Future. *Iranian journal of public health, 49*(4), 812-813. **(Muhammad Arif, Mohsin Javed, Hamid Raza (Chemistry/SSC) Web of Science JCR Listed (IF: 1.291) (Letter to editor)**

    Abstract: Not available.

    Keywords: *not available.*

14. **Shahid, S., Fatima, U., Rasheed, M. Z.,** Asghar, M. N., Zaman, S., & Sarwar, M. N. (2020). Enhanced sunlight-driven photocatalytic performance of Ag–ZnO hybrid nanoflowers. *Applied Nanoscience, 10*(1), 187-197. doi: 10.1007/s13204-019-01076-4. **(Sammia Shahid, Urooj Fatima, Muhammad Zaheer Rasheed (Chemistry/SSC) Web of Science JCR Listed (IF: 2.880)**

Abstract: Photocatalytic materials such as Ag-coated ZnO nanofowers, pristine ZnO nanofowers and ZnO nanorods were synthesized by template-assisted method for the treatment of industrial waste water through photocatalysis. Electropolishing and anodization lead to the formation of alumina template. After that, hydrothermal treatment was carried out for the growth of ZnO nanofowers and nanorods on the template. The morphology of synthesized samples was investigated by scanning electron microscope, X-ray difraction patterns and energy-dispersive X-ray spectroscopy. XRD patterns of samples clearly indicate the well crystalline structure of synthesized materials. The presence of Ag in Ag-coated ZnO nanofowers was confrmed by EDS spectral analysis and X-ray difraction patterns. Grain size was found to be in the range of 10–25 nm as calculated by Scherer's formula from XRD patterns. The sunlight-driven photocatalytic activity of Ag-coated ZnO nanofowers, ZnO nanofowers and ZnO nanorods was investigated and compared with each other. In addition, the stability and recovery of photocatalyst were also checked. Photocatalytic degradation experiment results indicated that Ag-coated ZnO nanofowers had highest photocatalytic activity towards methylene blue dye.

Keywords: *pristine ZnO nanofowers, hydrothermal synthesis, anodization, photocatalysis.*

15. Ahmad, A., Hussain, S., Rao, S. M., Asghar, A., Irshad, M**., Javed, M.,** . . . Kausar, H. S. (2020). Comparative Studies of Lead and Heavy Metals Concentrations in Pakistan Soil and Its Toxic Effects. *Polish Journal of Environmental Studies, 29*(4), 2533-2542. doi: DOI: 10.15244/pjoes/106028. **(Mohsin Javed (Chemistry/SCC) Web of Science JCR Listed (IF: 1.383)**

    Abstract: A study was conducted to determine qualitative and quantitative lead contamination in soil along two major roadsides (Motorway M-2 and National Highway N-5) of Thokar Niaz Baaig (TNB) in Lahore, and adjoining areas of the Hudiara drain in Pakistan by employing the digestion method using HCl/HNO_3 at 1:4. The characterization of lead (Pb) was performed by atomic absorption spectroscopy. High deposition of lead was observed along the soil of linking roads of rather populated towns of Lahore, Pakistan, and the soil irrigated by the wastewater of Hudiara drain. The lead contents originated mainly from vehicular emissions, urban pollution and industrial effluents, and may lead to a rise of lead levels in the vegetation of associated areas. The present study also explores a comparison of heavy metal (Pb, Cu, Cd, Zn, Ni, Fe, Mn, Cr, Ti) concentrations in different areas of Pakistan and its adverse effects on plant growth. There is a need to strictly monitor the water quality in the Hudiara drain; its wastewater should be avoided for irrigation purposes. Some fungal strains can also be used to control the heavy metal concentration in such polluted water. However, some beneficial effects of Hudiara drain wastewater as a nutritional source for plants have also been suggested. It is important to establish the proper nutrition conditions in areas of contaminated soil.

    Keywords: *lead, heavy metals, soil, Pakistan, toxic.*

16. Rauf, A., Shah, A., Munawar, K. S., Ali, S., Nawaz Tahir, M., **Javed, M.,** & Khan, A. M. (2020). Synthesis, physicochemical elucidation, biological screening and molecular docking studies of a Schiff base and its metal(II) complexes. *Arabian Journal of Chemistry, 13*(1), 1130-1141. doi: https://doi.org/10.1016/j.arabjc.2017.09.015. **(Mohsin Javed (Chemistry/SCC) Web of Science JCR Listed (IF: 4.762)**

    Abstract: A Schiff base 1-((3-nitrophenylimino)methyl)naphthalen-2-olate (HL) and its two novel complexes with Zn(II) and Co(II) metals were successfully synthesized and characterized by FTIR, ^{1}H NMR, ^{13}C NMR, elemental analysis, magnetic susceptibility, TGA and EIS-MS. Crystal of Schiff base was also characterized by X-ray analysis and experimental parameters were found in line with the theoretical parameters. Quantum mechanical approach was also used to compare structural and calculated parameters and to ensure the geometry of metal complexes. The photometric behaviors of all the synthesized compounds were investigated in a wide pH range using BR buffers. Appearance of isosbestic point suggested the existence of Schiff base molecules in different tautomeric forms. Binding of synthesized complexes with calf thymus DNA was explored by photometric and voltammetric titrations and binding constants were calculated. The results indicated that ligand and its metal

complexes bind to DNA by intercalation mode. Docking studies indicate their binding possibilities with topoisomerase II. Moreover, all these prepared compounds were screened for enzyme inhibition, antibacterial, cytotoxic and in vivo antidiabetic activities and found active against one or other activity. This effort just provides preliminary data for some biological properties and which can act as foundation stone for their application in drug development.

Keywords: *schiff base-metal complexes, spectroscopy, x-ray analysis, dna binding, molecular docking.*

17. Gillani, S. S., Munawar, M. A., Khan, K. M., & **Chaudhary, J. A.** (2020). Synthesis, characterization and applications of poly-aliphatic amine dendrimers and dendrons. *Journal of the Iranian Chemical Society*. doi: 10.1007/s13738-020-01973-4. **(Jamil Anwar Chaudhary (Chemistry/SCC) Web of Science JCR Listed (IF: 1.552)**

Abstract: In the current era, the dendrimers have vast potential applications in the area of electronics, healthcare, pharmaceuticals, biotechnology, engineering products, photonics, drug delivery, catalysis, electronic devices, nanotechnologies and environmental issues. This review recaps the synthesis, characterization and applications of poly-aliphatic amine dendrimers.

Keywords: *dendrons, dendrimers, synthesis, characterizations, electronic devices, environmental, catalysis, drug delivery.*

18. **Qamar, M. A., Shahid, S., Javed, M.,** Iqbal, S., **Sher, M.,** & Akbar, M. B. (2020). Highly efficient g-C3N4/Cr-ZnO nanocomposites with superior photocatalytic and antibacterial activity. *Journal of Photochemistry and Photobiology A: Chemistry, 401*, 112776. doi: https://doi.org/10.1016/j.jphotochem.2020.112776. **(Muhammad Azam Qamar, Sammia Shahid, Mohsin Javed, Mudassar Sher (Chemistry/SCC) Web of Science JCR Listed (IF: 3.306)**

Abstract: Currently, fabricating a narrow bandgap photocatalyst that can degrade pollutants in natural sunlight is critical but inspiring. In this study, a hybrid g-C3N4/Cr-ZnO nanocomposite was synthesized by a simple chemical coprecipitation method and its photocatalytic and antimicrobial properties were explored. In the first step, the photocatalytic efficiency of Cr-ZnO (1−9 wt. %) nanoparticles were carried out to find out the optimum doping of Cr into ZnO. The as-prepared 5% Cr-ZnO nanoparticles demonstrated the best optical absorption of sunlight and methylene blue degradation and in the second step; these were dispersed on g-C3N4 nanosheets as an active component to form ternary heterostructured photocatalyst. The nanoparticles and composite photocatalysts were characterized by X-ray diffraction spectroscopy, energy-disperse X-ray spectroscopy, transmission electron microscopy, Fourier transform infrared spectroscopy and ultraviolet-visible spectroscopy. The optimized composite (60 %g-C3N4/5%Cr-ZnO) performed enhanced harvesting of solar energy compared to ZnO, g-C3N4 and gC3N4/ZnO composite, achieving 93 % methylene blue dye degradation in 90 min. The improved photocatalytic activity of composite can be attributed to the better absorption and electron-hole pair separation between g-C3N4 and Cr-ZnO. The photocatalytic stability of the composite was testified by cyclic tests. The antibacterial aptitude of the samples was investigated against Gram-negative (Escherichia coli) and Gram-positive (Bacillus subtilis, Staphylococcus aureus and Streptococcus salivarius) bacteria applying diffusion well method. The 60 %g-C3N4/ 5%Cr-ZnO nanocomposite exhibits higher antibacterial activity compared to other samples. The enriched photocatalytic and antimicrobial activities of the composite may be predominantly ascribed to the synergistic effect of the heterojunction developed between g-C3N4 and Cr-ZnO.

Keywords: *water pollution, photodegradation, antibacterial, Cr-ZnO, composite.*

19. Riaz, T., Mughal, P., Shahzadi, T., **Shahid, S.,** & Abbasi, M. A. (2020). Green synthesis of silver nickel bimetallic nanoparticles using plant extract of Salvadora persica and evaluation of their various biological activities. *Materials Research Express, 6*(12), 1250k1253. doi: 10.1088/2053-1591/ab74fc. **(Sammia Shahid (Chemistry/SCC) Web of Science JCR Listed (IF: 1.929)**

Abstract: Metallic nanoparticles play vital role in the field of science, medicine, food and technology. Various strategies have been used for the synthesis of bimetallic nanoparticles to improve the physical and chemical properties of monometallic nanoparticles. The present study describes synthesis of Ag-Ni bimetallic nanoparticles, using aqueous extract of Salvadora persica. Silver and nickel ions were reduced by secondary metabolites within the extract which act as reducing as well as capping agents. UV-Visible spectrum produced an absorbance band in the range of 400 nm to 450 nm due to electronic transitions associated with resonance of surface electrons that was an indication of the formation of nanoparticles. Scanning Electron Microscopy (SEM) and X-Ray diffraction spectroscopy (XRD) were used for the determination of morphology and dimension of nanoparticles. Particle dimension of synthesized nanoparticles was 23.67 nm. Energy dispersive X-ray spectroscopy (EDX) was used for the elemental analysis that showed the presence of silver and nickel in elemental form. Fourier Transform Infrared Microscopy (FTIR) was used for the functional group analysis. Synthesized Ag-Ni bimetallic nanoparticles were assessed for the estimation of their antioxidant potential by three methods i.e DPPH free radical scavenging mechanism, phosphomolybdenum complex method and determination of phenolic contents. Percent scavenging activity of synthesized Ag-Ni bimetallic nanoparticles was observed as 70.5% at 1500µg/mL concentration. Total antioxidant activity calculated for synthesized nanoparticles was 0.6479 against BHT as a reference. Total phenolic contents of green synthesized nanoparticles were calculated to be 74.5 mg/g GAE. Different parameters like temperature, pH, effect of adsorbent concentration, time of contact, and concentration of adsorbate, were optimized for the utmost removal of congo red dye and chromium (VI).

Keywords: *not available.*

20. Akram, M., Asghar, M. N., Saleem Khan, M., **Shahid, S.,** Abdur Rahman, H. M., & Nadeem, I. (2020). Development and validation of an economical uric acid-Fe3+/Fe2+-ferrozine-based colorimetric assay to estimate uric acid level of pure and biological samples. *Bioscience, Biotechnology, and Biochemistry*, 1-8. doi: 10.1080/09168451.2020.1781593. **(Sammia Shahid (Chemistry/SCC) Web of Science JCR Listed (IF: 1.516)**

    Abstract: This work presents the development and validation of a simple, rapid, and cost-effective spectrophotometric method for quantitative analysis of uric acid in biological samples. The method relies upon uric acid-led reduction of Fe(III) to Fe(II) of sample/standard solutions which stoichiometrically engages ferrozine to form a magenta-colored complex. Different parameters including pH, metal and chelator concentrations, temperature, etc., were optimized for the maximum intensity and stability of the complex. The uric acid concentrations of synthetic/plasma solutions were determined by comparing the color intensity of $Fe(ferrozine)_3^{2+}$ complex produced by test solution with the standard curve formed by known uric acid concentrations. The method was validated in accordance with ICH guidelines and subjected to human plasma analysis. The results obtained were compared with a reference (enzymatic) method which revealed that there was no significant difference between the two methods at 95% confidence level. The method is highly specific, precise, linear, accurate, and robust. An economical and validated colorimetric method based on reduction of Fe(III) to Fe(II) by uric acid in sample/standard solutions which stoichiometrically combines with ferrozine to form a colored complex, is reported for estimation of uric acid in pure and biological samples.

    Keywords: *uric acid, ich guidelines, ferrozine.*

21. Altaf, F., Gill, R., Batool, R., Zohaib Ur, R., **Majeed, H.,** Abbas, G., & Jacob, K. (2020). Synthesis and applicability study of novel poly(dopamine)-modified carbon nanotubes based polymer electrolyte membranes for direct methanol fuel cell. *Journal of Environmental Chemical Engineering, 8*(5), 104118. doi: https://doi.org/10.1016/j.jece.2020.104118.**(Hammad Majeed (Chemistry/SSC) Web of Science JCR Listed (IF: 4.300) (SKT Campus)**

Abstract: Novel sulfonated polysulfone (SPS) based composite polymer electrolyte membranes (PEMs) filled with polydopamine modified carbon nanotubes (PD-CNTs) have been prepared using the phase inversion technique. The present study reports the development of novel and cost- efficient nanocomposite materials with excellent properties for polymer electrolyte membranes preparation. The progress is noteworthy towards the synthesis of economical organic-inorganic nanocomposites through which fuel cell related properties can be tailored. The applicability of prepared PEMs for direct methanol fuel cell (DMFC) has been investigated in terms of water uptake, methanol permeability, and proton conductivity by changing the filler content (0.5–1.0 wt. %). The carbon nanotubes were surface functionalized using polydopamine (PD) as the modifying agent. The resultant functionalized carbon nanotubes (PD-CNTs) have been incorporated into SPS polymer matrix to prepare the composite PEMs. The functional groups, structural properties, elemental analysis, morphological and topographical aspects of the resulting composite membranes were characterized using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Energy dispersive X-ray spectrometer (EDS), Scanning electron microscopy (SEM), and Transmission electron microscopy (TEM), respectively. It was found that PD served as an outstanding glue because of its adhesive qualities, facilitated the homogeneous dispersion of CNTs into the polymer matrix, and created new proton-conducting pathways in the subsequent membranes. A detailed analysis showed that water uptake and proton-conducting properties of the engineered PEMs have been improved significantly. Composite membarne (0.5 wt. % PD-CNTs) showed 43 % increase in proton conductivity compared to the pristine SPS membrane, increasing from 0.085 S/cm for pristin to 0.1216 S/cm for the composite membrane at 80 °C. The prepared PEMs also showed an impressive 75 % decrease in methanol permeability (5.68×10^{-7} cm^2/s) compared to recast Nafion®117 membarne (23.00×10^{-7} cm^2/s). These results demonstrated the immense potential of polydopamine functionalized CNTs based PEMs for DMFC application. The ability of the newly synthesized membrane to retain water, and its capability to give a structural framework for maximum proton conductivity with reduced fuel crossover towards the catalyst are the significant advances from the present study.

Keywords: *polymer electrolyte membranes, carbon nanotubes, polydopamine, functionalization, phase inversion, proton conductivity.*

22. Iqbal, S., Bahadur, A., Anwer, S., Shoaib, M., Liu, G., Li, H., . . . **Javed, M.,** Khalid, B. (2020). Designing novel morphologies of l-cysteine surface capped 2D covellite (CuS) nanoplates to study the effect of CuS morphologies on dye degradation rate under visible light. *CrystEngComm, 22*(24), 4162-4173. doi: 10.1039/D0CE00421A. **(Mohsin Javed (Chemistry/SSC) Web of Science JCR Listed (IF: 3.117)**

Abstract: Pure self-assembled L-cysteine stabilized covellite nanoplates (CuS@L-Cys NPs) with the best control over size, phase purity structure, morphology, and electrochemical properties were synthesized using a facile, template-free hydrothermal route. The effects of temperature (100–180 °C), reaction time (8–24 h), pH of reaction medium (7–14), concentration of base (0.1–2.4 mL NH_3) and concentration of thiourea (1–4 mmol) on the morphologies of CuS@L-Cys nanoplates were studied. The photocatalytic performance of CuS@L-Cys NPs under visible light was studied using methyl orange (MO) as a model dye. CuS@L-Cys NPs were reused successfully for the photodegradation of dye due to the recycling ability of CuS@L-Cys NPs. The hydroxyl radicals ($^{\cdot}OH$) generated by CuS@L-Cys NPs were detected using terephthalic acid (TA) as a probe molecule through the photoluminescence (PL) technique. The successful capping of L-Cys on the surface of CuS NPs was confirmed by FTIR spectroscopy. The BET surface areas of the hexagonal CuS@L-Cys NPs and oblong CuS@L-Cys NPs were measured to be 11.87 and 5.66 $m^2\ g^{-1}$, respectively. The optical band gaps of the hexagonal CuS@L-Cys NPs (2.0 eV) and oblong CuS@L-Cys NPs (2.04 eV) were determined according to direct bandgap calculations. These results support the presence of hexagonal CuS@L-Cys NP catalysts as efficient accelerators of the photodegradation of MO. Furthermore, the L-cysteine (L-Cys) protective layer could efficiently alleviate the photocorrosion of CuS, giving rise to excellent stability. The high photocatalytic activity of the hexagonal CuS@L-

Cys NPs can be ascribed to the reduction of photoinduced electron–hole pair recombination and high specific surface area, as confirmed by BET for other representative samples.

Keywords: *CuS, covellite, hexagonal nanosheet, methyl orange, novel morphology, photocatalysis.*

23. **Javed, M.,** & Hussain, S. (2020). Synthesis, Characterization and Photocatalytic applications of P (Aac) Microgels and Its Composites of Ni Doped Zno Nanorods. *Digest Journal of Nanomaterials and Biostructures*. 15(1). 217- 230. **(Mohsin Javed (Chemistry/SCC) Web of Science JCR Listed (IF: 0.785)**

Abstract: ZnO nanorods and Ni doped ZnO nanorods with various concentration of nickel 0%, 5%, 10%, 15%, 20%, 25% were prepared by co-precipitation method. By added zinc acetate dehydrate and nickel nitrate as zinc and nickel precursor in presence of Ammonia solution. Microgels of p(AAc) and its composites of Ni doped ZnO nanorods were synthesized by inverse phase polymerization method under N2 gas atmosphere. Optical structure and morphology of Ni doped ZnO nanorods and its composite with p(AAc) were determined by XRD, TEM, SEM, FTIR and UV-Visible spectrometer. The photocatalytic activity of the samples was testified by using Tungsten lamp of 500 W via photo-degradation of methylene blue (MB) as a standard dye. It was observed that the composite of p(AAc) microgels with Ni doped ZnO nanorods show much enhanced photocatalytic performance as compared to any other individual particle acting as alone. The enhanced photocatalytic activity is due to enhanced surface area, surface roughness and decreasing band gap.

Keywords: *ZnO nanorods, Ni doping, p(AAc) microgels, Characterization, Photocatalytic.*

Department of Physics

Research Articles

1. Ali, H., Soleimani, H., Yahya, N., Khodapanah, L., Sabet, M., Demiral, B. M. R., **Hussain, T.,** . . . Adebayo, L. L. (2020). Enhanced oil recovery by using electromagnetic-assisted nanofluids: A review. *Journal of Molecular Liquids, 309*, 113095. doi: https://doi.org/10.1016/j.molliq.2020.113095. **(Tanvir Hussain (Physics/SSC) Web of Science JCR Listed (IF: 5.065) (Review)**

Abstract: Applications of nanotechnology have grown enormously in recent years in various fields, such as drug delivery, energy storage, information technology, electronic devices and petroleum industry. The petroleum industry is using nanotechnology in a variety of applications, but the use of nanofluids with base fluid in the presence of the electromagnetic field in the reservoir for enhanced oil recovery (EOR) is a novel technique. After primary and secondary recovery from the reservoir, there is still an estimated amount of 50% oil remains there in most reservoirs, which cannot be extracted by conventional methods. Some studies regarding the magnetic and dielectric nanofluids in the presence of electromagnetic radiation have been carried out to recover the residual oil from depleted oil reservoirs. Such studies have shown promising results and yielded a consistent improvement in comparison to the conventional polymers and brine used in the industrial practice. However, some challenges like low sweep efficiency, potential formation damage, rheological improvement and high costs affect the further application of nanofluids for EOR technologies. The current study is a review of the activation of nanofluids using electromagnetic radiation for enhanced oil recovery, and the evaluation of mechanisms adopted for the prospects of this technology.

Keywords: *enhanced oil recovery, electromagnetic field, rheology, nanofluid, core-flooding.*

2. Li, G., **Ain, Q.,** Li, S., Saeed, M., Papp, D., Kamperidis, C., & Hafz, N. A. M. (2020). Control of electron beam energy-spread by beam loading effects in a laser-plasma accelerator. *Plasma Physics and Controlled Fusion, 62*(5), 055004. doi: 10.1088/1361-6587/ab7c50. **(Quratul Ain (Physics/SSC) Web of Science JCR Listed (IF: 2.829)**

Abstract: We present experimental results from a laser wakefield electron accelerator driven by 70 TW ultrashort laser pulses in Helium and Helium–Nitrogen gaseous plasmas with two different Nitrogen concentrations,

showing distinct electron-beam qualities. In order to get a clear view of the involved phenomenon, two-dimensional particle-in-cell simulations are performed which not only agreed with the experimental results but also provided an investigation on the evolution of accelerating structures. The experimental and simulation results depict that the beam loading effect can strongly modify the longitudinal accelerating electric field of the wake wave, imposing diametrically opposite effects on the final electron-beam qualities, especially the energy-spread, in the Helium–Nitrogen gas mixtures with different Nitrogen concentrations. In the Helium–Nitrogen-mixed plasma with a lower Nitrogen concentration (0.5%), if appropriately controlled, the beam loading effect can be employed to flatten the accelerating electric field for reducing the electron-beam energy spread. In contrast, in the Helium–Nitrogen-mixed plasmas with a higher Nitrogen concentration (5%), the accelerating electric field of the wake is locally reversed by the self-fields of the overloaded electron bunch, and the correspondingly generated negative-slope region of electric field increases the electron-beam energy-spread.
Keywords: *laser wakefield acceleration, ionization injection, experimental laser plasma acceleration.*

3. **Wahab, A.,** Sabir, B., Kattan, N. A., Yaqoob, N., Algrafy, E., Murtaza, G., . . . **Jamil, I.** (2020). Ab initio study of electronic, optical and thermoelectric character of intermetallic compounds XGa3 (X = Fe, Ru, Os). *Optical and Quantum Electronics, 52*(4), 219. doi: 10.1007/s11082-020-02332-6. **(A. Wahab, Muhammad Imran Jamil (Physics/SSC) Web of Science JCR Listed (IF: 1.842)**
Abstract: The electronic, optical and thermoelectric response of inter-metallic semiconductor MGa_3 (M = Fe, Ru, Os) in the tetragonal phase have been evaluated using PBEsol–mBJ approximation under the framework of DFT. The electronic properties demonstrate the indirect band gap values of these materials. The optical behavior predicted in terms of dielectric function, extinction coefficient, refractive index, optical conductivity, absorption coefficient, energy loss factor, and reflectivity. Moreover, the development of studied materials by changing the temperature is investigated by calculating the thermoelectric properties using BoltzTraP code. Therefore, ab initio calculations of the novel compounds is beneficial for the industry for their promising applications in energy renewable devices.
Keywords: *intermetallic compounds, modified becke–johnson potential, narrow band gap, refractive index, optical conductivity, power factor.*

4. Gilani, S. M. S., **Jamil, M. I.,** Masud, B., & Akram, F. (2020). ρJ/ Ψ scattering in an improved many-body potential. *The European Physical Journal A, 56*(2), 66. doi: 10.1140/epja/s10050-020-00067-2. **(Muhammad Imran Jamil (Physics/SSC) Web of Science JCR Listed (IF: 2.176)**
Abstract: We calculate the cross sections for the processes ρJ/ ψ→ DD¯ , ρJ/ ψ→ DD¯ 0 ∗ (D0 ∗D¯) and ρJ/ ψ→ D0 ∗D¯ 0 ∗ by modifying the usual sum of two-body interaction through a four-body form factor whose parameters are fitted to the relevant lattice QCD simulations. We use the formalism of the resonating group method, with the Born approximation utilized to decouple the resulting integral equations. Cross sections with using the realistic Cornell potential for each of the two-body interactions in the Hamiltonian are reported and are compared to those obtained through the quadratic potential. It is found that using four-body form factor, there is a significant suppression in the cross sections as compared to the more popular sum of two-body interaction. We find that total dissociation cross section of J/ψJ/ψ by ρρ meson is of the order of 0.1 mb for the most reliable case of Cornell potential with four-body form factor.
Keywords: *not available.*

5. Khan, Z. S., Rizwan, M., **Hafeez, M.,** Ali, S., Adrees, M., Qayyum, M. F., . . . Sarwar, M. A. (2020). Effects of silicon nanoparticles on growth and physiology of wheat in cadmium contaminated soil under different soil moisture levels. *Environmental Science and Pollution Research, 27*(5), 4958-4968. doi: 10.1007/s11356-019-06673-y. **(Muhammad Hafeez (Physics/SSC) Web of Science JCR Listed (IF: 3.056)**

Abstract: Soil degradation with different stress conditions like accumulation of cadmium (Cd) contents in soil and drought stress has become one of the most dangerous issues that obstruct the sustainable agriculture production. Silicon nanoparticles (Si NPs) play beneficial roles in combating various biotic and abiotic stresses but their role under combined metal and drought stress is not studied. A pot study was designed to determine the effect of Si NPs on wheat (Triticum aestivum L.) growth and uptake of Cd grown in Cd contaminated soil with different water levels under ambient conditions. Four different levels of Si NPs (0, 25, 50, and 100 mg/kg) were applied in the soil before 1 week of wheat sowing and two water levels (70% and 35% soil water-holding capacity) were introduced after 50 days of seed sowing for the remaining growth period. The lowest biomass, yield, and photosynthesis were observed in the control plants while oxidative stress and the highest Cd concentrations in shoots, roots, and grains were observed in the control plants, and the drought stress further enhanced this effect on the plants. The Si NPs treatments improved the plant growth indicators and photosynthesis, and reduced the Cd concentrations in wheat tissues, especially in grains either without or with drought stress. The Si NPs reduced the oxidative stress in leaves as was indicated by the reduced production of hydrogen peroxide, electrolyte leakage, and malondialdehyde contents, and increase in superoxide dismutase and peroxidase activities. The improvement in wheat growth and a reduction in oxidative stress and Cd concentration in tissues were dependent on the levels of Si NPs and the effect was the highest with the highest level of NPs used.

Keywords: *silicon, cadmium, drought, wheat, nanoparticles, yield, oxidative stress.*

6. **Ahmad, I.**, Ashraf, M., Khan, Y., **Khawaja, E. E.,** Ali, Z., Abbas, T. A., . . . Akhtar, S. M. J. (2020). Effects of preparation conditions on the optical properties of niobium oxide thin films. *Inorganic and Nano-Metal Chemistry, 50*(1), 22-27. doi: 10.1080/24701556.2019.1661462. **(Imtiaz Ahmad, Ehsan E. Khawaja (Physics/SSC) Web of Science JCR Listed (IF: 0.839)**

   Abstract: Major deposition parameters, including oxygen partial pressure and substrate temperature maintained during film deposition, affect the optical properties of electron beam evaporated niobium oxide films. All the films deposited were found to be amorphous as revealed by the X-ray diffraction study. A method requiring measurements at normal incidence of transmission from two films of different thicknesses prepared under identical conditions was used to determine the optical constants. Substantial changes in the optical constants and optical bandgap energy were observed following changes in the preparation conditions. These variations are related to the corresponding compositional changes, as observed by Rutherford Backscattering Spectroscopy, in the atomic ratio of oxygen to niobium in the films prepared under different conditions.

   Keywords: *optical properties, large bandgap material, niobium oxide, thin films.*

7. Bakar, A., Afaq, A., **Khan, M. F.,** ul Aarifeen, N., **Imran Jamil, M.,** & Asif, M. (2020). Insight into the structural, vibrational and thermodynamic properties of SmX (X = S, Se, Te) chalcogenides: First-principles investigations. *Physica B: Condensed Matter, 576*, 411715. doi: https://doi.org/10.1016/j.physb.2019.411715. **(Muhammad Faizan Khan, M. Imran Jamil (Physics/SSC) Web of Science JCR Listed (IF: 1.902)**

   Abstract: In this research work, Samarium based Chalcogenides are studied for structural, vibrational and thermodynamic properties. The structural optimization is performed by using Generalized Gradient Approximation as an exchange correlation potential in Density Functional Theory (DFT) and vibrational properties are computed by using norm-conserving Martins–Troullier pseudo-potential in Density Functional Perturbation Theory (DFPT). The Quasi Harmonic Debye model is used for the investigation of thermodynamic properties in temperature range 0–1000 K in Gibbs-code. There is no imaginary phonon frequency in phonon dispersion curves of SmS, SmSe and SmTe proving the dynamical stability. SmS has the largest while SmTe has the smallest phonon band gap which somehow suggests the polar property of these materials. For all Chalcogenides, acoustic phonon

modes near the gamma point have a linear behavior. At low temperature, Cv is a function of T3 while for higher temperatures it asymptotically tends to a constant as expected.

Keywords: *density functional theory, chalcogenides, dispersion relations, phonon density of states, debye temperature, specific heat.*

8. Adrees, M., Khan, Z. S., Ali, S., Hafeez, M., Khalid, S., ur Rehman, M. Z., . . . Rizwan, M. (2020). Simultaneous mitigation of cadmium and drought stress in wheat by soil application of iron nanoparticles. *Chemosphere, 238*, 124681. doi: https://doi.org/10.1016/j.chemosphere.2019.124681. **(Muhammad Hafeez (Physics/SSC) Web of Science JCR Listed (IF: 5.778)**

   Abstract: Excess amount of cadmium (Cd) in arable soils and shortage of good quality water are the major abiotic factors affecting the crop yield which needs immediate solution to feed the increasing population worldwide. Recently, nanoparticles (NPs) are widely used in various industries including agriculture which is due to the unique properties of NPs. Among NPs, iron (Fe) NPs might be used to alleviate the abiotic stresses in crops but limited informations are available in the literature about the role of Fe-NPs in crops under metal stress. The present study was designed to highlight the efficiency of Fe-NPs on Cd accumulation in Cd and drought-stressed wheat. Wheat plants were grown in Cd-contaminated soil after the supply of different levels of Fe-NPs and two water regimes were introduced in the soil in latter growth stages of the plants. Cadmium and drought stress negatively affected the wheat photosynthesis, yield and caused oxidative stress in leaves with excess accumulation of Cd in grains and other plant tissues. The NPs improved the photosynthesis, yield, Fe concentrations and diminished the Cd concentrations in tissues. The NPs alleviated the oxidative stress in leaves and the efficiency depends on the NPs concentrations applied in the soil. The results obtained indicated that Fe-NPs may be employed aiming to get wheat grains with excess Fe and decreased Cd contents. However, field investigations with various sizes, shapes and levels of NPs are needed before final recommendations to the farmers.

   Keywords: *cadmium, water shortage, nanoparticles, iron, cereals.*

9. Hafz, N. A. M., Li, G., Li, S., **Ain, Q.,** Gao, K., Saeed, M., . . . Kamperidis, C. (2020). Enhanced laser wakefield acceleration using dual-color relativistic pulses. *Plasma Physics and Controlled Fusion, 62*(9), 1-13. doi: 10.1088/1361-6587/aba481. **(Qurat-ul-ain (Physics/SSC) Web of Science JCR Listed (IF: 2.829)**

   Abstract: In a recent article by Li *et al* (2019 *Sci. Adv.* 5. eaav7940), experimental results from a dual-color laser wakefield acceleration (LWFA) were presented. In the present paper we, primarily, focus on detailed simulation studies of such a scheme in the self-injection and ionization injection regimes, respectively. The spatiotemporally-overlapped 30 fs dual-color laser pulses are at fundamental (FL, 800 nm, 'red') and second-harmonic (SH, 400 nm, 'blue') wavelengths. They are (a) co-propagating in an under-dense plasma, (b) relativistically intense ($I > 10^{18}$ W cm^{-2}) and (c) having relatively high-energy (multi-Joule, loose focusing) and low-energy (sub-Joule, tight focusing), respectively. The basic concept of the scheme is the fact that the depletion length (L_{pd}) for a relativistic laser pulse in an under-dense plasma has an inverse quadratic dependence on the laser wavelength ($\propto 1/\lambda^2$). Here, first by using a single FL 77 TW/30 fs laser pulse to drive a LWFA, an electron beam was accelerated up to ~400 MeV from a background plasma having an electron density of 10^{19} cm^{-3}. Then, by driving the same LWFA by co-propagating 'blue' 7 TW/30 fs and 'red' 70 TW/30 fs laser pulses, the electron energy reached ~700–800 MeV (maximum). The simulations confirm that in such a dual-color LWFA scheme, the role of the SH laser pulse is post-accelerating electrons after a rapid depletion of the FL laser pulse in the plasma. Furthermore, the SH pulse assists the ionization-injection of the electrons which is an additional benefit of the dual-color LWFA scheme.

   Keywords: *dual-color laser-plasma accelerator, laser wakefield acceleration, self-injection, ionization injection, PIC simulation.*

10. Nabi, G., Kamran, M. A., Usman, Z., Majid, A., Alharbi, T., **Abdullah, A.,** . . . Shah, T.-U.-H. (2020). Substitutional site effects of Cr(II) ions on optical and magnetic properties of 1D CdS semiconductor nanoneedles for optoelectronic and spintronic applications. *Inorganic Chemistry Communications, 121*, 108224. doi: https://doi.org/10.1016/j.inoche.2020.108224. **(Ali Abdullah (Physics/SSC) Web of Science JCR Listed (IF: 1.943) (SKT Campus) Short communication**

Abstract: Spin controlled diluted magnetic semiconductors (DMSs) could bring revolution in the processing speed as well as in enhancing the storage capacity. To achieve its industrial application, several impurities have been doped from the 3d/4f into semiconductors, however, Cr has not yet been doped into CdS 1D nanostructures. Here, in the present study, we report on the Cr-doped CdS 1D nanoneedles synthesized by CVD and studied its optical and magnetic properties. The successful incorporation of Cr-ions into CdS confirmed by EDX and XRD. Along with the increase in Cr-ions concentration, first PL-peak shifted from 514.1 to 558.3 nm associated with the formation of excitonic magnetic polarons (EMPs) and the second peak centered at 993.8 nm may correspond to the aggregation of Cr-ions. For the first time, we tuned CdS emission up to ~ 482 nm covering visible spectral region up to near-infrared (NIR) region. With increasing the Cr-ions concentration up to 6.2%, saturation magnetization (Ms) was significantly enhanced from 0.614×10^{-3} Am^2/kg to 0.987×10^{-3} Am^2/kg. These findings will promote their future applications in the optoelectronic and spintronic devices.

Keywords: *Cr, CdS, DMS, Optical, Magnetic.*

11. **Hussain, T., Junaid, M.,** & Qayyum, H. A. (2020). Preparation of Ba-doped SrTiO3 photocatalyst by sol-gel method for hydrogen generation. *Chemical Physics Letters, 754*, 137741. doi: https://doi.org/10.1016/j.cplett.2020.137741. **(Tanvir Hussain, M. Junaid (Physics/SSC) Web of Science JCR Listed (IF: 2.029)**

Abstract: Increasing energy demands and its impact on the environment make it necessary to look for alternative renewable energy sources. Hydrogen is considered as energy vector but on earth, free hydrogen is not available and found in the compound state. In this study, $Ba_xSr_{1-x}TiO_3$ (x = 0.00, 0.05, 0.10 and 0.20) photocatalysts are prepared by sol-gel method for water splitting. XRD patterns showed the formation of the pure cubic structure of $SrTiO_3$. It was observed that the optical absorption of $SrTiO_3$ was increased by increasing Ba content. Solar to hydrogen conversion efficiency of $SrTiO_3$ photocatalyst were increased by increasing Ba doping.

Keywords: *renewable energy source, photocatalyst, water splitting, bandgap, optical absorption, photocurrent.*

12. Shaikh, M. N., **Qayyum, Z.,** & Antonis, P. (2020). Development of a Comprehensive Matlab/Simulink Based Model for High-Efficiency 2nd Generation Photovoltaic (PV) Modules. *Current Nanoscience, 16*(4), 568-577. doi: http://dx.doi.org/10.2174/1573413715666190130161402. **(Qayyum Zafar (Physics/SSC) Web of Science JCR Listed (IF: 1.836)**

Abstract: Background: The accurate energy yield prediction of a PV system under various environmental conditions is important for designing a high-performance PV system.

Objective: The robust and cost-effective digital simulation studies on PV systems have the advantage in comparison to studies based on measurements because they provide the opportunity for sensitivity analysis on various design parameters of the PV system.

Methods: Herein, we present the development and implementation of a generalized photovoltaic computational model using Matlab/Simulink software package. The model is based on the equivalent diode circuit approach. It is designed to simulate two ubiquitous and high performing 2nd generation photovoltaic (PV) modules constructed with Cadmium Telluride (CdTe) and Copper Indium Gallium di-Selenide (CIGS) photoactive thin films, respectively. The values of key input parameters to the simulator, i.e., parallel resistor (Rp) and series resistor (Rs) have been computed by an efficient Newton-Raphson iteration method.

Results: The output current-voltage (I-V) and power-voltage (P-V) characteristic curves of the aforementioned PV modules have been simulated by taking two input variables (ambient irradiance and temperature) into consideration. The electrical performance of both PV modules under various environmental conditions have been mathematically investigated by the solution of classical non-linear equations.

Conclusion: The developed PV model has been validated with the experimental results obtained from standard PV module datasheets provided by manufacturers. The relative error between the simulated and experimental values of various photovoltaic parameters for CdTe and CIGS PV modules at Standard Test Conditions (STC) has been observed to be below 3%.

Keywords: *2nd generation photovoltaic (PV) modules, equivalent diode circuit, photovoltaic parameters, computational modelling, Newton-Raphson iteration method, Matlab/SimulinkEER.*

School of Systems and Technology (SST)

Department of Computer Science

Research Articles

1. Javed, M. U., Javaid, N., Aldegheishem, A., Alrajeh, N., Tahir, M., & **Ramzan, M.** (2020). Scheduling Charging of Electric Vehicles in a Secured Manner by Emphasizing Cost Minimization Using Blockchain Technology and IPFS. *Sustainability, 12*(12), 5151. **(Muhammad Ramzan (Computer Science/SST) Web of Science JCR Listed (IF: 2.576)**

Abstract: In this work, Electric Vehicles (EVs) are charged using a new and improved charging mechanism called the Mobile-Vehicle-to-Vehicle (M2V) charging strategy. It is further compared with conventional Vehicle-to-Vehicle (V2V) and Grid-to-Vehicle (G2V) charging strategies. In the proposed work, the charging of vehicles is done in a Peer-to-Peer (P2P) manner; the vehicles are charged using Charging Stations (CSs) or Mobile Vehicles (MVs) in the absence of a central entity. CSs are fixed entities situated at certain locations and act as charge suppliers, whereas MVs act as prosumers, which have the capability of charging themselves and also other vehicles. In the proposed system, blockchain technology is used to tackle the issues related with existing systems, such as privacy, security, lack of trust, etc., and also to promote transparency, data immutability, and a tamper-proof nature. Moreover, to store the data related to traffic, roads, and weather conditions, a centralized entity, i.e., Transport System Information Unit (TSIU), is used. It helps in reducing the road congestion and avoids roadside accidents. In the TSIU, an Inter-Planetary File System (IPFS) is used to store the data in a secured manner after removing the data's redundancy through data filtration. Furthermore, four different types of costs are calculated mathematically, which ultimately contribute towards calculating the total charging cost. The shortest distance between a vehicle and the charging entities is calculated using the Great-Circle Distance formula. Moving on, both the time taken to traverse this shortest distance and the time to charge the vehicles are calculated using real-time data of four EVs. Location privacy is also proposed in this work to provide privacy to vehicle users. The power flow and the related energy losses for the above-mentioned charging strategies are also discussed in this work. An incentive provisioning mechanism is also proposed on the basis of timely delivery of credible messages, which further promotes users' participation. In the end, simulations are performed and results are obtained that prove the efficiency of the proposed work, as compared to conventional techniques, in minimizing the EVs' charging cost, time, and distance.

Keywords: *blockchain, M2V, IPFS, charging scheduling, great-circle distance.*

2. **Farooq, M. S., Khan, M., & Abid, A.** (2020). A framework to make charity collection transparent and auditable using blockchain technology. *Computers & Electrical Engineering, 83*, 106588. doi: https://doi.org/10.1016/j.compeleceng.2020.106588. **(Muhammad Shoaib Farooq, Misbah Khan, Adnan Abid (Computer Science/SST) SJR**

Abstract: Charity is considered as a moral obligation throughout the world, and a huge amount of money comes into circulation in the name of charity. In most of the cases, the charity collection processes are not transparent, and due to this the charitable organizations struggle to gain donors' trust and interest. This article presents a blockchain-based charity management platform that aims to provide a transparent, secure, auditable, and efficient system. The proposed platform comprehensively covers charity collection process using crypto wallets, Initial Coin Offering (ICO), economic model, and introduces CharityCoin (CC) as a digital currency. Furthermore, smart-contracts for pertinent use cases have also been provided, which include exchanging fiat currency to CC, buying and selling CC, transferring CC to organizations and individuals, and call for donations. Finally, the performance evaluation shows that proposed architecture scales well for large data size.

Keywords: *blockchain charity solution, secure charity collection, creating trust in charity processes, auditable charity process, adding transparency in charity collection, smart contract.*

3. **Tehseen, R., Farooq, M. S., & Abid, A.** (2020). Earthquake Prediction Using Expert Systems: A Systematic Mapping Study. *Sustainability, 12*(6), 1-32. **(Rabia Tehseen, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 2.576)**

Abstract: Earthquake is one of the most hazardous natural calamity. Many algorithms have been proposed for earthquake prediction using expert systems (ES). We aim to identify and compare methods, models, frameworks, and tools used to forecast earthquakes using different parameters. We have conducted a systematic mapping study based upon 70 systematically selected high quality peer reviewed research articles involving ES for earthquake prediction, published between January 2010 and January 2020.To the best of our knowledge, there is no recent study that provides a comprehensive survey of this research area. The analysis shows that most of the proposed models have attempted long term predictions about time, intensity, and location of future earthquakes. The article discusses different variants of rule-based, fuzzy, and machine learning based expert systems for earthquake prediction. Moreover, the discussion covers regional and global seismic data sets used, tools employed, to predict earth quake for different geographical regions. Bibliometric and meta-information based analysis has been performed by classifying the articles according to research type, empirical type, approach, target area, and system specific parameters. Lastly, it also presents a taxonomy of earthquake prediction approaches, and research evolution during the last decade.

Keywords: *expert systems, systematic mapping study (sms), earthquake prediction, seismic data, early-warning systems.*

4. **Manzoor, A., Hussain, M., & Mehrban, S.** (2020). Performance Analysis and Route Optimization: Redistribution between EIGRP, OSPF & BGP Routing Protocols. *Computer Standards & Interfaces, 68*, 103391. doi: https://doi.org/10.1016/j.csi.2019.103391. **(Atif Manzoor, Muzammil Hussain, Sobia Mehrban (Computer Science/SST) SJR**

Abstract: Routing is the process of data path selection of IP networks. Routers perform path selection on the basis of routing tables stored in their memory. Routing table contains IP routes for route transformation via the best path in the networks. Service providers use different routing protocols in their enterprise networks. These routing-protocols have the limitation of non-convergence in the networks. Route redistribution is the technique which overcomes this limitation. Due to this technique, service providers can get optimized communication with IP networks where multiple routing protocols are being used. This research article focuses on the performance and redistribution of different routing protocols in medium or enterprise IP networks. A simulated network model is established in GNS3 simulator. Five Cisco-7200 series routers and a switch is used in this simulated topology. All these routers are directly connected with each other via serial links. Routing protocols EIGRP, OSPF and BGP are used in this topology and then configured route redistribution on these routers. Different types of data traffic are generated and passed through the network in order to analyze network convergence, throughput

and packet delay by the use of software wire shark network analyzer and debug command. EIGRP is better in convergence and through put whereas OSPF is better in packet delay.

Keywords: *routing protocol, EIGRP, OSPF, BGP, redistribution, administrative distance, convergence, packet delay, throughput.*

5. **Farooq, M. S., Riaz, S., Abid, A.,** Umer, T., & Zikria, Y. B. (2020). Role of IoT Technology in Agriculture: A Systematic Literature Review. *Electronics, 9*(2), 319. **(Muhammad Shoaib Farooq, Shamyla Riaz, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 2.412)**

Abstract: The growing demand for food in terms of quality and quantity has increased the need for industrialization and intensification in the agriculture field. Internet of Things (IoT) is a highly promising technology that is offering many innovative solutions to modernize the agriculture sector. Research institutions and scientific groups are continuously working to deliver solutions and products using IoT to address different domains of agriculture. This paper presents a systematic literature review (SLR) by conducting a survey of IoT technologies and their current utilization in different application domains of the agriculture sector. The underlying SLR has been compiled by reviewing research articles published in well-reputed venues between 2006 and 2019. A total of 67 papers were carefully selected through a systematic process and classified accordingly. The primary objective of this systematic study is the collection of all relevant research on IoT agricultural applications, sensors/devices, communication protocols, and network types. Furthermore, it also discusses the main issues and challenges that are being investigated in the field of agriculture. Moreover, an IoT agriculture framework has been presented that contextualizes the representation of a wide range of current solutions in the field of agriculture. Similarly, country policies for IoT-based agriculture have also been presented. Lastly, open issues and challenges have been presented to provide the researchers promising future directions in the domain of IoT agriculture.

Keywords: *internet of things, agriculture, devices/sensors, agricultural applications, communication protocols.*

6. **Nadeem, M. W.,** Ghamdi, M. A. A., **Hussain, M.,** Khan, M. A., Khan, K. M., Almotiri, S. H., & Butt, S. A. (2020). Brain Tumor Analysis Empowered with Deep Learning: A Review, Taxonomy, and Future Challenges. *Brain sciences, 10*(2). **(Muhammad Waqas Nadeem, Muzammil Hussain (Computer Science/SST) Web of Science JCR Listed (IF: 3.332)**

Abstract: Deep Learning (DL) algorithms enabled computational models consist of multiple processing layers that represent data with multiple levels of abstraction. In recent years, usage of deep learning is rapidly proliferating in almost every domain, especially in medical image processing, medical image analysis, and bioinformatics. Consequently, deep learning has dramatically changed and improved the means of recognition, prediction, and diagnosis effectively in numerous areas of healthcare such as pathology, brain tumor, lung cancer, abdomen, cardiac, and retina. Considering the wide range of applications of deep learning, the objective of this article is to review major deep learning concepts pertinent to brain tumor analysis (e.g., segmentation, classification, prediction, evaluation.). A review conducted by summarizing a large number of scientific contributions to the field (i.e., deep learning in brain tumor analysis) is presented in this study. A coherent taxonomy of research landscape from the literature has also been mapped, and the major aspects of this emerging field have been discussed and analyzed. A critical discussion section to show the limitations of deep learning techniques has been included at the end to elaborate open research challenges and directions for future work in this emergent area.

Keywords: *deep learning, brain tumor, computer vision, bioinformatics, segmentation, medical images, review.*

7. **Abid, A., Ali, W., Farooq, M. S., Farooq, U., Khan, N. S.,** & Abid, K. (2020). Semi-Automatic Classification and Duplicate Detection From Human Loss News Corpus. *IEEE Access, 8*, 97737-97747. doi:

10.1109/ACCESS.2020.2995789. **(Adnan Abid, Waqas Ali, Muhammad Shoaib Farooq, Nabeel Sabir Khan (Computer Science/SST) Uzma Farooq (Software Engineering/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Automatic news repository collection systems involve a news crawler that extracts news from different news portals, subsequently, these news need to be processed to figure out the category of a news article e.g. sports, politics, showbiz etc. In this process there are two main challenges first one is to place a news article under the right category of news, while the second one is to detect a duplicate news, i.e. when the news are being extracted from multiple sources, it is highly probable to get the same news from many different portals, resulting into duplicate news; failing to which may result into inconsistent statistics obtained after pre-processing the news text. This problem becomes more pertinent when we deal with human loss news involving crime, accident etc. related news articles. As the system may count the same news many times resulting into misleading statistics. In order to address these problems, this research presents the following contributions. Firstly, a news corpus comprising of human loss news of different categories has been developed by gathering data from different sources of well-known and authentic news websites. The corpus also includes a number of duplicate news. Secondly, a comparison of different classification approaches has been conducted to empirically find out the best suitable text classifier for the categorization of different sub-categories of human loss news. Lastly, methods have been proposed and compared to detect duplicate news from the corpus by involving different pre-processing techniques and widely used similarity measures, cosine similarity, and Jaccard's coefficient. The results show that conventional text classifiers are still relevant and perform well in text classification tasks as MNB has given 89.5% accurate results. While, Jaccard coefficient exhibits much better results than Cosine similarity for duplicate news detection with different pre-processing variations with an average accuracy of 83.16%.

Keywords: *Information retrieval, news classification, news similarity, duplicate detection, security profiling.*

8. **Khan, N. S., Abid, A.,** & Abid, K. (2020). A Novel Natural Language Processing (NLP)–Based Machine Translation Model for English to Pakistan Sign Language Translation. *Cognitive Computation*, 1-18. doi: https://doi.org/10.1007/s12559-020-09731-7. **(Nabeel Sabir Khan, Adnan Abid (Computer Science/SST) SJR**

Abstract: Background/Introduction The deaf community in the world uses a gesture-based language, generally known as sign language. Every country has a different sign language; for instance, USA has American Sign Language (ASL) and UK has British Sign Language (BSL). The deaf community in Pakistan uses Pakistan Sign Language (PSL), which like other natural languages, has a vocabulary, sentence structure, and word order. Majority of the hearing community is not aware of PSL due to which there exists a huge communication gap between the two groups. Similarly, deaf persons are unable to read text written in English and Urdu. Hence, the provision of an effective translation model can support the cognitive capability of the deaf community to interpret natural language materials available on the Internet and in other useful resources. Methods This research involves exploiting natural language processing (NLP) techniques to support the deaf community by proposing a novel machine translation model that translates English sentences into equivalent Pakistan Sign Language (PSL). Though a large number of machine translation systems have been successfully implemented for natural to natural language translations, natural to sign language machine translation is a relatively new area of research. State-of-the-art works in natural to sign language translation are mostly domain specific and suffer from low accuracy scores. Major reasons are specialised language structures for sign languages, and lack of annotated corpora to facilitate development of more generalisable machine translation systems. To this end, a grammar-based machine translation model is proposed to translate sentences written in English language into equivalent PSL sentences. To the best of our knowledge, this is a first effort to translate any natural language to PSL using core NLP techniques. The proposed approach involves a structured process to investigate the linguistic structure of PSL and formulate the grammatical structure of PSL sentences. These rules are then formalised into a context-free grammar, which, in turn, can be efficiently implemented as a parsing module for translation and

validation of target PSL sentences. The whole concept is implemented as a software system, comprising the NLP pipeline and an external service to render the avatar-based video of translated words, in order to compensate the cognitive hearing deficit of deaf people. Results and Conclusion The accuracy of the proposed translation model has been evaluated manually and automatically. Quantitative results reveal a very promising Bilingual Evaluation Understudy (BLEU) score of 0.78. Subjective evaluations demonstrate that the system can compensate for the cognitive hearing deficit of end users through the system output expressed as a readily interpretable avatar. Comparative analysis shows that our proposed system works well for simple sentences but struggles to translate compound and compound complex sentences correctly, which warrants future ongoing research.

Keywords: *machine translation, natural language processing, deaf people communication, Pakistan sign language, cognition, rule-based translation.*

9. **Khawaja, I. A., Abid, A., Farooq, M. S., Shahzada, A., Farooq, U.,** & Abid, K. (2020). Ad-Hoc Collaboration Space for Distributed Cross Device Mobile Application Development. *IEEE Access, 8*, 62800-62814. doi: 10.1109/ACCESS.2020.2980319. **(Imran Abbas Khawaja, Adnan Abid, Muhammad Shoaib Farooq, Adnan Shahzada (Computer Science/SST) Uzma Farooq (Software Engineering/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: In last few years, a tremendous increase has been observed in the usage of portable electronic devices including smart phones, tablets, laptops, and wearables. These devices are produced by different manufacturers and work on different platforms. People surrounded by these devices need to interact with them during the meeting, presentation, class room and lots of other collaborative activities to share and receive information across the devices. Recent research trends lead towards better utilization of these mobile devices by connecting them together, whereas the interaction among these devices is still device centric and is dependent on expensive fixed software and hardware infrastructure. However, ad-hoc settings, where fixed infrastructure services do not exist, or may suspend the interaction across these devices, require specialized collaborative space. This research presents an architectural framework, named Ad-hoc Collaborative Space (ACS) that provides an abstraction layer by hiding the complexities of ad-hoc environment thus resulting into reduced application development time by providing the easy to use API's. The experimental evaluation based on different operating parameters shows that the proposed framework efficiently manages service registration, service discovery, synchronization, and connectivity between different devices.

Keywords: *cross-device, collaborative applications, distributed interface, wifi direct, ad-hoc network, ad-hoc collaboration space.*

10. **Obaid, I., Farooq, M. S., & Abid, A.** (2020). Gamification for Recruitment and Job Training: Model, Taxonomy, and Challenges. *IEEE Access, 8*, 65164-65178. doi: 10.1109/ACCESS.2020.2984178. **(Iqra Obaid, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: The recruitment, engagement, and training of the employees are among the core and critical roles for running an organization successfully. Gamification has been proven to be a promising tool that offers many innovative solutions for various domains. This study presents a systematic literature review (SLR) of research studies involving gamification for recruitment, engagement, and training of employees. The SLR has been synthesized by reviewing carefully selected research studies published between 2014 and 2019 in well-reputed venues. Apart from reviewing the state-of-the-art studies on gamified solutions for recruiting and job training problems, a taxonomy of gaming elements based on the context of use in different environments has also been proposed. Similarly, the gamification model to develop gamified solutions to problems has also been presented. Lastly, the research gaps in terms of open issues have been presented to provide future directions for the researchers in the area of gamified solutions for recruitment and job training.

Keywords: *gamification, recruitment, employee engagement, employee training, gaming elements.*

11. **Aziz, O., Farooq, M. S., Abid, A.,** Saher, R., & Aslam, N. (2020). Research Trends in Enterprise Service Bus (ESB) Applications: A Systematic Mapping Study. *IEEE Access, 8*, 31180-31197. doi: 10.1109/ACCESS.2020.2972195. **(Omer Aziz, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

    Abstract: In recent years, enterprise service bus (ESB) has become a favorable adoption as a technology category in the IT industry as it provides secure and guaranteed delivery of services. The elasticity of Enterprise Service Bus (ESB) enables numerous applications to exchange information makes it a significant middleware layer responsible for transferring information in a Service-Oriented Architecture (SOA). ESB is presently the utmost promising tactic for the integration of business applications in distributed and diverse environments. It also offers essential infrastructure support for transforming messages or data, intelligent routing, and protocol transformation. The idea of ESBs emerged from the requirements to move out from traditional integration patterns, that becomes difficult to manage with the passage of time. Our study aim is to understand and provide ongoing research topics, challenges and future directions concerning ESB applications. A systematic mapping study (SMS) is therefore implemented to categorize the selected papers into the following classification: contribution type, ESB applications, research type and their approaches. We have extracted a total of twenty-two papers for this systematic study and they are classified according to defined criteria. The findings of this SMS are discussed and researchers were provided with suggestions on possible directions for future research.

    Keywords: *Enterprise service bus (ESB), applications, classification, service oriented architecture (SOA), systematic mapping study (SMS), criteria.*

12. Ishaq, K., Zin, N. A. M., Rosdi, F., Abid, A., & Ali, Q. (2020). Usefulness of Mobile Assisted Language Learning in Primary Education. *(IJACSA) International Journal of Advanced Computer Science and Applications, 11*(1), 384-395. **(Adnan Abid, Qasim Ali (Computer Science/SST) SJR**

    Abstract: Literacy & Numeracy Drive (LND) is a mobile application that is used in public sector primary schools in Punjab province, Pakistan to teach students of Grade 03 on a tablet for learning languages and Mathematics. Persons designated the role of a Monitoring & Evaluation Assistant (MEA) visit every school allocated by authorities once in a month and select 07-10 students randomly to evaluate them on his own tablet by asking multiple questions related to English, Urdu and Mathematics. After the evaluation, MEA has to upload the result on the official portal for the respective school. This study aims to evaluate the effectiveness of LND for its usefulness, usability, accessibility, content, and assessments by involving students and teachers using this application in different schools. A mixedmethod study has been adopted in which 57 teachers and nearly 300 students from different locations of the district and from different schools have been selected, to measure the effectiveness of LND and evaluate the effectiveness with the help of interviews and questionnaires. The result reveals, in its current form, the LND application is not effective and needs improvement in usability, design, content, accessibility, infrastructure, and assessment. Furthermore, teachers recommend that game-based learning consists of an interactive interface, phonics, animations. As the more interactive and attractive presentation of the content and variations in the assessment may increase students' involvement and will make this application more effective and will produce good results.

    Keywords: *literacy and numeracy drive, monitoring and evaluation assistant, assessment, usability, content, design, infrastructure.*

13. **Saba, A., Adeel, A., Waqar, H., Nouman, R., & Yaser, D. K.** (2020). Identification of Lysine Carboxylation Sites in Proteins by Integrating Statistical Moments and Position Relative Features via General PseAAC. *Current Bioinformatics, 15*(5), 396-407. doi: http://dx.doi.org/10.2174/1574893614666190723114923. **(Saba Amanat,**

Adeel Ashraf, Waqar Hussain, Yaser Daanial Khan (Computer Science/SST) Nouman Rasool (Life Sciences/SSC) **Web of Science JCR Listed (IF: 2.068)**

Abstract: Carboxylation is one of the most biologically important post-translational modifications and occurs on lysine, arginine, and glutamine residues of a protein. Among all these three, the covalent attachment of the carboxyl group with the lysine side chain is the most frequent and biologically important type of carboxylation. For studying such biological functions, it is essential to correctly determine the lysine sites sensitive to carboxylation. Objective: Herein, we present a computational model for the prediction of the carboxylysine site which is based on machine learning. Methods: Various position and composition relative features have been incorporated into the PseAAC for construction of feature vectors and a neural network is employed as a classifier. The model is validated by jackknife, cross-validation, self-consistency, and independent testing. Results: The results of the self-consistency test elaborated that model has 99.76% Acc, 99.76% Sp, 99.76% Sp, and 0.99 MCC. Using the jackknife method, prediction model validation gave 97.07% Acc, while for 10-fold cross-validation, prediction model validation gave 95.16% Acc. Conclusion: The results of independent dataset testing were 94.3% which illustrated that the proposed model has better performance as compared to the existing model PreLysCar; however, the accuracy can be improved further, in the future, due to the increasing number of carboxylysine sites in proteins.

Keywords: *Carboxylation, Carboxylysine, Statistical Moments, PseAAC, 5-step rule.*

14. Alsubhi, K., **Ashraf, M. U.,** & Ilyas, I. (2020). HBLP: A Privacy Protection Framework for TIP Attributes in NTTP-Based LBS Systems. *IEEE Access, 8*, 67718-67734. doi: 10.1109/ACCESS.2020.2985659. **(Muhammad Usman Ashraf (Computer Science)** **Web of Science JCR Listed (IF: 3.745)** **(SKT Campus)**

Abstract: Nowadays, location-based services are being widely popularized due to their massive usage in current and emerging technologies. These services are based on searching out areas of interest which are likely to be accessed by users. Despite helping users worldwide, Location Based Services (LBSs) Systems endanger users' privacy because a user must provide personal information in order to use the services. Users thus become easy prey for assailants to access their social and personal lives. This problem is a giant issue for contemporary technologies because they are increasingly being used with the passage of time. Many existing solutions have attempted to resolve the challenges, but they face some serious dilemmas regarding the preservation of privacy. In order to address the privacy challenges in LBS systems, in this paper we have introduced a new Hierarchy Based Location Privacy (HBLP) model that protects the user's privacy, including the user's query time and identity and location information. The proposed model protects the user's privacy by using pseudo identity exchange, an aggregation protocol, and the concepts of Forest User (FU), Tree User (TU), and Child Users (CU) with k-anonymity and t-closeness, which is a reasonable combination for privacy provision for a user's query time, identity, and location. In order to evaluate the privacy protection level, we implemented the HBLP model in a Riverbed (Opnet) simulation and compared the results with existing state-of-the-art privacy-provisioning methods. The results showed that HBLP protected all the privacy attributes when a user interacts with an LBS system.

Keywords: *location based services, user privacy, NTTP, point of interest.*

15. Ali, B., Tayyaba, S., Ashraf, M. W., Nawaz, M. W., **Mushtaq, M. T.,** Akhlaq, M., & Wasim, M. F. (2020). Fuzzy simulation, synthesis, characterization and voltage measurements of zinc oxide nano-rods based nanogenerators. *Digest Journal of Nanomaterials & Biostructures (DJNB), 15*(2), 289-297. **(Muhammad Tahir Mushtaq (Computer Science/SST)** **Web of Science JCR Listed (IF: 0.785)**

Abstract: Harvesting the mechanical energy from environment sources such as wavy motion of plant leaves and branches could power up the low power consumption electrical devices and sensors. Such low power energy harvesting devices will replace the batteries especially at the remote areas where the replacement of batteries is very expensive or sometimes impossible. An environment friendly nano generator using ZnO nanorods can be

built easily and useful for energy generation. Although, performance of harvesting ZnO piezoelectric nanorods have gradually improved even then their power is insufficient for real devices. However, the integration of nanogenerator devices for energy harvesting into a single power source is necessary. Therefore, its simulation using MATLAB fuzzy logic and fabrication is presented in this paper with a very low error of 0.24 % which shows its excellence in performance by presenting new technique of energy generation with plant leave movement. The fabricated ZnO nano-wires on aluminum substrate connected in series and parallel were also tested and the results are closely in contrast to the stimulated results. The nano-generator shows an enhanced voltage when connected in series and a high current value when connected in parallel. The nano-generator give a voltage of 0.695 mV when connected in series and a current density of 25 nA cm-2when connected in parallel.

Keywords: *nano-rods, nano-generator, piezoelectric material, matlab, fuzzy logic controller, zinc oxide.*

16. Ahmed, S., Asim, M. M., Mehmood, N. Q., Ali, M., & **Shahzaad, B.** (2020). Implementation of Class-Based Low Latency Fair Queueing (CBLLFQ) Packet Scheduling Algorithm for HSDPA Core Network. *KSII Transactions on Internet & Information Systems, 14*(2). **(Babar Shahzaad (Computer Science/SST) Web of Science JCR Listed (IF: 0.648)**

    Abstract: To provide a guaranteed Quality of Service (QoS) to real-time traffic in High-Speed Downlink Packet Access (HSDPA) core network, we proposed an enhanced mechanism. For an enhanced QoS, a Class-Based Low Latency Fair Queueing (CBLLFQ) packet scheduling algorithm is introduced in this work. Packet classification, metering, queuing, and scheduling using differentiated services (DiffServ) environment was the points in focus. To classify different types of real-time voice and multimedia traffic, the QoS provisioning mechanisms use different DiffServ code points (DSCP).The proposed algorithm is based on traffic classes which efficiently require the guarantee of services and specified level of fairness. In CBLLFQ, a mapping criterion and an efficient queuing mechanism for voice, video and other traffic in separate queues are used. It is proved, that the algorithm enhances the throughput and fairness along with a reduction in the delay and packet loss factors for smooth and worst traffic conditions. The results calculated through simulation show that the proposed calculations meet the QoS prerequisites efficiently.

    Keywords: *Packet Classification, Marking, Scheduling, QoS and DiffServ.*

17. Ul-Amin, R., Sventek, J., Mackenzie, L., & **Abid, A.** (2020). Smart and intelligent network selection approach to support location-dependent and context-aware service migration. *Journal of Ambient Intelligence and Smart Environments, 12*, 219-237. doi: 10.3233/AIS-200559. **(Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 1.595)**

    Abstract: Vehicular networking has gained considerable interest within the research community and industry. The automotive industry is supporting the notion of pervasive connectivity by agreeing to equip vehicles with devices required for vehicular ad hoc networking. Equipped with these devices, mobile nodes in vehicular ad hoc networks (VANETs) are capable of hosting many types of applications as services for other nodes in the network. This research focuses on addressing the challenges of location-dependence, intermittent network connectivity and irregular network traffic flows in unplanned areas for VANETs to host and operate non-safety-critical VANETs services. We assume unplanned areas as the one that lack communication infrastructure and planning. Such areas observe irregular vehicular traffic on the roads as well as on the networks. This research investigates the shortcomings of location-dependence, intermittent network connectivity and irregular network traffic flows and addresses them by exploiting location-dependent service migration over an integrated network in an efficient and cost-effective manner.

    Keywords: *LDCAMS, cooperative & cost effective network selection algorithm (CACENSA), VANET deployment, VANET services, network Integration, WAVE, UMTS.*

18. **Mehrban, S., Nadeem, M. W., Hussain, M.,** Ahmed, M. M., **Hakeem, O., Abbas, F.,** . . . **Hassan, M.** (2020). Towards Secure FinTech: A Survey, Taxonomy, and Open Research Challenges. *IEEE Access, 8*, 23391-23406. doi: 10.1109/ACCESS.2020.2970430. **(Sobia Mehrban, Muhammad Waqas Nadeem, Muzammil Hussain, Owais Hakeem, Fakhar Abbas, Mujtaba Hassan (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Financial Technology (FinTech) has attracted a wide range of attention and is rapidly proliferating. As a result of its consistent growth new terms have been introduced in this domain. The term 'FinTech' is one such terminology. This term is used for describing various operations that are being frequently employed in the financial technology sector. These operations are usually practiced in enterprises or organizations and provide requested services by using Information Technology based applications. The term does take into account various other sensitive issues, like, security, privacy, threats, cyber-attacks, etc. This is important to note that the development of FinTech is indebted to the mutual integration of different state of the art technologies, for example, technologies related to a mobile embedded system, mobile networks, mobile cloud computing, big data, data analytics techniques, and cloud computing etc. However, this technology is facing several security and privacy issues that are much needed to be addressed in order to improve the acceptability of this new technology among its users. In an effort to secure FinTech, this article provides a comprehensive survey of FinTech by reviewing the most recent as well as anticipated financial industry privacy and security issues. It provides a comprehensive analysis of current security issues, detection mechanisms and security solutions proposed for FinTech. Finally, it discusses future challenges to ensure the security and privacy of financial technology applications.

Keywords: *FinTech, security, privacy, cyber security, threats, fraud detection, internet of things.*

19. Arooj, A., **Farooq, M. S.,** Umer, T., Rasool, G., & Wang, B. (2020). Cyber Physical and Social Networks in IoV (CPSN-IoV): A Multimodal Architecture in Edge-Based Networks for Optimal Route Selection Using 5G Technologies. *IEEE Access, 8*, 33609-33630. doi: 10.1109/ACCESS.2020.2973461. **(Muhammad Shoaib Farooq (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Humans are blessed with the intelligence to create links, develop semantic metaphors and models for reasoning; construct rules for decision making; and to form bounded loops for interaction, socialization and knowledge sharing. But machines are inadequate with these extraordinary abilities rather, numerous algorithms and mathematical models can be used to connect physical resources with cyberspaces to control objects and, develop cognitive learning for optimal decision making. Connected users and devices in closed virtual and physical proximity give direction towards the plethora of real-world applications for physical, social and, cyber computing. Because of the increase in social media networking and 5G communication links offer real-time crowdsourcing and sensing as a complementary base for information. Proceeding this idea, in this study we have proposed Cyber-Physical and Social Networks (CPSN) for two fundamental operations in IoV (Internet of Vehicles) as CPSN-IoV; (1) to define conceptual architecture of CPSN-IoV for data-oriented network for smart infrastructure and, (2) to create the significant virtual space where the instances of smart vehicles, devices, and things will have meaningful links with the real world objects where, CPSN-IoV will evolve, emerge, compete, and collaborate with all connected objects to strengthen the decision making process. To investigate the potential impact of our proposed study, we have simulated the taxicab trajectory data of the urban city of Portugal in OMNeT++ for the in-depth understanding of road topology, connected vehicles and things, and their traffic trends; and users' social media streams in respective edge for efficient route planning. The results of simulation demonstrate that our proposed framework has the ability to achieve human-machine intellectual association for managing the smart environment.

Keywords: *CPSN, data fusion, IoV, IoT, knowledge discovery.*

20. Naeem, M. A., **Mehmood, E.,** Malik, M. G., & Jamil, N. (2020). Optimizing Semi-Stream CACHEJOIN for Near-Real-Time Data Warehousing. *Journal of Database Management (JDM), 31*(1), 20-37. doi:10.4018/JDM.2020010102. **(Erum Mehmood (Computer Science/SST) Web of Science JCR Listed (IF: 1.138)**

Abstract: Streaming data join is a critical process in the field of near-real-time data warehousing. For this purpose, an adaptive semi-stream join algorithm called CACHEJOIN (Cache Join) focusing non-uniform stream data is provided in the literature. However, this algorithm cannot exploit the memory and CPU resources optimally and consequently it leaves its service rate suboptimal due to sequential execution of both of its phases, called stream-probing (SP) phase and disk-probing (DP) phase. By integrating the advantages of CACHEJOIN, in this paper we present two modifications in it. First is called P-CACHEJOIN (Parallel Cache Join) that enables the parallel processing of two phases in CACHEJOIN. This increases number of joined stream records and therefore improves throughput considerably. Second is called OP-CACHEJOIN (Optimized Parallel Cache Join) that implements a parallel loading of stored data into memory while the DP phase is executing. We present the performance analysis of both of our approaches with existing CACHEJOIN empirically using synthetic skewed dataset.

Keywords: *Near-real-time data warehousing, Semi-stream join, Service rate optimization.*

21. Awais, M., Ali, I., Alghamdi, T. A., **Ramzan, M.,** Tahir, M., Akbar, M., & Javaid, N. (2020). Towards Void Hole Alleviation: Enhanced GEographic and Opportunistic Routing Protocols in Harsh Underwater WSNs. *IEEE Access, 8*, 96592-96605. doi: 10.1109/ACCESS.2020.2996367. **(Muhammad Ramzan (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Internet of Things enabled Underwater Wireless Sensor Networks (IoT-UWSNs) are quite useful in monitoring different tasks including: from instrument monitoring to the climate recording and from pollution control to the prediction of natural disasters. However, there are some challenges, which affect the performance of a network, i.e., void hole occurrence, high Energy Consumption (EC) and low Packet Delivery Ratio (PDR). Therefore, in this work, two energy efficient routing protocols are proposed to maximize the PDR by minimizing the ratio of void hole occurrence. Scalability analysis of the proposed routing protocols is also performed. Additionally, feasible regions are computed to check the optimality of the proposed protocol in terms of EC. Furthermore, proposed protocols are compared with benchmark routing protocols in counterparts. Simulation results clearly show that proposed routing protocols achieved 80-81% higher PDR than GEographic and opportunistic routing with Depth Adjustment based topology control for communication Recovery (GEDAR) and Transmission Adjustment Neighbor-node Approaching Distinct Energy Efficient Mates (TA-NADEEM). Moreover, the ratio of void hole occurrence is minimized upto 30% approximately.

Keywords: *underwater wireless sensor networks, Internet of Things enabled harsh underwater WSNs, energy hole alleviation, enhanced geographic and opportunistic routing.*

22. Tariq, M. I., Memon, N. A., Ahmed, S., Tayyaba, S., **Mushtaq, M. T.,** Mian, N. A., . . . Ashraf, M. W. (2020). A Review of Deep Learning Security and Privacy Defensive Techniques. *Mobile Information Systems, 2020*, 6535834. doi: 10.1155/2020/6535834. **(Muhammad Tahir Mushtaq (Computer Science/SST) Web of Science JCR Listed (IF: 1.508)**

Abstract: In recent past years, Deep Learning presented an excellent performance in different areas like image recognition, pattern matching, and even in cybersecurity. The Deep Learning has numerous advantages including fast solving complex problems, huge automation, maximum application of unstructured data, ability to give high quality of results, reduction of high costs, no need for data labeling, and identification of complex interactions, but it also has limitations like opaqueness, computationally intensive, need for abundant data, and more complex algorithms. In our daily life, we used many applications that use Deep Learning models to make decisions based on predictions, and if Deep Learning models became the cause of misprediction due to internal/external malicious effects, it may create difficulties in our real life. Furthermore, the Deep Learning training models often

have sensitive information of the users and those models should not be vulnerable and expose security and privacy. The algorithms of Deep Learning and machine learning are still vulnerable to different types of security threats and risks. Therefore, it is necessary to call the attention of the industry in respect of security threats and related countermeasures techniques for Deep Learning, which motivated the authors to perform a comprehensive survey of Deep Learning security and privacy security challenges and countermeasures in this paper. We also discussed the open challenges and current issues.

Keywords: *not available.*

23. **Khan, Y. D., Amin, N.,** Hussain, W., Rasool, N., Khan, S. A., & Chou, K.-C. (2020). iProtease-PseAAC(2L): A two-layer predictor for identifying proteases and their types using Chou's 5-step-rule and general PseAAC. *Analytical Biochemistry, 588*, 113477. doi: https://doi.org/10.1016/j.ab.2019.113477. **(Yaser Daanial Khan, Najm Amin (Computer Science/SST) Web of Science JCR Listed (IF: 2.877)**

Abstract: Proteases are a type of enzymes, which perform the process of proteolysis. Proteolysis normally refers to protein and peptide degradation which is crucial for the survival, growth and wellbeing of a cell. Moreover, proteases have a strong association with therapeutics and drug development. The proteases are classified into five different types according to their nature and physiochemical characteristics. Mostly the methods used to differentiate protease from other proteins and identify their class requires a clinical test which is usually time-consuming and operator dependent. Herein, we report a classifier named iProtease-PseAAC (2L) for identifying proteases and their classes. The predictor is developed employing the flow of 5-step rule, initiating from the collection of benchmark dataset and terminating at the development of predictor. Rigorous verification and validation tests are performed and metrics are collected to calculate the authenticity of the trained model. The self-consistency validation gives the 98.32% accuracy, for cross-validation the accuracy is 90.71% and jackknife gives 96.07% accuracy. The average accuracy for level-2 i.e. protease classification is 95.77%. Based on the above-mentioned results, it is concluded that iProtease-PseAAC (2L) has the great ability to identify the proteases and their classes using a given protein sequence.

Keywords: *Protease, PseAAC, statistical moments, 5-step rule, prediction.*

24. **Omer, U., Muhammad Shoaib, F., & Abid, A.** (2020). Cognitive Learning Analytics Using Assessment Data and Concept Map: A Framework-Based Approach for Sustainability of Programming Courses. *Sustainability, 12*(17), 6990. doi: http://dx.doi.org/10.3390/su12176990. **(Uzma Omer, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 2.576)**

Abstract: Students of initial level programming courses generally face difficulties while learning the programming concepts. The learning analytics studies, in these courses, are mostly anecdotal on the aspect of assessment as less or no attention is given to assess learning at various cognitive levels of specific concepts. Furthermore, the existing work reflects deficiencies in examining the effect of learners' cognitive performance on subsequent stages of the course. This gap needs to be addressed by introducing more granular and methodical approaches of cognitive analysis for sustaining the programming courses effectively in computer science and associated disciplines. In this article, a framework-based approach is proposed for cognitive learning analytics on the concepts taught in initial level programming courses. The framework serves as a platform that provides structure to the concept data using the technique of concept mapping and examines learners' cognitive propagation on related concepts using assessment data. Learners' performance prediction has been examined on relatively higher-level programming concepts through the metrics established from the cognitive maps of learners, acquired by deploying the related layers of framework. Overall maximum prediction accuracy range obtained was 64.81% to 90.86%, which was better than the prediction accuracies presented in most of the related studies.

Keywords: *learning analytics, sustainability, cognition, programming, performance prediction.*

25. Manzoor, A., Ahmad, W., Ehatisham-ul-Haq, M., **Hannan, A.,** Khan, M. A., **Ashraf, M. U.,** . . . Alfakeeh, A. S. (2020). Inferring Emotion Tags from Object Images Using Convolutional Neural Network. *Applied Sciences, 10*(15), 5333. doi: http://dx.doi.org/10.3390/app10155333. **(Abdul Hannan, Muhammad Usman Ashraf (Computer Science) Web of Science JCR Listed (IF: 2.747) (SKT Campus)**

Abstract: Emotions are a fundamental part of human behavior and can be stimulated in numerous ways. In real-life, we come across different types of objects such as cake, crab, television, trees, etc., in our routine life, which may excite certain emotions. Likewise, object images that we see and share on different platforms are also capable of expressing or inducing human emotions. Inferring emotion tags from these object images has great significance as it can play a vital role in recommendation systems, image retrieval, human behavior analysis and, advertisement applications. The existing schemes for emotion tag perception are based on the visual features, like color and texture of an image, which are poorly affected by lightning conditions. The main objective of our proposed study is to address this problem by introducing a novel idea of inferring emotion tags from the images based on object-related features. In this aspect, we first created an emotion-tagged dataset from the publicly available object detection dataset (i.e., "Caltech-256") using subject evaluation from 212 users. Next, we used a convolutional neural network-based model to automatically extract the high-level features from object images for recognizing nine (09) emotion categories, such as amusement, awe, anger, boredom, contentment, disgust, excitement, fear, and sadness. Experimental results on our emotion-tagged dataset endorse the success of our proposed idea in terms of accuracy, precision, recall, specificity, and F1-score. Overall, the proposed scheme achieved an accuracy rate of approximately 85% and 79% using top-level and bottom-level emotion tagging, respectively. We also performed a gender-based analysis for inferring emotion tags and observed that male and female subjects have discernment in emotions perception concerning different object categories.

Keywords: *emotion recognition, convolutional neural network, deep learning, image emotion analysis, object categorization.*

26. **Hussain, A.,** Draz, U., Ali, T., **Tariq, S.,** Irfan, M., Glowacz, A., . . . Rahman, S. (2020). Waste Management and Prediction of Air Pollutants Using IoT and Machine Learning Approach. *Energies, 13*(15), 1-22. **(Ayaz Hussain, Saman Tariq (Computer Science) Web of Science JCR Listed (IF: 2.702) (SKT Campus)**

Abstract: Increasing waste generation has become a significant issue over the globe due to the rapid increase in urbanization and industrialization. In the literature, many issues that have a direct impact on the increase of waste and the improper disposal of waste have been investigated. Most of the existing work in the literature has focused on providing a cost-efficient solution for the monitoring of garbage collection system using the Internet of Things (IoT). Though an IoT-based solution provides the real-time monitoring of a garbage collection system, it is limited to control the spreading of overspill and bad odor blowout gasses. The poor and inadequate disposal of waste produces toxic gases, and radiation in the environment has adverse effects on human health, the greenhouse system, and global warming. While considering the importance of air pollutants, it is imperative to monitor and forecast the concentration of air pollutants in addition to the management of the waste. In this paper, we present and IoT-based smart bin using a machine and deep learning model to manage the disposal of garbage and to forecast the air pollutant present in the surrounding bin environment. The smart bin is connected to an IoT-based server, the Google Cloud Server (GCP), which performs the computation necessary for predicting the status of the bin and for forecasting air quality based on real-time data. We experimented with a traditional model (k-nearest neighbors algorithm (k-NN) and logistic reg) and a non-traditional (long short term memory (LSTM) network-based deep learning) algorithm for the creation of alert messages regarding bin status and forecasting the amount of air pollutant carbon monoxide (CO) present in the air at a specific instance. The recalls of logistic regression and k-NN algorithm is 79% and 83%, respectively, in a real-time testing environment for predicting the status of the bin. The accuracy of modified LSTM and simple LSTM models is 90% and 88%, respectively, to predict the future concentration of gases present in the air. The system resulted in a delay of 4 s in the creation and transmission of

the alert message to a sanitary worker. The system provided the real-time monitoring of garbage levels along with notifications from the alert mechanism. The proposed works provide improved accuracy by utilizing machine learning as compared to existing solutions based on simple approaches.

Keywords: *internet of Things, air monitoring, forecasting, air pollutant, smart bin, machine learning.*

27. Khan, J. A., Irfan, M., Irawan, S., Yao, F. K., Rahaman, M. S. A., Shahari, A. R., . . . **Zeb, N.** (2020). Comparison of Machine Learning Classifiers for Accurate Prediction of Real-Time Stuck Pipe Incidents. *Energies, 13*(14), 1-26. **(Nazia Zeb (Computer Science/SST) Web of Science JCR Listed (IF: 2.702)**

Abstract: Stuck pipe incidents are one of the contributors to non-productive time (NPT), where they can result in a higher well cost. This research investigates the feasibility of applying machine learning to predict events of stuck pipes during drilling operations in petroleum fields. The predictive model aims to predict the occurrence of stuck pipes so that relevant drilling operation personnel are warned to enact a mitigation plan to prevent stuck pipes. Two machine learning methodologies were studied in this research, namely, the artificial neural network (ANN) and support vector machine (SVM). A total of 268 data sets were successfully collected through data extraction for the well drilling operation. The data also consist of the parameters with which the stuck pipes occurred during the drilling operations. These drilling parameters include information such as the properties of the drilling fluid, bottom-hole assembly (BHA) specification, state of the bore-hole and operating conditions. The R programming software was used to construct both the ANN and SVM machine learning models. The prediction performance of the machine learning models was evaluated in terms of accuracy, sensitivity and specificity. Sensitivity analysis was conducted on these two machine learning models. For the ANN, two activation functions—namely, the logistic activation function and hyperbolic tangent activation function—were tested. Additionally, all the possible combinations of network structures, from [19, 1, 1, 1, 1] to [19, 10, 10, 10, 1], were tested for each activation function. For the SVM, three kernel functions—namely, linear, Radial Basis Function (RBF) and polynomial—were tested. Apart from that, SVM hyper-parameters such as the regularization factor (*C*), sigma (σ) and degree (*D*) were used in sensitivity analysis as well. The results from the sensitivity analysis demonstrate that the best ANN model managed to achieve an 88.89% accuracy, 91.89% sensitivity and 86.36% specificity, whereas the best SVM model managed to achieve an 83.95% accuracy, 86.49% sensitivity and 81.82% specificity. Upon comparison, the ANN model is the better machine learning model in this study because its accuracy, sensitivity and specificity are consistently higher than those of the best SVM model. In conclusion, judging from the promising prediction accurateness as demonstrated in the results of this study, it is suggested that stuck pipe prediction using machine learning is indeed practical.

Keywords: *artificial neural networks, drilling operation, machine learning classifiers, RBF Kernel function, stuck pipe, support vector machines, sensitivity analysis.*

28. **Tehseen, R., Farooq, M. S., & Abid, A.** (2020). Fuzzy Expert System for Earthquake Prediction in Western Himalayan Range. *Elektronika Ir Elektrotechnika*, *26*(3), 4-12. https://doi.org/10.5755/j01.eie.26.3.25744. **(Rabia Tehseen, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST) Web of Science JCR Listed (IF: 0.707)**

Abstract: Fuzzy Expert System (FES) with application to earthquake prediction has been presented to reproduce the performance of a human expert in earthquake prediction using expert systems. This research aims to predict future earthquakes having a magnitude 5.5 or greater. Previous earthquake data from 2000 to 2019 have been collected for this purpose. Since the earthquake data for the specified region have been reported on different magnitude scales, suitable relationships were determined to obtain uniform data. The uniform data have been used to calculate seismicity indicators according to the guidelines provided by Gutenberg-Richter's scale for quantitative determination of earthquake features. The relationships among these seismic indicators have been used by the human expert to set the rule base of Fuzzy expert system. These rules have been mathematically validated and tested on instrumentally recorded earthquake data. The results obtained from the proposed FES

presented 47 % accuracy in predicting future earthquakes that may occur in the 100 km radial area from 34.708 ° N, 72.5478 ° E.

Keywords: *expert system, fuzzy logic, earthquake prediction, seismic data.*

29. Alsubhi, K., **Imtiaz, Z., Raana, A., Ashraf, M. U.,** & Hayat, B. (2020). MEACC: an energy-efficient framework for smart devices using cloud computing systems. *Frontiers of Information Technology & Electronic Engineering, 21*(6), 917-930. doi: 10.1631/FITEE.1900198. **(Zuhaib Imtiaz, Ayesha Raana, Muhammad Usman Ashraf (Computer Science) Web of Science JCR Listed (IF: 1.604) (SKT Campus)**

Abstract: Rapidly increasing capacities, decreasing costs, and improvements in computational power, storage, and communication technologies have led to the development of many applications that carry increasingly large amounts of traffic on the global networking infrastructure. Smart devices lead to emerging technologies and play a vital role in rapid evolution. Smart devices have become a primary 24/7 need in today's information technology world and include a wide range of supporting processing-intensive applications. Extensive use of many applications on smart devices results in increasing complexity of mobile software applications and consumption of resources at a massive level, including smart device battery power, processor, and RAM, and hinders their normal operation. Appropriate resource utilization and energy efficiency are fundamental considerations for smart devices because limited resources are sporadic and make it more difficult for users to complete their tasks. In this study we propose the model of mobile energy augmentation using cloud computing (MEACC), a new framework to address the challenges of massive power consumption and inefficient resource utilization in smart devices. MEACC efficiently filters the applications to be executed on a smart device or offloaded to the cloud. Moreover, MEACC efficiently calculates the total execution cost on both the mobile and cloud sides including communication costs for any application to be offloaded. In addition, resources are monitored before making the decision to offload the application. MEACC is a promising model for load balancing and power consumption reduction in emerging mobile computing environments.

Keywords: *offloading, smart devices, cloud computing, mobile computing, power consumption.*

30. **Malik, H., Farooq, M. S.,** Khelifi, A., **Abid, A., Qureshi, J. N., & Hussain, M.** (2020). A Comparison of Transfer Learning Performance Versus Health Experts in Disease Diagnosis From Medical Imaging. *IEEE Access, 8*, 139367-139386. doi: 10.1109/ACCESS.2020.3004766. **(Hassaan Malik, Muhammad Shoaib Farooq, Adnan Abid, Junaid Nasir Qureshi, Muzammil Hussain (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Deep learning methods have huge success in task specific feature representation. Transfer learning algorithms are very much effective when large training data is scarce. It has been significantly used for diagnosis of diseases in medical imaging. This article presents a systematic literature review (SLR) by conducting a comparison of a variety of transfer learning approaches with healthcare experts in diagnosing diseases from medical imaging. This study has been compiled by reviewing research studies published in renowned venues between 2014 and 2019. Moreover, the data for the diagnosis performed by health care experts has also been acquired to perform a detailed comparative analysis for a wide range of diseases. The analysis has been performed on the basis of diseases, transfer learning approaches, type of medical imaging used. The comparative analysis is based on performance indices reported in studies which include diagnostic accuracy, true-positive (TP), false-positive (FP), true-negative (TN), false-negative (FN) sensitivity, specificity, and the area under the receiver operating characteristic curve (AUROC). A total of5,188articles were identified out of which 63 studies were included. Among them 21 research studies contain sufficient data to construct the evaluation tables that enable process of test accuracy of transfer learning having sensitivity ranged from 71% to 100% (mean 85.25%) and specificity ranged from 64% to 100% (mean 81.92%). Furthermore, health experts having sensitivity ranged from 33% to 100% (mean 85.27%) and specificity ranged from 82% to 100% (mean 91.63%).This SLR found that diagnostic accuracy of transfer learning is approximately equivalent to the diagnosis of health experts. The results

also revealed that convolutional neural networks (CNN) have been extensively used for disease diagnosis from medical imaging. Finally, inappropriate exposure of diseases in transfer learning studies restricts reliable elucidation of the outcomes of diagnostic accuracy.

Keywords: *transfer learning, heath experts, disease, medical imaging, SLR.*

31. Vistro, D. M., **Attique-Ur-Rehman, Farooq, M. S., Abid, A.,** Idrees, M. (2020). Bayesian Net Password Strength Checker for Security Analysis of Cloud-based Application. *Journal of Advanced Research in Dynamical and Control Systems,* 12(7), 1599-1602. doi: 10.5373/JARDCS/V12SP7/20202263. **(Attique-Ur-Rehman, Muhammad Shoaib Farooq, Adnan Abid (Computer Science/SST)** SJR

Abstract: Cloud computing plays an important role in modern world automation and digitalization. On one hand, now a days where people are able to perform their different kind of computing tasks with just one click, on the other hand they face a lot of security threats as the cyber criminals are also busy and active for 24 hours on cloud-based system for different purposes. So, the password is the main significant key which provides base to secure oneself from evil eyes while performing the cloud-based activities. The proposed approach of this article is BNPSC (Bayesian Net Password strength checker), the AI based method is used to compute the complexity of password. For this purpose, the Bayesian net machine learning algorithm is used. The independent set test accuracy of proposed model is 100% and trained accuracy of proposed model is 99%. For simulation and results the dataset is taken from Kaggle.

Keywords: *AI, Cloud, Cloud Computing, Cloud Security, Password Complexity.*

32. Vistro, D. M., **Attique-Ur-Rehman, Abid, A., Farooq, M. S.,** Idrees, M. (2020). Iot based big data analytics for cloud storage using edge computing. *Journal of Advanced Research in Dynamical and Control Systems,* 12(7), 1594-1598. doi: 10.5373/JARDCS/V12SP7/20202262. **(Attique-Ur-Rehman, Adnan Abid, Muhammad Shoaib Farooq (Computer Science/SST)** SJR

Abstract: Deep Learning which is enhanced from machine learning is now associated with different applications have been provided its best to people and worked much better in the benefit of people. IoT (Internet of things) based smart devices like IoV (Internet of vehicles), sensors and cloud computing which are using deep learning algorithms needs efficient data storage and fast data transfer rate. However, we have seen that the techniques like edge computing which provides many benefits not used to cloud platform. Cloud computing using Big-data analytics needs fast data transmission. Due to this reason high performance, Iot based devices, which needs huge data after every millisecond becomes slower and not able to give high performance. To tackle these issues edge computing will help us to increase the performance of different devices.

Keywords: *big-data analytics, cloud computing, deep learning, edge computing, internet of things, internet of vehicles, mobile computing, sensors.*

33. **Mehmood, E., Abid, A., Farooq, M. S.,** & Nawaz, N. A. (2020). Curriculum, Teaching and Learning, and Assessments for Introductory Programming Course. *IEEE Access, 8*, 125961-125981. doi: 10.1109/ACCESS.2020.3008321. **(Erum Mehmood, Adnan Abid, Muhammad Shoaib Farooq (Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Learning to program involves acquisition of various skills including problem solving, fundamental design techniques as well as critical thinking. Generally, most of the novice programmers struggle to develop all these important skill. The research community has addressed the problem in many different ways while involving improvisations in curriculum, pedagogical methods, cognitive aspects, supporting tools, and in designing assessments. This research aims to analyze and synthesize the existing literature in the aforementioned areas. Research articles pertaining to the area of Introductory Programming Courses (IPC) have been found using appropriate search queries, while nearly 60 research articles, published in last ten years, have been carefully

selected by employing a systematic filtering process. The scope of this work only covers the research conducted for IPC in higher education. Main findings of this study show that "solution proposal" and "evaluation research" have been reported as two main research types adopted by these studies. Moreover, pedagogy, language choice and students' performance analysis are the most frequently addressed aspects of IPC; whereas, curriculum contents, assessment design, and teaching/learning through tools have appeared as less addressed aspects of IPC. Furthermore, a taxonomy of IPC has been presented based on the studied literature. Lastly, general considerations and future research directions have been presented for the practitioners and researchers in this area.

Keywords: *Introductory programming, higher education, programming education curriculum, language choice, systematic review.*

34. Ishaq, K. M., Azan, N., Rosdi, F., **Abid, A., & Ali, Q.** (2020). Usability of Mobile Assisted Language Learning App. *International Journal of Advanced Computer Science and Applications,* 11(1). 354-363. **(Adnan Abid, Qasim Ali (Computer Science/SST)** SJR

Abstract: The aim of this study is to evaluate the usability of Mobile Assisted Language Learning i.e. Literacy and Numeracy Drive (LND) which is smartphone application to learn language and mathematics in public sector primary schools of Punjab, the biggest province of Pakistan. In this study, usability tests were conducted which included surveys of questionnaires from teachers and students. The user experience, reliability, and performance of mobile application assessed, along with user satisfaction. The LND mobile application has not been found to be successful, with a poor user interface and requires improvement. The "Using Experience," "Ease of Use" and "Usefulness" variables have been the lowest scorers in terms of user experience. Mobile device specifications were not simple and confusing; the services provided by the LND were not appealing and effective for students or teachers. This research suggested several improvements in the usability and functionality of this LND application based on assessed user experience. Many schools have chosen to use mobile apps for the teaching and evaluation of language at school. The use of mobile-assisted learning at public sector schools in Punjab, invites us to gauge the usability and effectiveness of this approach at such a huge scale which will make it more effective.

Keywords: *Literacy and numeracy drive, usability, user experience, mobile app, assessment, public school.*

35. Ishaq, K., Rosdi, F., Zin, N. A. M., & **Abid, A.** (2020). Usability and Design Issues of Mobile Assisted Language Learning Application. *(IJACSA) International Journal of Advanced Computer Science and Applications,* 11(6). 86-94. **(Adnan Abid (Computer Science/SST)** SJR

Abstract: This paper aims to look at teachers, government officials, and students for Literacy & Numeracy Drive (LND), a smartphone app for students in Punjab province, Pakistan, to teach languages and math. Furthermore, to recognize LND usability and design problems while its use for grade three in schools. As the usability and design issues of LND were not discussed since the launch of this application. The methodology for this study is the questionnaire for teachers and semi-structured interviews for government officials of District Sheikhupura and students. The result shows that LND has various usability and design problems in its current form, i.e., buttons, icons, color schemes, sluggish performance, and fonts. Besides, teachers, government officials, and students suggested that game-based learning consists of an interactive interface, phonics, key animations to be created and adopted. Highly engaging and appealing delivery of the curriculum and improvements in the appraisal will improve the participation of students and deliver better outcomes.

Keywords: *educational technology, language learning, literacy and numeracy drive, mobile application (app), m-learning, usability, user interface design.*

36. **Naeem, A., Farooq, M. S.,** Khelifi, A., & **Abid, A.** (2020). Malignant Melanoma Classification Using Deep Learning: Datasets, Performance Measurements, Challenges and Opportunities. *IEEE Access, 8*, 110575-110597. doi: 10.1109/ACCESS.2020.3001507. **(Ahmad Naeem, Muhammad Shoaib Farooq, Adnan Abid(Computer Science/SST)** Web of Science JCR Listed (IF: 3.745)

Abstract: Melanoma remains the most harmful form of skin cancer. Convolutional neural network (CNN) based classifiers have become the best choice for melanoma detection in the recent era. The research has indicated that classifiers based on CNN classify skin cancer images equivalent to dermatologists, which has allowed a quick and life-saving diagnosis. This study provides a systematic literature review of the latest research on melanoma classification using CNN. We restrict our study to the binary classification of melanoma. In particular, this research discusses the CNN classifiers and compares the accuracies of these classifiers when tested on non-published datasets. We conducted a systematic review of existing literature, identifying the literature through a systematic search of the IEEE, Medline, ACM, Springer, Elsevier, and Wiley databases. A total of 5112 studies were identified out of which 55 well-reputed studies were selected. The main objective of this study is to collect state of the art research which identify the recent research trends, challenges and opportunities for melanoma diagnosis and investigate the existing solutions for the diagnosis of melanoma detection using deep learning. Moreover, proposed taxonomy for melanoma detection has been presented that summarizes the broad variety of existing melanoma detection solutions. Lastly, proposed model, challenges and opportunities have been presented which helps the researchers in the domain of melanoma detection.

Keywords: *deep learning, CNN, skin cancer, melanoma, detection, diagnosis.*

37. **Attique, M., Farooq, M. S.,** Khelifi, A., & **Abid, A.** (2020). Prediction of Therapeutic Peptides Using Machine Learning: Computational Models, Datasets, and Feature Encodings. *IEEE Access, 8*, 148570-148594. doi: 10.1109/ACCESS.2020.3015792**. (Muhammad Attique, Muhammad Shoaib Farooq, Adnan Abid(Computer Science/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Peptides, short-chained amino acids, have shown great potentials toward the investigation and evolution of novel medications for treatment or therapy. The wet-lab based discovery of potential therapeutic peptides and eventually drug development is a hard and time-consuming process. The computational prediction using machine learning (ML) methods can expedite and facilitate the discovery process of potential prospects with therapeutic effects. ML approaches have been practiced favorably and extensively within the area of proteins, DNA, and RNA to discover the hidden features and functional activities, moreover, recently been utilized for functional discovery of peptides for various therapeutics. In this paper, a systematic literature review (SLR) has been presented to recognize the data-sources, ML classifiers, and encoding schemes being utilized in the state-of-the-art computational models to predict therapeutic peptides. To conduct the SLR, fourty-one research articles have been selected carefully based on well-defined selection criteria. To the best of our knowledge, there is no such SLR available that provides a comprehensive review in this domain. In this article, we have proposed a taxonomy based on identified feature encodings, which may offer relational understandings to researchers. Similarly, the framework model for the computational prediction of the therapeutic peptides has been introduced to characterize the best practices and levels involved in the development of peptide prediction models. Lastly, common issues and challenges have been discussed to facilitate the researchers with encouraging future directions in the field of computational prediction of therapeutic peptides.

Keywords: *anti-angiogenic, anti-cancer, anti-inflammatory, anti-microbial, feature extraction, encodings, machine learning, peptide therapeutics.*

38. **Ashraf, M. U.,** Jambi, K. M., Arshad, A., Aslam, R., & Ilyas, I. (2020). M2C: A Massive Performance and Energy Throttling Framework for High-Performance Computing Systems. *(IJACSA) International Journal of Advanced Computer Science and Applications,* 11(7). 529-541. **(Muhammad Usman Ashraf (Computer Science) SJR (SKT Campus)**

Abstract: At the Petascale level of performance, HighPerformance Computing (HPC) systems require significant use of supercomputers with the extensive parallel programming approaches to solve the complicated computational tasks. The Exascale level of performance having 1018 calculations per second is another

remarkable achievement in computing with a fathomless influence on everyday life. The current technologies are facing various challenges while achieving ExaFlop performance through energy-efficient systems. Massive parallelism and power consumption are vital challenges for achieving ExaFlop performance. In this paper, we have introduced a novel parallel programming model that provides massive performance under power consumption limitations by parallelizing data on the heterogeneous system to provide coarse grain and fine-grain parallelism. The proposed dual-hierarchical architecture is a hybrid of MVAPICH2 and CUDA, called the M2C model, for heterogeneous systems that utilize both CPU and GPU devices for providing massive parallelism. To validate the objectives of the current study, the proposed model has been implemented using bench-marking applications including linear Dense Matrix Multiplication. Furthermore, we conducted a comparative analysis of the proposed model by existing state-ofthe-art models and libraries such as MOC, kBLAS, and cuBLAS. The suggested model outperforms existing models while achieving massive performance in HPC clusters and can be considered for emerging Exascale computing systems.

Keywords: *high performance computing, exascale computing, compute unified device architecture.*

39. **Ashraf, M. U.,** Jambi, K. M., Qayyum, R., Ejaz, H., & Ilyas, I. (2020). IDP: A privacy provisioning framework for TIP attributes in trusted third party-based location-based services systems. *(IJACSA) International Journal of Advanced Computer Science and Applications,* 11(7). 604-617. **(Muhammad Usman Ashraf (Computer Science) SJR (SKT Campus)**

Abstract: Location-Based Services (LBS) System is rapidly growing due to radio communication services with wireless mobile devices having a positioning component in it. LBS System offers location-based services by knowing the actual user position. A mobile user uses LBS to access services relevant to their locations. In order to provide Point of Interest (POI), LBS confronts numerous privacy related challenges in three different formats including Non-Trusted Third Party (NTTP), Trusted Third Party (TTP), and Mobile Peer-to-Peer (P2P). The current study emphasized the TTP based LBS system where the Location server does not provide full privacy to mobile users. In TTP based LBS system, a user's privacy is concerned with personal identity, location information, and time information. In order to accomplish privacy under these concerns, state-of-the-art existing mechanisms have been reviewed. Hence, the aim to provide a promising roadmap to research and development communities for the right selection of privacy approach has achieved by conducting a comparative survey of the TTP based approaches. Leading to these privacy attributes, the current study addressed the privacy challenge by proposing a new privacy protection model named "Improved Dummy Position" (IDP) that protects TIP (Time, Identity, and Position) attributes under TTP LBS System. In order to validate the privacy level, a comparative analysis has been conducted by implementing the proposed IDP model in the simulation tool, Riverbed Modeler academic edition. The different scenarios of changing query transferring rate evaluate the performance of the proposed model. Simulation results demonstrate that our IDP could be considered as a promising model to protect user's TIP attributes in a TTP based LBS system due to better performance and improved privacy level. Further, the proposed model extensively compared with the existing work.

Keywords: *Location Based Services (LBS), Trusted Third Party (TTP), privacy protection goals, mobile user privacy, Improved Dummy Position (IDP), Sybil Query.*

40. **Tariq, S.,** Ahmad, N., **Ashraf, M. U.,** Alghamdi, A. M., & Alfakeeh, A. S. (2020). Measuring the Impact of Scope Changes on Project Plan Using EVM. *IEEE Access, 8*, 154589-154613. doi: 10.1109/ACCESS.2020.3018169. **(Saman Tariq, Muhammad Usman Ashraf (Computer Science) Web of Science JCR Listed (IF: 3.745) (SKT Campus)**

Abstract: Earned Value Management (EVM) measures project performance against a baseline plan. It identifies deviations in budget and schedule, aids project managers in taking earlier corrective actions against cost and schedule overruns. Although the literature highlights the significance of scope by adopting it as a leading indicator to measure project success or failure. However, EVM does not include scope when evaluating the performance

of any software project. While considering the importance of scope and its ever-changing nature, it is imperative to measure the effect of changes in scope on the project plan. To analyse such effects, this study aims to enhance the traditional EVM by incorporating scope into it. The main objectives of this paper are: i) to extract the effects of project scope changes, ii) to map extracted effects of project scope changes with Software Project Scope Rating Index (SPSRI) elements, and iii) to quantify the extracted effects and integrate them with EVM. An extensive literature review is conducted to achieve the first objective, which results in the seventeen unique effects; that were used to map with SPSRI elements. To forecast the variations in scope for a given project budget, Monte Carlo simulations were run on the top eight scope elements, whereas, the results were incorporated with EVM to identify the deviations between actual and projected values of scope's score and cost. Finally, the multivariate regression model was used to evaluate the influence of individual element on the overall estimated cost of the project. The correlation between the independent variables (SPSRI elements) and the dependent variable (overall cost) was calculated along with the valuation of each independent variable on the dependent variable. Moreover, the effects are statistically shown that independent variables have influenced the dependent variable. This technique could assist the project managers to forecast deviations in project scope earlier.

Keywords: *earned value management, project monitoring and controlling, software project scope rating index, monte carlo simulations.*

41. **Khalid, H., Hussain, M.,** Al Ghamdi, M. A., Khalid, T., Khalid, K., **Fatima, K., Farooq, M. S.,** . . . Ahmed, A. (2020). A Comparative Systematic Literature Review on Knee Bone Reports from MRI, X-rays and CT Scans Using Deep Learning and Machine Learning Methodologies. *Diagnostics (Basel, Switzerland), 10*(8). doi:10.3390/diagnostics10080518. **(Hafsa Khalid, Muzammil Hussain, Kalsoom Fatima, Muhammad Shoaib Farooq(Computer Science/SST) Web of Science JCR Listed (IF: 3.110)**

Abstract: The purpose of this research was to provide a "systematic literature review" of knee bone reports that are obtained by MRI, CT scans, and X-rays by using deep learning and machine learning techniques by comparing different approaches—to perform a comprehensive study on the deep learning and machine learning methodologies to diagnose knee bone diseases by detecting symptoms from X-ray, CT scan, and MRI images. This study will help those researchers who want to conduct research in the knee bone field. A comparative systematic literature review was conducted for the accomplishment of our work. A total of 32 papers were reviewed in this research. Six papers consist of X-rays of knee bone with deep learning methodologies, five papers cover the MRI of knee bone using deep learning approaches, and another five papers cover CT scans of knee bone with deep learning techniques. Another 16 papers cover the machine learning techniques for evaluating CT scans, X-rays, and MRIs of knee bone. This research compares the deep learning methodologies for CT scan, MRI, and X-ray reports on knee bone, comparing the accuracy of each technique, which can be used for future development. In the future, this research will be enhanced by comparing X-ray, CT-scan, and MRI reports of knee bone with information retrieval and big data techniques. The results show that deep learning techniques are best for X-ray, MRI, and CT scan images of the knee bone to diagnose diseases.

Keywords: *magnetic resonance imaging (MRI), computed tomography (CT scan), electromagnetic radiation (X-ray), trabecular bone (TB).*

Conference Proceedings

1. **Khan, A. H.,** Haroon, M., Altaf, O., **Awan, S. M.,** & Asghar, A. (2020). *Sentimental Content Analysis and Prediction of Text.* Paper presented at the Second International Conference, INTAP 2019 Bahawalpur, Pakistan, November 6–8, 2019, Springer, Singapore. **(Ali Haider Khan, Shahid Mehmood Awan (Computer Science/SST) SJR**

Abstract: In the advancement of technology, the web era revolutionized mankind life; huge amounts of data are available on the internet in the form of articles and blogs. From this huge volume of data opinion mining is an important for extracting the raw data to become useful information. Sentiment analysis provides categorization

in opinion mining as positive or negative class for content analysis. English language is considered as a universal language and used almost every part of the word, so classification of opinion is important to get the end meaning of the word phrase and comments. No literature is available for classification of sub opinion in the text mining. SAP of Text through Machine Learning algorithm (KNN) is a three-step technique of opinion mining. In this study, authors have put articles at first removing stop-words, tokenizing the sentence and revamping the tokens, it will calculate the polarity of the sentence, paragraph and text through contributing weighted words by keeping sentiment shifters and intensity clauses in consideration. Secondly, over polarization of sentence is adjusted. Finally, overall trend of the input text on the basis of tokenization and polarization of sentence is predicted with proposed algorithm and compared with KNN. Furthermore, domain specific analysis is a distinct feature of the proposed model where data can be updated according to the required domain to ensure the optimal level of efficiency.

Keywords: *machine learning, opinion mining, polarity, sentiment analysis and training data.*

2. Samuel, O., Javaid, N., Shehzad, F., Iftikhar, M. S., Iftikhar, M. Z., Farooq, H., & **Ramzan, M.** (2020). *Electric Vehicles Privacy Preserving Using Blockchain in Smart Community.* Paper presented at the Broad-Band Wireless Computing, Communication and Applications. BWCCA 2019. Lecture Notes in Networks and Systems, vol 97. Springer, Cham. https://doi.org/10.1007/978-3-030-33506-9_7. **(Muhammad Ramzan (Computer Science/SST) SJR**

Abstract: During the process of charging, electric vehicle's location is usually revealed when making payment. This brings about the potential risk to privacy of electric vehicle. We observe that the trade information recorded on blockchain may raise privacy concern and therefore, we propose a blockchain oriented approach to resolve the privacy issue without restricting trading activities through (ϵ,δ)(ϵ,δ)-differential privacy. The proposed scheme does not only preserve the electric vehicle's location; however, prevents semantic, linking and data mining based attacks. Simulation results show that as the privacy level increases, the risk revealing decreases as well.

Keywords: *Blockchain, Demand side management, Electric vehicle, Energy trading and privacy preserving.*

Department of Software Engineering

Research Articles

1. **Mehmood, E., & Anees, T.** (2020). Challenges and Solutions for Processing Real-Time Big Data Stream: A Systematic Literature Review. *IEEE Access, 8*, 119123-119143. doi: 10.1109/ACCESS.2020.3005268**. (Erum Mehmood, Tayyaba Anees (Software Engineering/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: Contribution: Recently, real-time data warehousing (DWH) and big data streaming have become ubiquitous due to the fact that a number of business organizations are gearing up to gain competitive advantage. The capability of organizing big data in efficient manner to reach a business decision empowers data warehousing in terms of real-time stream processing. A systematic literature review for real-time stream processing systems is presented in this paper which rigorously look at the recent developments and challenges of real-time stream processing systems and can serve as a guide for the implementation of real-time stream processing framework for all shapes of data streams. Background: Published surveys and reviews either cover papers focusing on stream analysis in applications other than real-time DWH or focusing on extraction, transformation, loading (ETL) challenges for traditional DWH. This systematic review attempts to answer four specific research questions. Research Questions: 1)Which are the relevant publication channels for real-time stream processing research? 2) Which challenges have been faced during implementation of real-time stream processing? 3) Which approaches/tools have been reported to address challenges introduced at ETL stage while processing real-time stream for real-time DWH? 4) What evidence have been reported while addressing different challenges for processing real-time stream? Methodology: A systematic literature was conducted to compile studies related to

publication channels targeting real-time stream processing/joins challenges and developments. Following a formal protocol, semi-automatic and manual searches were performed for work from 2011 to 2020 excluding research in traditional data warehousing. Of 679,547 papers selected for data extraction, 74 were retained after quality assessment. Findings: This systematic literature highlights implementation challenges along with developed approaches for real-time DWH and big data stream processing systems and provides their comparisons. This study found that there exists various algorithms for implementing real-time join processing at ETL stage for structured data whereas less work for un-structured data is found in this subject matter.

Keywords: *Real-time stream processing, big data streaming, structured/un-structured data, ETL, systematic literature review.*

Conference Proceedings

1. Adil, M., Khan, R., & **Ghani, M. A. N. U.** (2020, 17-19 Feb. 2020). *Preventive Techniques of Phishing Attacks in Networks.* Paper presented at the 2020 3rd International Conference on Advancements in Computational Sciences (ICACS). **(M. Ahmad Nawaz Ul Ghani (Software Engineering/SST)** **SJR**

   Abstract: —Internet is the most widely used technology in the current era of information technology and it is embedded in daily life activities. Due to its extensive use in everyday life, it has many applications such as social media (Face book, WhatsApp, messenger etc.,) and other online applications such as online businesses, e-counseling, advertisement on websites, e-banking, e-hunting websites, e-doctor appointment and e-doctor opinion. The above mentioned applications of internet technology makes things very easy and accessible for human being in limited time, however, this technology is vulnerable to various security threats. A vital and severe threat associated with this technology or a particular application is "Phishing attack" which is used by attacker to usurp the network security. Phishing attacks includes fake E-mails, fake websites, fake applications which are used to steal their credentials or usurp their security. In this paper, a detailed overview of various phishing attacks, specifically their background knowledge, and solutions proposed in literature to address these issues using various techniques such as antiphishing, honey pots and firewalls etc . Moreover, installation of intrusion detection systems (IDS) and intrusion detection and prevention system (IPS) in the networks to allow the authentic traffic in an operational network. In this work, we have conducted end use awareness campaign to educate and train the employs in order to minimize the occurrence probability of these attacks. The result analysis observed for this survey was quite excellent by means of its effectiveness to address the aforementioned issues.

   Keywords: *network security, information security, malware, phishing, spam, social engineering, and machine learning, anti-phishing.*

Department of Informatics and Systems

Research Articles

1. Mustahsan, M., Younas, H. M., **Iqbal, S.,** Rathore, S., Nisar, K. S., & Singh, J. (2020). An Efficient Analytical Technique for Time-Fractional Parabolic Partial Differential Equations. *Frontiers in Physics, 8*(131). doi: 10.3389/fphy.2020.00131. **(Shaukat Iqbal (INFS/SST)** **Web of Science JCR Listed (IF: 2.638)**

   Abstract: In this work, we examine time-fractional fourth-order parabolic partial differential equations with the aid of the optimal homotopy asymptotic method (OHAM). The 2nd order approximate results obtained by using the suggested scheme are compared with the exact solution. It has been noted that the results achieved via OHAM have a large convergence rate for the problems. The solutions are graphically analyzed, and the relative errors are presented in tabular form.

   Keywords: *approximate solutions, fractional calculus, TFPPDE, OHAM, convergence.*

2. Naz, T., Akhtar, M., **Shahzad, S. K.,** Fasli, M., Iqbal, M. W., & Naqvi, M. R. (2020). Ontology-driven advanced drug-drug interaction. *Computers & Electrical Engineering, 86*, 106695. doi: https://doi.org/10.1016/j.compeleceng.2020.106695. **(Syed Khuram Shahzad(INFS/SST) Web of Science JCR Listed (IF: 2.663)**

   Abstract: The rapid growth of data in the pharmaceutical area has created new challenges for large-scale data mining like Drug-Drug Interaction (DDI) analysis. To meet these challenges, various types of data related to DDI must be integrated with true semantics. However, the existing tools do not provide automated DDI analysis. Interaction details are not machine readable and pharmacists need to do further processing for its extraction. This research paper proposed an ontology-driven Advanced Drug-Drug Interaction (ADDI) system to assists the physicians and pharmacists to identify the DDI effects. ADDI provides ontological definitions and semantic relations among diseases, drugs, ingredients, action mechanism, physiologic effect, dosage formation, administration methods, DDI mechanism, DDI types (Antagonism, Synergism, Potentiation, and Interaction with metabolism), DDI reactions, their frequency and duration. It can be used as Semantic Information Layer (SIL) to resolve the heterogeneity problem and can play a significant role to remove the barriers for semantic interoperability.

   Keywords: *drug-drug interaction, pharmacy semantics, drug ontologies, pharmaceutical informatics.*

3. Ahmad, A., Jin, Y., Zhu, C., **Javed, I.,** Waqar Akram, M., & Buttar, N. A. (2020). Support vector machine based prediction of photovoltaic module and power station parameters. *International Journal of Green Energy, 17*(3), 219-232. doi: 10.1080/15435075.2020.1722131. **(Iqra Javed (INFS/SST) Web of Science JCR Listed (IF: 1.388)**

   Abstract: The uncertainty in the output power of the photovoltaic (PV) power generation station due to variation in meteorological parameters is of serious concern. An accurate output power prediction of a PV system helps in better design and planning. The present study is carried out for the prediction of output power of PV generating station by using Support Vector Machines. Two cases are considered in the present study for prediction. Case-I deals with the prediction of PV module parameters such as V oc ,I sh ,R s ,R sh ,I max ,V max ,P max , and case-II deals with the prediction of power generation parameters such as P DC, P AC , and system efficiency. Historical data of PV power station with an installed capacity of 10 MW and weather information are used as input to develop four different seasons-based SVM models for all parameters. The performance results of the models are presented in terms of Mean Relative Error (MRE) and Root Mean Square Error (RMSE). Additionally, the performance results obtained with polynomial and Radial Based Function kernel are also compared to show that which kernel has better prediction accuracy, and practicability. The result shows that the minimum average RMSE and MRE for case-I with Radial Based Function kernel are 0.034%, 0.055%, 0.002%, 1.726%, 0.044%, 0.047%, 2.342%, and 0.005%, 0.014%, 0.079%, 0.885%, 0.005%, 0.007%, 0.013%, and for case-II with poly kernel are 0.014%, 0.016%, 0.149% and 0.011%, 0.0175, 1.03%, respectively. The present study will be helpful to provide technical guidance to the prediction of the PV power System.

   Keywords: *photovoltaic system, power prediction, seasonal classification, support vector machine, support vector regression.*

4. Ahmad, A., Jin, Y., Zhu, C., **Javed, I.,** & Waqar Akram, M. (2020). Investigating tension in overhead high voltage power transmission line using finite element method. *International Journal of Electrical Power & Energy Systems, 114*, 105418. doi: https://doi.org/10.1016/j.ijepes.2019.105418. **(Iqra Javed (INFS/SST) Web of Science JCR Listed (IF: 3.588)**

   Abstract: Transmission line failure is a serious problem in developing countries. The major cause of high voltage overhead transmission line failure in power system is prolonged excessive current. The determination of line segments where high tension is generated due to prolonged excessive current under the different arrangements

of line spacing and current carrying conditions can lead us to analyze high tension zones for efficient design of transmission lines. In this context, the mechanical tension on an overhead high voltage electrical power transmission line resulting from excessive or normal currents was computed using Finite Element Method. Multiple segments of a long transmission line with symmetrical and unsymmetrical spacing under accidental and normal line current are examined. Therein, the line segments with high tension are determined. Maximum integrated tension is found in middle segments of both symmetrical and unsymmetrical spaced transmission line. While, maximum per unit tension is found in initial and bottom segments. However, variation in magnitude is found for symmetrical and unsymmetrical spacing. The present study may provide technical guidance to the transmission line design engineers and technicians regarding the risk and solutions related to electrical power transmission line systems.

Keywords: *finite element method, power transmission linetension, symmetrical spacing, unsymmetrical spacing, accidental current.*

5. **Zahid, A. H.,** Al-Solami, E., & Ahmad, M. (2020). A Novel Modular Approach Based Substitution-Box Design for Image Encryption. *IEEE Access, 8*, 150326-150340. doi: 10.1109/ACCESS.2020.3016401. **(Amjad Hussain Zahid (INFS/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: In modern-day block ciphers, the role of substitution-boxes is to transform the plaintext data nonlinearly to generate ciphertext data with sufficient confusion. It has been well-confirmed that the robustness and security of such block ciphers heavily based on the cryptographic strength of the underlying substitution-boxes. Reason being, they are the only components that are held responsible to bring required nonlinearity and complexity into the security system which can frustrate the attackers. Accordingly, a number of different concepts have been explored to construct strong S-boxes. To move forward with the same aim, a novel simple modular approach, the very first time, is investigated to construct nonlinear S-box in this paper. The proposed new modular approach consists of three operations such as new transformation, modular inverses, and permutation. A number of highly nonlinear S-boxes can be easily constructed with slight changes in the novel transformation parameters. An example S-box is presented whose critical performance assessment against some benchmarking criterions such as high nonlinearity, absence of fixed points, fulfillment of SAC and BIC properties, low differential uniformity and linear approximation probability and comparison with recent S-boxes demonstrate its upright cryptographic potentiality. In addition, an image encryption algorithm is also proposed wherein the generated S-box is applied to perform the pixels shuffling and substitution for strong statistical and differential encryption performance.

Keywords: *Substitution-box, modular approach,linear transformation,image encryption,block cipher.*

6. Gul, M., Kalam, M. A., Mujtaba, M. A., Alam, S., Bashir, M. N., **Javed, I.,** . . . Iqbal, S. (2020). Multi-objective-optimization of process parameters of industrial-gas-turbine fueled with natural gas by using Grey-Taguchi and ANN methods for better performance. *Energy Reports, 6*, 2394-2402. doi: https://doi.org/10.1016/j.egyr.2020.08.002. **(Iqra Javed (INFS/SST) Web of Science JCR Listed (IF: 3.595)**

Abstract: Gas-turbines are widely utilized in the power generation sectors as these require low operational cost, have very good efficiencies among other turbines, and produce less pollution but required to improve their performances further. This study used efficient and simple optimization methods of grey Taguchi and ANN to enhance gas turbine performance. The objective was to increase ηth, horsepower, and to decrease SFC and heat release of the industrial gas turbine (model # T-4502) by optimizing different levels of input process parameters by gyey-Taguchi method. Finally, air inlet temperature of 28.8 °C,14400 rpm and cartridge filter were found as optimal input parameters at which gas turbine's performance improved with less consumption of natural gas. Moreover, ANOVA analysis revealed that 'air-inlet-temperature' is the dominant and 'type of air-inlet-filter' is the least effective process parameter with 71.17% and 1.40% impacts on the output parameters of the gas

turbine. Confirmatory test was carried out experimentally and by ANN at suggested optimal level of input parameters, satisfactory results obtained which validates the effectiveness of the grey-Taguchi-method.

Keywords: *gas turbine, grey taguchi optimization, grey relational analysis, anova analysis, artificial neural networking.*

7. Manzoor, T., Zafar, M., **Iqbal, S.,** Nazar, K., Muddassir, A., Saleem, M., . . . Woo Young, K. (2020). Theoretical Analysis of Roll-Over-Web Surface Thin Layer Coating. *Coatings, 10*(7), 691. doi: http://dx.doi.org/10.3390/coatings10070691. **(Shaukat Iqbal (INFS/SST) Web of Science JCR Listed (IF: 2.436)**

   Abstract: This study presents the theoretical investigation of a roll-over thin layer formation under the lubrication approximation theory. The set of differential equations derived by lubrication approximation is solved by the optimal homotopy asymptotic method (OHAM) to obtain precise expressions for pressure and velocity gradients. Critical quantities such as velocity, pressure gradient, and coating layer depth are numerically estimated. The impact of parameters affecting the coating and layer formation is revealed in detail. Results indicate that the transport properties of the higher-grade fluid play an essential role in regulating velocity, pressure, and the final coated region. Moreover, couple stress effects on the properties of fluid particles to be coated on roller-surface have also been studied.

   Keywords: *roll-over-web coating, couple stress fluid, lubrication approximation theory, optimal homotopy asymptotic method (OHAM).*

8. Sarwar, S., Sirhindi, R., Aslam, L., **Mustafa, G.,** Yousaf, M. M., & Jaffry, S. W. U. Q. (2020). Reinforcement Learning Based Adaptive Duty Cycling in LR-WPANs. *IEEE Access, 8*, 161157-161174. doi: 10.1109/ACCESS.2020.3021016. **(Ghulam Mustafa (INFS/SST) Web of Science JCR Listed (IF: 3.745)**

   Abstract: For conserving energy, duty cycle is defined by setting up the active and sleep periods of network nodes. In beacon enabled networks, to provide support for duty cycle, the IEEE 802.15.4 standard uses optional super-frame structure. This duty cycle is usually fixed and does not consider the topology changes that often occur in dynamic sensor networks. In this paper, existing energy conserving duty cycling approaches for 802.15.4 networks especially the adaptive duty cycling techniques for wireless sensor networks are summed up. Also, this paper highlights the shortcomings of the proposals in the literature, such as induced additional latency, so that they may not support the practical scenarios of Internet of Things (IoT). Further, this study highlights a gross shortcoming that relative performance comparison of RL-based proposals cannot be performed without using a benchmarking framework and real test-bed environment. In this paper, we have presented the future research directions that would lay the foundation for successful development of energy efficient RL-based duty-cycling techniques.

   Keywords: *duty cycling, reinforcement learning, super frame parameters.*

9. **Sattar, M. U.,** Palaniappan, S., Lokman, A., Shah, N., Khalid, U., & Hasan, R. (2020). Motivating Medical Students Using Virtual Reality Based Education. *International Journal of Emerging Technologies in Learning (iJET), 15*(2), 160-174. **(Mian Usman Sattar (INFS/SST) SJR**

   Abstract: An exploratory study to compare the effects of immersive virtual reality based training on the learning motivation of final year medical students as compared to video and text-based learning. Different modes of delivery of a training simulation of laparoscopy operation were presented to students and learning motivation corresponding to which were evaluated using the Intrinsic Motivation Inventory. The study was conducted from September 2018 to May 2019. Undergraduate medical students from 8 medical colleges and universities across Punjab, Pakistan participated in this study. A total of 87 students with a mean age of 22.5 ± 4 years were recruited for the study. Of these, 57.4% (n = 50) were males and 42.6% (n = 37) were females. Paired sampled t-test was

chosen for the statistical investigation for the study. The tests were conducted by comparing means of text, video, and virtual reality learning methodologies in medical students. All executed statistical models are having significance value P=.000. Therefore, results are generalizable and can be implemented across the population. Medical student motivation was observed to be the greatest in Virtual Reality settings as compared to video-based and text-based learning settings. Both theoretical and practical studies have importance in medical studies, whereas practical hand-on-practice can enhance medical students' professional proficiency. Virtual reality was at the top in User experience, perceived competence, usefulness, and motivation for final year medical students. It can play a signficant role in contemporary teaching and learning methodology with medical educationist and students can get benefit from this technology.

Keywords: *Virtual Reality (VR), Learning Motivation, Medical Simulations, Intrinsic Motivation Inventory (IMI).*

10. Tanveer, M., **Zahid, A. H.,** Ahmad, M., Baz, A., & Alhakami, H. (2020). LAKE-IoD: Lightweight Authenticated Key Exchange Protocol for the Internet of Drone Environment. *IEEE Access, 8*, 155645-155659. doi: 10.1109/ACCESS.2020.3019367. **(Amjad Hussain Zahid (INFS/SST) Web of Science JCR Listed (IF: 3.745)**

Abstract: A drone is an unmanned aerial vehicle, which is deployed in a particular Fly Zone (FZ), and used to collect crucial information from its surrounding environment to be transmitted to the server for further processing. Generally, a Mobile User (MU) is required to access the real-time information collected by the drone stationed in a specific FZ securely. Therefore, to ensure secure and reliable communications an Authenticated Key Exchange (AKE) protocol is imperative to the Internet of Drone (IoD) environment. An AKE scheme ensures only authentic MU to access IoD network resources. Upon successful authentication, MU and drone can set up a secret session key for secure communication in the future. This paper presents a novel Lightweight AKE Protocol for IoD Environment (LAKE-IoD), which first ensures the authenticity of MU and also renders session key establishment mechanism between MU and drone with the help of a server. LAKE-IoD is an AKE protocol, which is based on an authenticated encryption scheme AEGIS, hash function, and bit-wise XOR operation. Meticulous formal security verification by employing a software tool known as Scyther and informal security analysis demonstrates that LAKE-IoD is protected against different well-known active and passive security attacks. Additionally, Burrows-Abadi-Needham logic is applied to verify the logical completeness of LAKE-IoD. Furthermore, a comparison of LAKE-IoD with the related schemes shows that LAKE-IoD incurs less communication, computational and storage overhead.

Keywords: *internet of drone, authenticated key exchange, lightweight cryptography, unmanned aerial vehicles, security and privacy.*

Conference Proceedings

1. Hasan, R., Palaniappan, S., Mahmood, S., Naidu, V. R., Agarwal, A., Singh, B., . . . **Sattar, M. U.** (2020, 2020//). *A Review: Emerging Trends of Big Data in Higher Educational Institutions.* Paper presented at the Micro-Electronics and Telecommunication Engineering, Singapore. **(Mian Usman Sattar (INFS/SST) SJR**

Abstract: Universities/higher educational institutions are finding ways to increase the student-faculty interactions beyond the traditional classroom, helping institutions to gather the information to enhance the student learning experiences with the help of learning analytics. These interactions are captured using the virtual learning environment through which institutions learn from the student interactions and behavioral patterns within those systems. This helps the institutions for better retention rate, prediction of the results and focus on weak students. Many institutions have placed an early detection system for management and faculty to engage with the students and figure out the problems faced by the students and provide a remedy to improvise for the faculty members. Most of the institutions rely mainly on one system such as the learning management system to capture the student interactions thus creating a gap. The Internet gives an edge to its users for practicing, learning, by doing, this leads to the emergence of video-based learning technologies that are practiced and used

in several ways, such as flipped classrooms. Student faces a doubt often in their phase of learning, to clear their doubts they refer to multiple sources to get the information and knowledge. These videos provide complete skill sets, students due to lack of skill set they use these sources for their specific problems. This paper discusses literature and background studies on the big data used in institutions of higher education. It establishes a framework based on the latest trends in this area that can help stakeholders to predict their business needs.

Keywords: *learning analytics, big data, virtual learning environment, learning management system, education data mining, prediction.*

2. Tahir, M. U., Naqvi, M. R., **Shahzad, S. K.,** & Iqbal, M. W. (2020, 22-23 Feb. 2020). *Resolving Data De-Duplication issues on Cloud.* Paper presented at the 2020 International Conference on Engineering and Emerging Technologies (ICEET). **(Syed Khuram Shahzad(INFS/SST)** SJR

Abstract: Data de-duplication refers to provide the cloud providers a way to manage the uncontrollable data and the challenges of cloud storage. The success of IOT and social media led us to face big data challenges. Big data is interesting but also becomes a critical challenge for cloud service providers. Data storage and management become also the topic of discussion where big data generate opportunity for business as well as come with big issues for the cloud providers. In this paper, we discussed the issues of redundant data and techniques to prevent the data redundancy on the cloud. Version control system for data de-duplication is also discussed for the solution of this problem.

Keywords: *de-duplication on the cloud, big data management, cloud computing, data management.*

3. Naqvi, M. R., Jaffar, M. A., Aslam, M., **Shahzad, S. K.,** Iqbal, M. W., & Farooq, A. (2020, 26-28 June 2020). *Importance of Big Data in Precision and Personalized Medicine.* Paper presented at the 2020 International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA). **(Syed Khuram Shahzad(INFS/SST)**

Abstract: The rapidly increasing adaptation of Big data technologies in biomedicine, has introduced a revolution in and medical research practice. Trending high-throughput data analysis techniques, have converted the appearance of the biological system to acquire idolization methods for complicated diseases. Majority of the acquired Big-data models govern the materialization of illustrating medicine. This transformation aims at quantification of the period of P4 medicine that will then progressively be more predictive, personalized, pre-emptive, and participatory. It layouts a track to modernize antiseptic methods for the patient's concern center. P4 medicine besides being a scientific face of systems medicine has two highlighted purposes first of which is to evaluate wellness, while the other is, to identify and expose disease. Patients are major operators in the cognizance of P4 medicine as they directly get engaged with a medically familiar network that helps them boost their health. This article will discuss the maturity in big data planning and correlated challenges in biomedicine.

Keywords: *big data analytics, medical records, genomics data, P4, P5 medicine.*

4. Naqvi, M. R., Aslam, M., Iqbal, M. W., **Shahzad, S. K.,** Malik, M., & Tahir, M. U. (2020, 26-28 June 2020). *Study of Block Chain and its Impact on Internet of Health Things (IoHT):Challenges and Opportunities.* Paper presented at the 2020 International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA). **(Syed Khuram Shahzad(INFS/SST)**

Abstract: Blockchain has been making some vital progress in these days because of its secure and amiable structure. It is a distributed and decentralized database that deals with transactions. The blockchain is also emerging in the healthcare sector rapidly. Healthcare has now become a prestigious part of our life as it is making life-changing innovations day by day whether it is about artificial intelligence influence in the diagnostic system, expert system, patient's data storage, retrieval, security, and any other healthcare smart services. Smart health data is the most important ingredient to help us in solving our healthcare needs. Many researchers are now

emerging blockchain in smart health because of its secure, flexible, and reliable architecture. In this paper, the major progress made in implementing the blockchain and its vulnerabilities are discussed in the area of smart health. The major focus is on the issues of patient's electronic health record, retrieval, security, and interoperability in Internet of Health Things (IoHT).

Keywords: *Blockchain, data analysis, data retrieval, EHR systems, IoHT, immutability, Smart health.*

School of Engineering (SEN)

Department of Mechanical Engineering

Research Articles

1. Al Rashid, A., Imran, R., & **Khalid, M. Y.** (2020). Determination of opening stresses for railway steel under low cycle fatigue using digital image correlation. *Theoretical and Applied Fracture Mechanics, 108*, 102601. doi: https://doi.org/10.1016/j.tafmec.2020.102601. **(Muhammad Yasir Khalid (Mechanical Engineering/SEN) Web of Science JCR Listed (IF: 3.021) (SKT Campus)**

Abstract: Crack closure phenomenon is important to study as it provides an estimation to fatigue life of the components. It becomes even more complex under low cycle fatigue (LCF), since under LCF high amount of plasticity is induced within the material near notches or defects, as a result the assumptions used by linear elastic fracture mechanics (LEFM) approach become invalid. Evaluation of opening stresses for mechanical components undergoing LCF phenomenon requires a robust methodology to correctly predict the fatigue life. In this study, an experimental campaign was carried out for determination of opening stresses of railway steels (25CrMo4 and 30NiCrMoV12) subjected to LCF using digital image correlation (DIC) technique. The concept of crack opening displacement (COD) was used for the analysis. Two different methodologies were introduced to analyze experimental data for the identification of opening levels. Experimental results were then compared with crack closure prediction model, Newman model. Results from Newman model agreed well with the experimental analysis. Newman model provided very good prediction for strain ratio $R_\varepsilon = -1$, however, for the materials undergoing strain ratio $R_\varepsilon = 0$, stress ratio must be considered rather than strain ratio, because Newman model can't predict stress relaxation behaviour.

Keywords: *crack closure, crack propagation, digital image correlation, low cycle fatigue, non-contact testing, opening stresses.*

2. Rashid, A. A., **Khalid, M. Y., Imran, R., Ali, U.,** & Koc, M. (2020). Utilization of Banana Fiber-Reinforced Hybrid Composites in the Sports Industry. *Materials, 13*(14), 3167. doi: http://dx.doi.org/10.3390/ma13143167. **(Muhammad Yasir Khalid, Ramsha Imran, Umair Ali (Mechanical Engineering/SEN) Web of Science JCR Listed (IF: 2.972)**

Abstract: The sports industry is an ever-growing sector worldwide. With technological advancements in information technologies, the sports industry has merged with the entertainment industry, reaching and influencing billions of people globally. However, to ensure and advance the safety, security, and sustainability of the sports industry, technological innovations are always needed in several manufacturing and materials processes to achieve cost-effectiveness, efficiency, durability, reusability, and recyclability of products used in this industry. For example, 90% of the field hockey equipment produced in the world comes from Sialkot, Pakistan. Most export quality field hockey equipment is currently produced via reinforcement of glass/carbon fibers in epoxy resin. The current study aimed to introduce new materials for field hockey equipment to reduce manufacturing costs and the environmental impact of synthetic materials, without comprising the quality of the final product. Our literature review on natural fibers revealed that they offer excellent and compatible mechanical properties. Based on extensive experimental studies, we concluded that banana fiber reinforced

hybrid composites could be an alternative to pure glass fiber reinforced composites, with comparable and even higher load withstanding capabilities. Using banana fiber reinforced hybrid composites for the fabrication of hockey products would cut costs and lower the environmental impact stemming from the uses of biodegradable organic materials. It will also lead to the development of a domestic economy based on domestic resources.

Keywords: *hockey, banana fiber-reinforced composites, hybrid composites, finite element analysis.*

Department of Electrical Engineering

Research Articles

1. **Ullah, I.** (2020). Fiber-based daylighting system using trough collector for uniform illumination. *Solar Energy, 196*, 484-493. doi: https://doi.org/10.1016/j.solener.2019.12.052. **(Irfan Ullah (Electrical Engineering/SEN) Web of Science JCR Listed (IF: 4.608)**

   Abstract: A lot of research attention has been given to collect sunlight through solar concentrators for indoor illumination. Traditional, parabolic trough as a line focus with single array of fibers had mechanical design and installation issues. Here, a novel daylighting system is proposed to transmit maximum light into the optical fibers using parabolic trough as the primary collector and nonimaging reflector as the secondary reflector. The proposed system increases light levels, improves installations difficulties, and maintains long-term reliability. All modules are designed and verified through raytracing simulation for calculating the efficiency and achieving the required light-levels. The proposed trough-based design inserts maximum light into the fiber bundle, which is placed at the center of the trough. Further, the fiber-coupled bi-layer prismatic optical diffuser provides relatively high uniform illuminance distribution. Simulation results have shown that the light concentration of 285, an optical efficiency of 42%, and an acceptance angle of ± 1.1° are achieved that are better than that of previous troughbased daylighting system.

   Keywords: *parabolic trough, optical fiber, daylighting, indoor illumination.*

2. **Ahmad, S.,** Nasir, M., Dąbrowski, J., & Guerrero, J. M. (2020). Improved topology of high voltage gain DC-DC converter with boost stages. *International Journal of Electronics Letters*, 1-13. doi: 10.1080/21681724.2020.1744040. **(Shakeel Ahmad (Electrical Engineering/SEN) SJR**

   Abstract: In this letter, a novel topology of a non-isolated high voltage gain dc-dc converter is proposed. The topology is based on the diode-capacitor voltage multiplier stages, integrated with inductor-based boost stages at the input. Due to reduced voltage imbalance between the voltage multiplier stage capacitors the design features low spikes in the switch current. Consequently the switch current stress, as well as conduction and switching losses are reduced accordingly. The proposed converter can draw continuous current either as a multiport converter from two input sources or from a single source as an interleaved converter and achieves a voltage gain of 15 with two voltage multiplier stages. A 400 W prototype of the converter with V_{in} = 20 V and V_{out} = 300 V has been implemented to validate the enhancement.

   Keywords: *DC-DC converter, interleaved, non-isolated, renewable, voltage multiplier.*

3. **Asim, M.,** Saleem, S., Imran, M., Leung, M. K. H., Hussain, S. A., Miró, L. S., & Rodríguez, I. (2020). Thermo-economic and environmental analysis of integrating renewable energy sources in a district heating and cooling network. *Energy Efficiency, 13*(1), 79-100. doi: 10.1007/s12053-019-09832-9. **(Muhammad Asim (Electrical Engineering/SEN) Web of Science JCR Listed (IF: 1.810)**

   Abstract: This paper presents the technical, environmental, and economic evaluation of integrating various combinations of renewable energy sources-based systems in the expansion of a district heating and cooling network of a Technology Park near Barcelona in Spain. At present, a combined heat and power plant running on fossil fuels serves the heating, cooling, and electricity demand of the Park. However, this energy demand is

expected to increase substantially in the coming years. EnergyPRO software was used to model the energy demand growth till 2030. Validation of the software application was done by making a base model using real plant data from the year 2014. The software was then used to project the energy supply based on three 15-year scenarios, having different combinations of renewable energy technologies, from 2016 until 2030. Primary energy consumption, CO_2 emissions, and the net present value obtained in each scenario were used to decide the best combinations of renewable energy sources. The results of the study showed that presently, biomass boilers combined with absorption chillers and supported with solar thermal cooling are the most competitive technologies in comparison to ground source heat pumps for large DHC networks. This is mainly because of the lower primary energy consumption (624,380 MWh/year in 2030 vs. 665,367 MWh/year), higher net present value (NPV) (222 million € vs. 178 million €), and lower CO_2 emissions (107,753 tons/year in 2030 vs. 111,166 tons/year) obtained as a result of the simulations.

Keywords: *district heating and cooling, renewable energy integration, energy efficiency, feasibility study, techno-economic evaluation.*

4. Ayub, M., Atiq, S., Ali, Q., **Hussain, A.,** & Kwon, B. (2020). Dual-Mode Wound Rotor Synchronous Machine for Variable Speed Applications. *IEEE Access, 8*, 115812-115822. doi: 10.1109/ACCESS.2020.2999609. **(Asif Hussain (Electrical Engineering/SEN) Web of Science JCR Listed (IF: 3.745)**

   Abstract: This paper presents a novel dual-mode wound rotor synchronous machine (DWRSM) for variable speed applications. The proposed machine combines the advantages of both the conventional wound rotor synchronous machine (CWRSM) and the brushless wound rotor synchronous machine (BWRSM). Unlike the existing BWRSM, through the dual-mode operation of the proposed machine, constant torque is achieved in the constant torque region by operating the machine in mode-I, i.e., as a CWRSM, and constant power is achieved in the field weakening region by operating the machine in mode-II, i.e., as a BWRSM. The mode change is performed through an additional thyristor drive circuit. The airgap magnetomotive force (MMF) in both modes is derived analytically. To verify this principle, finite element analysis (FEA) and an experiment on a 1- horsepower prototype machine was performed, and key influential factors were verified. The transients in the stator currents and torque during the mode change was analyzed. The test results validated the correctness of the theory and the FEA results.

   Keywords: *brushless, dual-mode, harmonic winding, sub-harmonic, wound rotor synchronous machine.*

5. Ayub, M., **Hussain, A.,** Sirewal, G. J., & Kwon, B.-i. (2020). Wye-delta winding configuration for brushless operation of a wound field synchronous machine. *International Journal of Applied Electromagnetics and Mechanics, Preprint*, 1-8. doi: 10.3233/JAE-209433. **(Asif Hussain (Electrical Engineering/SEN) Web of Science JCR Listed (IF: 0.684)**

   Abstract: This manuscript proposes a wye-delta winding configuration for brushless operation of a wound field synchronous machine (BL-WFSM). In existing third harmonically excited BL-WFSM topologies, the additional third harmonic component of the stator magnetomotive force (MMF) was produced by an extra thyristor drive circuit or by utilizing an additional inverter. In the proposed single inverter topology, the stator winding is divided into two coil sets: the wye coil and delta coil. Triplen harmonic currents are produced owing to the delta coils set and start to circulate in the delta coils. This triplen harmonic circulating currents produce a triplen harmonic pulsating MMF in the airgap. The additional triplen harmonic pulsating MMF induces voltage in the rotor harmonic winding. This induced voltage in the harmonic winding is used to excite the rotor field. A 2D finite element analysis is performed, and the simulation results confirmed the operation principle of the proposed brushless topology.

   Keywords: *brushless, delta coils, MMF, triplen harmonic, wye coils, WFSM.*

6. **Saleem, M. S.,** Abas, N., Kalair, A. R., Rauf, S., **Haider, A.,** Tahir, M. S., & Sagir, M. (2020). Design and optimization of hybrid solar-hydrogen generation system using TRNSYS. *International Journal of Hydrogen Energy, 45*(32), 15814-15830. doi: https://doi.org/10.1016/j.ijhydene.2019.05.188. **(Muhammad Shoaib Saleem, Aun Haider (Electrical Engineering/SEN) Web of Science JCR Listed (IF: 4.939) (SKT Campus)**

Abstract: Solar thermal systems are an efficient utilization of solar energy for hot water and space heating at domestic level. A Solar Water Heater (SWH) incorporating an Evacuated Glass Tube Collector (EGTC) is simulated using TRNSYS software. Efficiency parameters are pointed, and a parametric optimization method is adopted to design the system with maximum conceivable efficiency. In the first part, the selection of refrigerant for heat transportation in SWH loop is presented. A set of 15 working fluids are chosen, and their chemical properties are computed using NIST standard software (REFPROP). The selected working fluids are tested in the system under study and plots for energy gain and temperature are plotted using TRNSYS. Results showed that ammonia (NH_3) having specific heat 4.6kJ/kg-K and fluid thermal conductivity 2.12 kJ/hr-m supplies peak energy gain of 7500 kJ/h in winter and 8900 kJ/h in summer season along 120 °C temperature rise. On the other hand, R-123 having specific heat 0.65kJ/kg-K and fluid thermal conductivity 0.0293kJ/hr-m showed inferior performance during the simulation. A solar-hydrogen co-generation system is also designed and simulated under low solar insolation and warm climate regions to study annual hydrogen produced by the hybrid system. System comprises main components: a PV array, an electrolyzer, a fuel cell, a battery, a hydrogen storage unit and a controller in the complete loop. Results of Hydrogen cogeneration system provide 7.8% efficiency in the cold climate of Fargo North Dakota state due to lower solar insolation. While hot climate condition of Lahore weather provides efficiency of 11.8% which satisfy the statistics found in literature.

Keywords: *TRNSYS, solar water heater, evacuated glass tube collector, hydrogen energy.*

Conference Proceedings

1. Basit, A., **Ullah, Z., Khan, I.,** Ullah, K., Sarwar, M. A., Ali, S. M., . . . Mehmood, C. A. (2020, 29-30 Jan. 2020). *Electric Vehicles Interactions for Efficient Energy Performance within Smart Grid.* Paper presented at the 2020 3rd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET). **(Zahid Ullah, Irfan Ullah (Electrical Engineering/SEN) SJR (SKT Campus)**

Abstract: Electric Vehicles (EVs) evolution brought a revolutionary change in the domain of electric transformation. The development of EVs is growing day-by-day. The rapid growth in EV technology is diverting consumers from normal cars to electric vehicles. EV has become the need of the modern era. Fossil fuel reserves are depleting which results in inflation of fuel prices. The solution to this problem is to develop new technologies that are independent of fossil fuels. EVs are the answer to the massive increase in oil prices. Therefore, this paper presents two interactive modes of EVs, namely: (a) Grid- to-Vehicle (G2V) and (b) Vehicle-to-Grid (V2G) operational modes. Moreover, interactions of V2G and G2V are discussed with respect to SG dynamics and control. Finally, a case study of EVs operating in Wide Area Smart Grid System (WASGS) is presented in the context of (a) wide area system stability, (b) voltage control, and (c) active and reactive power management. The computer-based simulation of EVs is evaluated in three areas of the WASGS with distributed parking stations.

Keywords: *smart grid, electric vehicles, energy flows, vehicle-to-grid, grid-to-vehicle, wide area smart grid system, energy efficiency.*

2. Uddin, W., Ishfaq, M., Zeb, K., Islam, S. u., Kim, H. J., **Ullah, Z**., . . . Sarwar, M. A. (2020, 29-30 Jan. 2020). *Super twisting sliding mode control for inner current suppression of Modular Multilevel Converter.* Paper presented at the 2020 3rd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET). **(Zahid Ullah (Electrical Engineering/SEN) SJR (SKT Campus)**

Abstract: Modular Multilevel Converter (MMC) is very popular due to its flexibility, use of low rating devices, low harmonic distortion, and high efficiency. Despite these advantages, MMC faces challenges of controlling its

parameters especially inner current and capacitor voltages. This paper presents the control of the inner current of MMC using Sliding Mode Controller (SMC). The switching function of SMC is based on 2 nd order super twisting algorithm. The Proposed super twisting algorithm is proved to be efficient in controlling the inner current. The 2 nd order harmonic is effectively suppressed, and the inner current is fully converged to its reference value. Moreover, the continuous nature of the super twisting algorithm solves the chattering issue. The implementation of MMC and its control is carried out in MATLAB/Simulink.

Keywords: *modular multilevel converter, inner current, sliding mode control, harmonic supression, inner current.*

Department of Industrial Engineering

Research Articles

1. Arslan, M., Farooq, M., Naqvi, M., Sultan, U., Tahir, Z.-u.-R., **Ahmad, I. C.,** . . . Anukam, A. (2020). Impact of Varying Load Conditions and Cooling Energy Comparison of a Double-Inlet Pulse Tube Refrigerator. *Processes, 8*(3). doi: 10.3390/pr8030352. **(Ijaz Ahmad Chaudhry (Industrial Engineering/SEN) Web of Science JCR Listed (IF: 2.753)**

Abstract: Modeling and optimization of a double-inlet pulse tube refrigerator (DIPTR) is very difficult due to its geometry and nature. The objective of this paper was to optimize-DIPTR through experiments with the cold heat exchanger (CHX) along the comparison of cooling load with experimental data using different boundary conditions. To predict its performance, a detailed two-dimensional DIPTR model was developed. A double-drop pulse pipe cooler was used for solving continuity, dynamic and power calculations. External conditions for applicable boundaries include sinusoidal pressure from an end of the tube from a user-defined function and constant temperature or limitations of thermal flux within the outer walls of exchanger walls under colder conditions. The results of the system's cooling behavior were reported, along with the connection between the mass flow rates, heat distribution along pulse tube and cold-end pressure, the cooler load's wall temp profile and cooler loads with varied boundary conditions i.e. opening of 20% double-inlet and 40-60% orifice valves, respectively. Different loading conditions of 1 and 5 W were applied on the CHX. At 150 K temperature of the cold-end heat exchanger, a maximum load of 3.7 W was achieved. The results also reveal a strong correlation between computational fluid dynamics modeling results and experimental results of the DIPTR.

Keywords: *boundary conditions, two-dimensional simulation, fluent, pressure user define function, regenerator.*

2. Uddin, G. M., Niazi, S. G., Arafat, S. M., Kamran, M. S., Farooq, M., Hayat, N., . . . **Chaudhry, I. A.** (2020). Neural networks assisted computational aero-acoustic analysis of an isolated tire. *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering, 0*(0), 0954407020915104. doi: 10.1177/0954407020915104. **(Ijaz Ahmad Chaudhry (Industrial Engineering/SEN) SJR**

Abstract: The computational aero-acoustic study of an isolated passenger car tire is carried out to understand the effect of dimensions of longitudinal tire grooves and operational parameters (velocity and temperature) on tire noise. The computational fluid dynamics and acoustic models are used to obtain aero-acoustic tire noise at near-field and far-field receivers around the tire and artificial neural networks-based regression are used to study the highly non-linear and interactive causal relationships in the system. Unsteady Reynolds-Averaged Navier-Stokes based realizable k-epsilon model is used to solve the flow field in the computational domain. The Ffowcs Williams and Hawkings model is used to obtain aero-acoustic tire noise at far-field positions. Spectral analysis is used to convert the output time domain to frequency domain and to obtain A-weighted sound pressure level. Artificial neural network–based response surface regression is conducted to understand casual relationships between A-weighted sound pressure level and control variables (Groove depth, Groove width, Temperature and velocity). Maximum A-weighted sound pressure level is observed in the wake region of the tire model. The interaction study indicates that ∼10% reduction in the aero-acoustic emissions is possible by selecting appropriate combinations of groove width and groove depth. The interaction of velocity with width is found to

be most significant with respect to A-weighted sound pressure level at all receivers surrounding the tire. The interaction of operational parameters, that is, velocity and temperature are found to be significant with respect to A-weighted sound pressure level at wake and front receivers. Therefore, the regional speed limits and seasonal temperatures need to be considered while designing the tire to achieve minimum aero-acoustic emissions.

Keywords: *aero-acoustic, artificial intelligence, isolated tire, computational aero-acoustics, computer simulated experimentation, response surface methodology.*

3. Uddin, G. M., Arafat, S. M., Ashraf, W. M., Asim, M., Bhutta, M. M. A., Jatoi, **Chaudhry, I. A.**, . . . Zeid, I. (2020). Artificial Intelligence-Based Emission Reduction Strategy for Limestone Forced Oxidation Flue Gas Desulfurization System. *Journal of Energy Resources Technology, 142*(9). doi: 10.1115/1.4046468. **(Ijaz Ahmad Chaudhry (Industrial Engineering/SEN) SJR**

Abstract: The emissions from coal power plants have serious implication on the environment protection, and there is an increasing effort around the globe to control these emissions by the flue gas cleaning technologies. This research was carried out on the limestone forced oxidation (LSFO) flue gas desulfurization (FGD) system installed at the 2*660 MW supercritical coal-fired power plant. Nine input variables of the FGD system: pH, inlet sulfur dioxide (SO_2), inlet temperature, inlet nitrogen oxide (NO_x), inlet O_2, oxidation air, absorber slurry density, inlet humidity, and inlet dust were used for the development of effective neural network process models for a comprehensive emission analysis constituting outlet SO_2, outlet Hg, outlet NO_x, and outlet dust emissions from the LSFO FGD system. Monte Carlo experiments were conducted on the artificial neural network process models to investigate the relationships between the input control variables and output variables. Accordingly, optimum operating ranges of all input control variables were recommended. Operating the LSFO FGD system under optimum conditions, nearly 35% and 24% reduction in SO_2 emissions are possible at inlet SO_2 values of 1500 mg/m^3 and 1800 mg/m^3, respectively, as compared to general operating conditions. Similarly, nearly 42% and 28% reduction in Hg emissions are possible at inlet SO_2 values of 1500 mg/m^3 and 1800 mg/m^3, respectively, as compared to general operating conditions. The findings are useful for minimizing the emissions from coal power plants and the development of optimum operating strategies for the LSFO FGD system.

Keywords: *artificial intelligence, process industry, neural networks, emission control, environment, LSFO FGD system, SO2 emissions, NOx emissions, Hg emissions, dust emissions, coal power plant, air emissions from fossil fuel combustion, fuel combustion.*

4. Saeed, M. A., Farooq, M., Anwar, A., Abbas, M. M., Soudagar, M. E. M., **Chaudhry, I. A.**, . . Phylaktou, H. N. (2020). Flame propagation and burning characteristics of pulverized biomass for sustainable biofuel. *Biomass Conversion and Biorefinery*. doi: 10.1007/s13399-020-00875-y. **(Ijaz Ahmad Chaudhry (Industrial Engineering/SEN) Web of Science JCR Listed (IF: 2.602)**

Abstract: One of the critical energy challenges, which our planet is confronting today, is how to curtail the reliance on fossil fuels for a sustainable environment. Biomass is a promising source of renewable energy for sustainable power generation compared to the conventional coal. However, they are hard to mill to finer size due to their fibrous nature. In this study, the size dependency on the flame propagation and burning characteristics of pulverized biomass is examined compared to coals. Modified Hartmann and 1- m3 explosion vessels were used to perform flame speed and explosion tests. Fine-sized particles propagated the flame with a flame velocity of 2.5 m/s for non-spherical-shaped particles compared to round-shaped lycopodium and corn flour. For coarse size particles, the flame speeds were measured to be around 1 m/s. The minimum explosion concentration was measured to be 0.2–0.4 equivalence ratio for a size range of 40–200 µm and higher for larger particle sizes. Reactivity data showed functional correlations for selected biomass and coal samples. SEM images of post-explosion residues showed incomplete combustion of bigger particles and formation of the cenosphere because of siliceous contents. The study findings concluded that the fine-sized particles of biomass had higher

fire/explosion risk due to greater burning characteristics and it could only be replaced with conventional coal after assessing their combustion data by reliable methods.

Keywords: *biofuels, combustion, explosion, reactivity, flame propagation, activation energy.*

5. Ikhlaq, A., Javed, F., **Akram, A.,** Rehman, A., Qi, F., Javed, M., . . . Aziz, H. A. (2020). Synergic catalytic ozonation and electroflocculation process for the treatment of veterinary pharmaceutical wastewater in a hybrid reactor. *Journal of Water Process Engineering, 38*, 101597. doi: https://doi.org/10.1016/j.jwpe.2020.101597. **(Asia Akram) Web of Science JCR Listed (IF: 3.465)**

Abstract: The research investigates the treatment of real veterinary pharmaceutical wastewater by synergic catalytic ozonation with iron-loaded zeolite A (Fe-Z) catalyst and electroflocculation process in a hybrid reactor. The wastewater was characterized by high organic content (COD =1220 mg/L) and turbidity 247 NTU. The experiments were conducted in a batch laboratory scale hybrid reactor with ozone spargers, metal electrodes, and suspended buckets loaded with (Fe-Z) catalyst. The effect of operational parameters of voltage (5−15 V), pH (5–9), ozone dose (0.2−0.4 mg/min), and catalyst dose (1−2 g/L) on COD and turbidity removal was studied with the mechanism explored. The obtained results showed the COD removal efficiency was 85.12 % and the turbidity of pharmaceutical wastewater reduced to 78 NTU at optimal conditions of voltage 5 V, pH 7, ozone dose 0.4 mg/min, and catalyst dose 1.5 g/L. The pharmaceutical removals achieved were 100 % for enrofloxacin and 90 % for amoxicillin. It is therefore concluded that the synergic process was found highly suitable for the effective treatment of veterinary pharmaceutical wastewater in the hybrid reactor as an effective option.

Keywords: *catalytic ozonation, chemical oxygen demand, electroflocculation, pharmaceutical wastewater.*

Department of Civil Engineering

Research Articles

1. Tanveer, M., Kashmiri, F. A., Naeem, H., Yan, H., Qi, X., Rizvi, S. M. A., . . . Lu, H. (2020). An Assessment of Age and Gender Characteristics of Mixed Traffic with Autonomous and Manual Vehicles: A Cellular Automata Approach. *Sustainability, 12*(7), 2922.**(Faizan Ahmad Kashmiri (Civil Engineering/SEN) Web of Science JCR Listed (IF: 2.576)**

Abstract: Traffic congestion has become increasingly prevalent in many urban areas, and researchers are continuously looking into new ways to resolve this pertinent issue. Autonomous vehicles are one of the technologies expected to revolutionize transportation systems. To this very day, there are limited studies focused on the impact of autonomous vehicles in heterogeneous traffic flow in terms of different driving modes (manual and self-driving). Autonomous vehicles in the near future will be running parallel with manual vehicles, and drivers will have different characteristics and attributes. Previous studies that have focused on the impact of autonomous vehicles in these conditions are scarce. This paper proposes a new cellular automata model to address this issue, where different autonomous vehicles (cars and buses) and manual vehicles (cars and buses) are compared in terms of fundamental traffic parameters. Manual cars are further divided into subcategories on the basis of age groups and gender. Each category has its own distinct attributes, which make it different from the others. This is done in order to obtain a simulation as close as possible to a real-world scenario. Furthermore, different lane-changing behavior patterns have been modeled for autonomous and manual vehicles. Subsequently, different scenarios with different compositions are simulated to investigate the impact of autonomous vehicles on traffic flow in heterogeneous conditions. The results suggest that autonomous vehicles can raise the flow rate of any network considerably despite the running heterogeneous traffic flow.

Keywords: *autonomous vehicle, age, gender, manual vehicle, cellular automata.*

2. **Ali, N.,** & Piantanakulchai, M. (2020). Self-reported inclination of heavy-duty vehicle drivers to adopt eco-

driving in different motivation contexts. *Songklanakarin Journal of Science and Technology (SJST), 42* (3), 496-503.**(Nazam Ali (Civil Engineering/SEN) SJR**

Abstract: Eco-driving is an emerging field of research. Due to its positive dimensions on fuel-economy and environmental emissions, it is becoming a well-known concept in transportation industry. Behavioral responses of drivers' readiness to adopt eco-driving are studied. Questionnaires are collected from 87 truck drivers working for a logistics firm in Thailand. Eco-driving was introduced using three different strategies; changing driving behavior, competition with fellow drivers, and reward or penalty systems. A five-point Likert scaling system is adopted to record their self-evaluation scoring to practice eco-driving in given contextual motivations. Results are reported in the form of eco-driving scores and Statistical evaluations to check if the difference in behavioral response is statistically significant. Statistically significantly different results showed that in-relationship (score 3.75) and high school drivers (score 4.38) manifested strong motivations in penalty or reward systems while high school drivers exhibited great inclinations in changing their driving behavior (score 3.89).

Keywords: *co-driving, Thai drivers, co-driving score, behavioral response, motivation contexts.*

3. Dias, C., Iryo-Asano, M., **Abdullah, M.,** Oguchi, T., & Alhajyaseen, W. (2020). Modeling Trajectories and Trajectory Variation of Turning Vehicles at Signalized Intersections. *IEEE Access, 8*, 109821-109834. doi: 10.1109/ACCESS.2020.3002020. **(Muhammad Abdullah (Civil Engineering/SEN) Web of Science JCR Listed (IF: 3.745)**

   Abstract: Information on the trajectories of turning vehicles at signalized intersections can be used in numerous applications, such as movement planning of autonomous vehicles, realistic representation of surrounding vehicle movements in driving simulator and virtual reality applications, and in microscopic simulation tools. However, no proper framework is currently available to realistically model and estimate trajectories of turning vehicles reflecting the intersection geometries, which is critical for the reliability of simulation models. This study explores the applicability of the minimum-jerk principle, which has been initially applied in neuroscience and robotics domains, to model and simulate free-flow trajectories of turning vehicles. The modeling method is validated by comparing model outputs with empirical trajectories collected at several signalized intersections in Nagoya, Japan. The capability of the model in realistically capturing the variations in turning trajectories based on intersection geometry (e.g., intersection angle and turning radius) is also explained. Further, the applicability of the modeling framework at intersections with different geometric features under different speeds and accelerations are also discussed.

   Keywords: *autonomous vehicles, motion planning, numerical simulation, path planning, predictive models, traffic control, trajectory optimization.*

4. Muley, D., Shahin, M., Dias, C., & **Abdullah, M.** (2020). Role of Transport during Outbreak of Infectious Diseases: Evidence from the Past. *Sustainability, 12*(18), 7367. doi: http://dx.doi.org/10.3390/su12187367. **(Muhammad Abdullah (Civil Engineering/SEN) Web of Science JCR Listed (IF: 2.576)**

   Abstract: The outbreak of infectious diseases affects people's lifestyles significantly, as they undertake fewer outdoor activities as a protective measure and to follow government orders of restricted movements. This paper reviewed the scientific literature related to transport and infectious diseases to gain insights into managing such circumstances. The outcomes indicate that the transport sector has a two-fold role during the outbreak of infectious diseases: controlling the spread of infection and assessing the impact of reduced outdoor activities on the transport sector. It was found that local and international travel restrictions, if applied at the initial stages, are effective in controlling the spread of infectious disease; at a later stage, behavioral changes become prominent in limiting the spread. Further, the outbreaks resulted in a significant reduction in mobility, altering traffic patterns with lower peaks and improving traffic safety.

The public transport mode share reduced considerably and people preferred cars and active modes. These changes also showed positive impacts on air pollution and water pollution. Further, the air transport and tourism sector were noted to be the hardest hit and will recover slowly. The outcomes from the review will be useful for planners and administrators in managing future emergency conditions better.

Keywords: *infectious disease, pandemic, epidemic, transport effects, health emergencies, spread of diseases, traffic impacts.*

5. Joyklad, P., Hussain, Q., & **Ali, N.** (2020). Mechanical Properties of Cement-Clay Interlocking (CCI) Hollow Bricks. *Engineering Journal,* vol. 24, no. 3, pp. 89-106, doi: https://doi.org/10.4186/ej.2020.24.3.89. **(Nazam Ali (Civil Engineering/SEN)** SJR

Abstract: In this paper, an investigative study on mechanical properties of CCI hollow bricks, for example, compressive strength, modulus of rupture, splitting tensile strength, water absorption capacity and heat transfer is conducted. The experimental program is divided into two parts. In the 1st part, bricks from three different regions (A, B and C having different soil stratum) of Thailand were collected and their mechanical properties were investigated. The mechanical properties of CCI hollow bricks of region A were observed relatively very low as compared to other regions. The compressive strength values of region A bricks were found even below the standard values required by Thai Community Product Standards (TCPS). Then, in the 2nd part, change in three mix design ratios followed by sand, cement and fly ash for region A have been exercised to observe their effects on mechanical properties of bricks from said region. Results showed significant improvements as compared with previous results obtained in first part of the experimental program. Also, a cost-benefit analysis was performed to observe the effect of the manufacturing cost on the mechanical properties of CCI hollow bricks in Thailand. It has been investigated that the brick samples with more cement content (from region C, Mix – 2 & Mix – 3) are relatively expensive as compared with other brick samples with less cement content (from region A, region B & Mix – 1).

Keywords: *cement, clay, interlocking bricks, compressive strength, water absorption capacity, fly ash.*

6. **Raja, M. N. A.,** & Shukla, S. K. (2020). Ultimate bearing capacity of strip footing resting on soil bed strengthened by wraparound geosynthetic reinforcement technique. *Geotextiles and Geomembranes*. doi: https://doi.org/10.1016/j.geotexmem.2020.06.005. **(Muhammad Nouman Amjad Raja (Civil Engineering/SEN)** Web of Science JCR Listed (IF: 3.400) Technical note

Abstract: In the recent past, the wraparound geosynthetic reinforcement technique has been recommended for constructing the geosynthetic-reinforced soil foundations. This paper presents the development of an analytical expression for estimating the ultimate bearing capacity of strip footing resting on soil bed reinforced with geosynthetic reinforcement having the wraparound ends. The wraparound ends of the geosynthetic reinforcement are considered to provide the shearing resistance at the soil-geosynthetic interface as well as the passive resistance due to confinement of soil by the geosynthetic reinforcement. The values of ultimate load-bearing capacity determined by using the developed analytical expression agree well with the model footing load test values as reported in the literature.

Keywords: *geosynthetic reinforcement, strip footing, ultimate bearing capacity, wraparound technique.*

School of Business and Economics (SBE)

Department of Management

Research Articles

1. Raja, U., Haq, I. U., De Clercq, D., & **Azeem, M. U.** (2020). When ethics create misfit: Combined effects of despotic leadership and Islamic work ethic on job performance, job satisfaction, and psychological well-being. *International Journal of Psychology, 55*(3), 332-341. doi: 10.1002/ijop.12606. **(Muhammad Umer Azeem (Management/SBE) Web of Science JCR Listed (IF: 1.255)**

   Abstract: This study applies social exchange and person–environment fit theories to predict that despotic leaders tend to hinder employee job performance, job satisfaction, and psychological well-being, whereas employees' own Islamic work ethic (IWE) enhances these outcomes. Also, IWE moderates the relationship of despotic leadership with the three outcomes, such that it heightens the negative impacts, because employees with a strong IWE find despotic leadership particularly troubling. A multi-source, two-wave, time-lagged study design, with a sample (303 paired responses) of employees working in various organisations, largely supports these predictions. Despotic leadership and IWE relate significantly to job performance, job satisfaction and psychological well-being in the predicted directions, except that there is no significant relationship between IWE and job satisfaction. A test of moderation shows that the negative relationships of despotic leadership with job outcomes are stronger when IWE is high. These findings have pertinent implications for theory, as well as for organisational practice.

   Keywords: *despotic leadership, Islamic work ethic, social exchange theory, person–environment fit.*

2. De Clercq, D., Haq, I. U., & **Azeem, M. U.** (2020). When does job dissatisfaction lead to deviant behaviour? The critical roles of abusive supervision and adaptive humour. *Australian Journal of Management, 45*(2), 294-316. doi: 10.1177/0312896219877679. **(Muhammad Umer Azeem (Management/SBE) Web of Science JCR Listed (IF: 1.065)**

   Abstract: With a basis in conservation of resources theory, this study investigates the relationship between employees' sense of job dissatisfaction and their engagement in deviant behaviour, as well as the moderating roles that their exposure to abusive leadership and possession of adaptive humour skills can play in this process. Based on two-way survey data collected from employees in Pakistan, the findings show that employees' unhappy feelings about their job situations enhance the likelihood that they undertake negative behaviours that can harm their organization, especially when they suffer from abusive leadership or lack adaptive humour skills. The buffering effect of their adaptive humour on the positive relationship between job dissatisfaction and deviant behaviour is also particularly salient in the presence of abusive leadership.

   Keywords: *abusive supervision, adaptive humour, conservation of resources theory, deviant behaviour, job dissatisfaction.*

3. De Clercq, D., **Azeem, M. U.,** Haq, I. U., & Bouckenooghe, D. (2020). The stress-reducing effect of coworker support on turnover intentions: Moderation by political ineptness and despotic leadership. *Journal of Business Research, 111*, 12-24. doi: https://doi.org/10.1016/j.jbusres.2020.01.064. **(Muhammad Umer Azeem (Management/SBE) Web of Science JCR Listed (IF: 4.874)**

   Abstract: Grounded in conservation of resources theory, this study investigates the mediating role of job stress in the relationship between coworker support and employees' turnover intentions, as well as the moderating roles of political ineptness and despotic leadership in this process. Time-lagged data collected from employees in Pakistan reveal that an important reason coworker support diminishes turnover intentions is the lower stress that employees experience while undertaking their job tasks. This influence of stress reduction is particularly

salient to the extent that employees are equipped with less political skill and, contrary to expectations, are less exposed to despotic leadership. For organizations, this study accordingly pinpoints a key mechanism by which coworker support can diminish the tendency to leave the organization (stress containment), and it reveals that this mechanism varies according to both personal and leadership factors.

Keywords: *coworker support, turnover intentions, job stress, political ineptness, despotic leadership, conservation of resources theory.*

4. Ying, M., Faraz, N. A., Ahmed, F., & **Raza, A.** (2020). How Does Servant Leadership Foster Employees' Voluntary Green Behavior? A Sequential Mediation Model. *International journal of environmental research and public health, 17*(5). **(Ali Raza (KUBEAC) Web of Science JCR Listed (IF: 2.849) (SKT Campus)**

Abstract: Employees' voluntary green behavior (EVGB) is indispensable in realizing organizations' environmental sustainability objectives. Leaders can act as catalysts to shape the behavior of their employees. On EVGB, noticeably the missing link is investigating the influence of servant leadership and the mechanism through which it operates. Building upon self-determination and psychological empowerment theories, this research examined the impact of servant leadership on EVGB through the simple and sequential mediation of psychological empowerment and autonomous motivation for the environment (AME). Through systematic sampling, dyadic data were collected from 315 pairs of subordinates and supervisors working in the power sector organizations of Pakistan. Results were obtained by employing the partial least squares structural modeling (PLS-SEM) technique with Smart-PLS 3.2.8 software. Findings revealed that psychological empowerment and AME simply and sequentially mediate the influence of servant leadership on EVGB. Implications for theory and organizational practitioners are offered, accompanied by suggestions for future research.

Keywords: *servant leadership, employees' voluntary green behavior, psychological empowerment, autonomous motivation for the environment, sequential mediation.*

5. **Raza, A., Saeed, A., Iqbal, M. K.,** Saeed, U., **Sadiq, I.,** & Faraz, N. A. (2020). Linking Corporate Social Responsibility to Customer Loyalty through Co-Creation and Customer Company Identification: Exploring Sequential Mediation Mechanism. *Sustainability, 12*(6), 1-19. **(Ali Raza, Muhammad Khalid Iqbal (KUBEAC) Amer Saeed (Operations and Supply Chain/SBE) Imran Sadiq (Marketing/SBE) Web of Science JCR Listed (IF: 2.576) (SKT Campus)**

Abstract: Promoting corporate social responsibility (CSR) and co-creation has become a crucial relationship marketing strategy for the banks. This research empirically investigates how banks' CSR activities generate positive customer responses in the form of co-creation, customer–company identification (CCI), and loyalty. This research sheds light on the influence of CSR on customer behavior by analyzing the underlying psychological processes through the sequential mediation of co-creation and CCI. Working with a sample of 280 banking customers in Pakistan, partial least square based structural equation modeling (PLS-SEM) is employed to test the conceptual model. CSR is a multidimensional formative construct that affects customer loyalty both directly and indirectly. Sequential partial mediations of co-creation and CCI are found between CSR activities and customer loyalty. Lastly, CCI has a direct and significant impact on co-creation and customer loyalty. Banks must include CSR in their long-term marketing plans to improve overall customer behavior because banks' CSR activities result in customer identification and co-creation. Similarly, banks should welcome the customers' participation in service design and use their knowledge and skills to improve overall service culture.

Keywords: *corporate social responsibility, co-creation, customer-company identification, customer loyalty, customer behavior, developing country, sustainability.*

6. De Clercq, D., Haq, I. U., & **Azeem, M. U.** (2020). The relationship between workplace incivility and depersonalization towards co-workers: Roles of job-related anxiety, gender, and education. *Journal of Management & Organization,* 26(2), 219-240. doi: 10.1017/jmo.2019.76. **(Muhammad Umer Azeem**

(Management/SBE) Web of Science JCR Listed (IF: 1.935)

Abstract: This study contributes to management scholarship by unpacking the relationship between employees' exposure to workplace incivility and their exhibition of depersonalization towards co-workers, according to the mediating effect of job-related anxiety and the moderating effects of gender and education. Time-lagged data from employees in Pakistani organizations show that an important reason workplace incivility enhances depersonalization towards co-workers is that employees feel anxious about their jobs. This mediating role of job-related anxiety is particularly salient among male and higher-educated employees, possibly because they suffer from resource losses in the form of dignity threats when they are treated with disrespect. For organizations, this study accordingly pinpoints a key mechanism by which disrespectful workplace treatment can escalate into depersonalization towards co-workers (enhanced job-related feelings of anxiety), as well as how the strength of this mechanism might depend on individual factors.

Keywords: *workplace incivility, depersonalization, job-related anxiety, gender, education level, conservation of resources theory.*

7. Raja, U., **Azeem, M. U.,** Haq, I. U., & Naseer, S. (2020). Perceived threat of terrorism and employee outcomes: The moderating role of negative affectivity and psychological capital. *Journal of Business Research, 110*, 316-326. doi: https://doi.org/10.1016/j.jbusres.2020.01.026. **(Muhammad Umer Azeem (Management/SBE) Web of Science JCR Listed (IF: 4.874)**

Abstract: Using the conservation of resources theory and the terror management theory, we proposed that the perceived threat of terrorism would hurt employees' well-being, performance and individually directed citizenship behaviors (OCBI) and increase employee stress and emotional exhaustion. We tested our hypotheses in two studies using time-lagged data with independent measures for behaviors. In study 1, two-wave data comprised of 160 peer-employee dyads supported the proposed relationships of fear of terrorism with well-being and performance and the moderating role of negative affectivity. In study 2, two-wave data from 350 employee-supervisor dyads supported the proposed relationships of perceived threat of terrorism with stress, emotional exhaustion, performance, and OCBI. Results supported a moderating role of psychological capital in these relationships. We believe that our research adds meaningfully to the limited research on the effects of terrorism on employees' well-being and behaviors. We discuss the implications of our findings for managers and the future research.

Keywords: *fear of terrorism, perceived threat of terrorism, cor theory, terror management theory, performance, ocbis, tress, emotional exhaustion, psychological capital, negative affectivity.*

8. **Azeem, M. U., Bajwa Sami, U., Shahzad, K., & Aslam, H.** (2020). Psychological contract violation and turnover intention: the role of job dissatisfaction and work disengagement. *Employee Relations: The International Journal, ahead-of-print*(ahead-of-print). doi: 10.1108/ER-09-2019-0372. **(Muhammad Umer Azeem Sami Ullah Bajwa, Khuram Shahzad (Management/SBE) (Haris Aslam (Operation and Supply Chain/SBE) SJR**

Abstract: Purpose – This paper investigates the role of psychological contract violation (PCV) as the antecedent of employee turnover intention. It also explores the role of job dissatisfaction and work disengagement as the sequential underlying mechanism of a positive effect of PCV on employee turnover intention. Design/methodology/approach – Drawing on social exchange theory (SET), the authors postulate that PCV triggers negative reciprocity behaviour in employees, which leads to job dissatisfaction and work disengagement, which in turn develop into turnover intentions. The authors tested the research model on timelagged data from 200 managers working in the banking sector of Pakistan. Findings – The findings confirmed the hypothesis that employees experiencing PCV raise their turnover intentions because of a feeling of organisational betrayal which makes them dissatisfied and detached from their work. Originality/value – This research advances the body of knowledge in the area of psychological contracts by identifying the mechanisms through which PCVs translate

into employee turnover intentions.

Keywords: *psychological contract violation, job dissatisfaction, work disengagement, turnover intention.*

9. **Raza, A.,** Rather Raouf, A., **Iqbal Muhammad, K.,** & Bhutta Umair, S. (2020). An assessment of corporate social responsibility on customer company identification and loyalty in banking industry: a PLS-SEM analysis. *Management Research Review*. doi: 10.1108/mrr-08-2019-0341. **(Ali Raza, Muhammad Khalid Iqbal (KUBEAC) SJR (SKT Campus)**

   Abstract: Purpose: This paper aims to address the need for a more in-depth empirical investigation of exploring the link between the adoption of corporate social responsibility (CSR) practices and different aspects of customer behavior in a developing country. This paper develops a research framework and assesses the mediating role of trust, customer-company identification (CCI) and electronic-service quality (E-SQ) between customer perceptions of CSR and customer loyalty.

   Design/methodology/approach: Working with a sample of 280 banking customers in Pakistan, partial least square based structural equation modeling is used to test the conceptual model.

   Findings: Surprisingly, results suggest that CSR is not directly related to customer loyalty, which is contradictory to previously established findings conducted in developed countries. Thus, confirming a full mediation of CCI, E-SQ and trust in enhancing the effect of CSR on customer loyalty. The study also confirms that CSR is positively related to E-SQ, and E-SQ also directly affects CCI.

   Practical implications: Banks should adhere to honest CSR practices and effectively communicate and advertise these practices to increase awareness and knowledge among the customers. Similarly, banks should advance in technological expertise to generate customer identification, which then leads to their loyalty.

   Originality/value: Previous studies conferred short-term customer's reactions, such as purchase intention and brand image. Still, this research discusses the long-term effect of CSR on customer behavior, such as the loyalty of the customers. Moreover, this is the pioneer study that investigates how CSR actions influence customer perceptions about E-SQ and how electronic services affect customer identification with a bank.

   Keywords: *corporate socialre sponsibility, electronic-servicequality, trust, customer firmidentification, customerloyalty, Pakistan.*

10. Zeesahn, M., **Qureshi, T. W.,** Bashir, S., & Ahmed, U. (2020). Transformational Leadership and Corporate Reputation: Mediation Effects of Employer Branding. *Journal of Management and Research*, *7*(1), 184-211. Retrieved from https://ojs.umt.edu.pk/index.php/jmr/article/view/466. **(Tariq Waheed Qureshi (Management/SBE) UMT JOURNAL**

    Abstract: The purpose of this paper is to examine the impact of transformational leadership and corporate reputation on employer branding by testing a hypothesized model. This study employed a quantitative online survey technique. The researcher distributed 350 questionnaires through purposive sampling out of which 132 questionnaires received back for data analysis. Regression analysis was selected to analyze the collected data to test the hypothesis developed from past literature. Results validate that transformational leadership has an impact on employer branding and employer branding has a direct impact on corporate reputation but correlation amid transformational leadership and business reputation goes insignificant when added employer branding showing full mediation of this variable. The present study backs the writings of business reputation that can be developed through transformational leadership and employer branding. The findings would be helpful for organizational leaders in developing strategies to create a corporate reputation.

    Keywords: *Transformational leadership, employer branding, corporate reputation, management.*

11. **Ghaffar, A.** (2020). The Impact of the Financial Cost of Caring for Greying on Emotional Exhaustion in the Workplace: The Mediating Role of Stress. *Is Ahlakı Dergisi, Turkish Journal of Business Ethics, 13*(1), 31-51. **(Abdul**

Ghaffar (Management/SBE) MJL

Abstract: The workforce around the globe is facing multiple challenges due to ever-increasing greying (ageing) of the world's population. One of the major challenges is caring for this greying population i.e. eldercare. A family member is usually the one who provides care for an elder and resultantly faces a lot of issues including financial hardships. A caregiver may face financial challenges and the impact may spill over the workplace. This financial burden may produce stress that later on results in emotional exhaustion at work. Therefore, the objective of this study is to investigate the impact of this financial burden on the employee's emotional exhaustion at the workplace. A total of 143 respondents from education, banking and health sector were included in this study. The results indicate that the impact of financial burden spills over the workplace and initially it generates stress at work that eventually results in emotional exhaustion. Furthermore, the study suggests that employers should also focus on eldercare demands carried by the employees as the burden of these demands are regarded as a "silent productivity killer".

Keywords: *financial burden, emotional exhaustion, job stress, caregiving.*

12. Khan, W., Ali, A., Khan, S., **Yazdani, N.** (2020). Islamic perspective regarding the promotion of health and participation in sports activities. *Journal of Islamic Thought and Civilization (JITC)*, *10*(1). 365-374. https://journals.umt.edu.pk/index.php/JITC/article/view/731. **(Naveed Yazdani (Management/SBE) SJR**

Abstract: Sound health is considered a prerequisite for performing any action, whether it iparticipation in sports or performing any other activity of life. From the perspective oIslam, health and fitness are imperative for the appropriate performance of various religiouobligations. Sports and other physical activities are considered very effective means to achieve good health. In this paper, the researchers analyzed diverse Islamic standards and rules with reference to participation in games. Moreover, researchers also analyzed the preservation and maintenance of health in the light of the teachings of Islam. After a briediscussion, it was concluded that the Islamic approach is very clear and Islam endorses the upkeep and maintenance of health, fitness and physical power. It was also concluded thasports and other physical activities of today are variations of such activities performed in the past. The study also claims that Islam promotes involvement in leisure sports and othephysical activities carried out to strengthen the body and to retain fitness, while observing Islamic teachings, formulated rules and regulations. It can be inferred that the Holy Prophet (SAW) not only took part in different games but also convinced and encouraged his disciples to take part in sporting activities

Keywords: *health, Islamic perspective, participation, promotion, sports activities.*

13. Farrukh, M., Meng, F., **Raza, A.,** & Tahir, M. S. (2020). Twenty-seven years of Sustainable Development Journal: A bibliometric analysis. *Sustainable Development, n/a*(n/a). doi: 10.1002/sd.2120**. (Ali Raza (KUBEAC) Web of Science JCR Listed (IF: 4.082) (SKT Campus)**

Abstract: This study aims to analyse 27 years' bibliometric data of the Sustainable Development Journal (SD). The analysis of 874 publications exhibits multi-folded growth, rising from 22 articles in 1993 to 121 articles by 2019. Moreover, the analysis of publication structure, as well as the mapping of bibliographic data based on co-citation, bibliographic coupling (BC), and co-occurrence (CC), showed the intellectual structure and the connection among the contributing universities, countries, and authors. As the first retrospection of the Journal, this study not only educates and enriches SD's global readers and aspiring contributors but also may be useful to its editorial board, as it provides several inputs to navigate for future research.

Keywords: *bibliographic coupling, bibliometrics, co-citation, co-occurrence, scimago, scopus, vos viewer.*

Department of Operations & Supply Chain

Research Articles

1. **Aslam, H.,** Blome, C., Roscoe, S., & **Azhar Tashfeen, M.** (2020). Determining the antecedents of dynamic supply chain capabilities. *Supply Chain Management: An International Journal, 25*(4), 427-442. doi: 10.1108/SCM-02-2019-0074. **(Haris Aslam, Tashfeen Azhar(Operation and Supply Chain/SBE) Web of Science JCR Listed (IF: 4.725)**

   Abstract: Purpose – The purpose of this paper is to determine the antecedents of dynamic supply chain capabilities (DSCCs). The authors test entrepreneurial orientation (EO) and supply chain learning orientation (SCLO) as two antecedents of DSCCs. Design/methodology/approach – The paper uses structural equation modelling to test a hypothetical model. Data are gathered from a survey of 275 operations managers in Pakistan's turbulent manufacturing industry. Findings – The findings suggest that the weaker direct effects of EO, in comparison to the indirect effects, indicate that an SCLO mediates the relationship between EO and DSCCs. Research limitations/implications – It is widely accepted that firms do not compete with each other, instead, it is end-to-end supply chains that fight for market dominance. Many scholars use the dynamic capabilities view to understand supply chain level competition. However, the dynamic capabilities view is firm-centric in its examination of how companies transform internal resources to compete in the external environment. The theoretical contribution of this paper is a roadmap of how to build dynamic, supply-chain level and capabilities by determining the key antecedents. This paper explains that DSCCs emerge when buyers and suppliers share strategic orientations. Firms with an EO and the ability to learn with supply chain partners are well-positioned to develop DSCCs. This provides a new angle to theory testing by indicating that dynamic capabilities are enabled by an EO and an ability to learn with supply chain partners. Practical implications – Managers are given the building blocks of DSCCs, starting with fostering an entrepreneurially-oriented mindset in the company and then learning with supply chain partners. Entrepreneurially-oriented managers are encouraged to take risks and co-develop innovative ideas with suppliers during the supply chain learning process. Originality/value – This study is one of the earliest efforts to determine the strategic orientations that antecede the emergence of DSCCs.

   Keywords: *entrepreneurial orientation, supply-chain management, structural equation model, supply chain agility, dynamic supply chain capabilities, supply chain learning orientation, market sensing, supply chain adaptability.*

2. **Usama, M., & Ramish, A.** (2020). Towards a sustainable Reverse Logistics framework/typologies based on Radio Frequency Identification (RFID). *Operations and Supply Chain Management: An International Journal, 13*(3), 222-232. **(Muhammad Usama, Asher Ramish (Operation and Supply Chain/SBE) SJR**

   Abstract: In the past, closed loop supply chains (CLSCs) were not considered as value creating chains due to complexities and uncertainties in the product returns until the introduction of radio frequency identification (RFID) in the domain of supply chain (SC), which has made the product visibility possible in the CLSCs and has overcome the issues of uncertainties in product returns. There is a lack of research to configure RFID in closed loop supply chains or reverse logistics (CLSCs/RL). The objective of this paper is to develop the typology and propose the framework for configuring RFID in the CLSC/RL by categorizing the products based on RFID tagging and correspondingly finding the place of tagging RFID to the products in the CLSC/RL on the basis of product category in order to attain sustainability in an efficient and effective manner. Two typologies (pre-tagging and post-tagging) regarding deployment of RFID in sustainable and CLSC/RL are developed along with categorization of products as single-piece and multi-piece products followed by a proposed conceptual framework for RFID configuration in Reverse Logistics domain. Empirical study is required to validate the proposed conceptual

framework. The outcomes include: improvement in product visibility, forecasting accuracy, customer satisfaction, profit and market share and reduction in inventory cost and pollution.

Keywords: *sustainability, radio frequency identification (RFID), closed-loop supply chain (CLSC), reverse logistics (RL), framework, typology, typologies.*

3. **Mukhtar, U., & Azhar, T. M.,** (2020). Inter-functional Coordination to Co-create Value Within Integrated Value Chains for Competitive Supply Chain. *Operations and Supply Chain Management: An International Journal, 13*(1), 11-22. **(Umer Mukhtar, Tashfeen Mahmood Azhar (Operation and Supply Chain/SBE) SJR**

Abstract: This paper aims to develop a conceptual model that can assist managers in the development of competitive value chain using value co-creation and integration to make the whole supply chain competitive. The model is based on theoretical and conceptual underpinnings of value co-creation, network theory, value chain, and customer value theory. The model focuses on the idea that integrated value chains with high value co-creation abilities within them would make the whole supply chain competitive. That means that if the individual firms along the supply chain work on improving their value co-creation abilities, and they are well-integrated, it will increase the whole supply chain competitiveness. It is a conceptual model that needs to be operationalized and empirically tested in the future. The model suggests high value co-creation abilities in the individual value chains with a well-integrated supply chain as a basis for supply chain competitiveness. The model includes several theoretical and conceptual views related to value co-creation. However, it may be possible to add some additional perspectives in the future research.

Keywords: *value chain, value co-creation, integration, supply chain competitiveness, supply chain performance.*

4. **Aslam, H., Khan Abdul, Q., Rashid, K., & Rehman, S.-u.** (2020). Achieving supply chain resilience: the role of supply chain ambidexterity and supply chain agility. *Journal of Manufacturing Technology Management*. doi: https://doi.org/10.1108/JMTM-07-2019-0263. **(Haris Aslam, Abdul Qadeer Khan, Kamran Rashid and Saif-ur Rehman (Operation and Supply Chain/SBE) Web of Science JCR Listed (IF: 3.385)**

Abstract: Purpose – This study analyzes the role of supply chain ambidexterity (SC-Ambidexterity) in developing supply chain resilience (SC-Resilience). We describe SC-Ambidexterity as a simultaneous application of supply chain adaptability (SC-Adaptability) and supply chain alignment (SC-Alignment) capabilities. We also consider the role of supply chain agility (SC-Agility) in the relationship between SC-Ambidexterity and SC-Resilience. We further suggest that the relationship between SC-Ambidexterity and SC-Resilience may be stronger in case of higher market uncertainty. Design/methodology/approach – Based on the dynamic capabilities view (DCV) of the firm, we develop a set of hypotheses that are tested through a survey of manufacturing firms in Pakistan. The hypothesized model is tested through structural equation modeling (SEM). Findings – The results of this study show a positive effect of SC-Ambidexterity on SC-Resilience. SC-Agility positively mediates the relationship between SC-Ambidexterity and SC-Resilience. However, our results show that this relationship does not vary at different levels of environmental uncertainty. Originality/value – This study provides the seminal operationalization of SC-Ambidexterity in the supply chain context. It further shows the importance of SC-Ambidexterity and SC-Agility in contributing toward SCResilience.

Keywords: *dynamic capabilities, supply chain ambidexterity, supply chain adaptability, supply chain alignment, supply chain agility, supply chain resilience.*

Department of Information Systems

Research Articles

1. **Wajid, B**., Iqbal, H., Jamil, M., Rafique, H., & Anwar, F. (2020). MetumpX—a metabolomics support package for untargeted mass spectrometry. *Bioinformatics, 36*(5), 1647-1648. doi: 10.1093/bioinformatics/btz765. **(Bilal**

Wajid (Information Systems/SBE) Web of Science JCR Listed (IF: 5.610)

Abstract: Motivation: Metabolomics is a data analysis and interpretation field aiming to study functions of small molecules within the organism. Consequently Metabolomics requires researchers in life sciences to be comfortable in downloading, installing and scripting of software that are mostly not user friendly and lack basic GUIs. As the researchers struggle with these skills, there is a dire need to develop software packages that can automatically install software pipelines truly speeding up the learning curve to build software workstations. Therefore, this paper aims to provide MetumpX, a software package that eases in the installation of 103 software by automatically resolving their individual dependencies and also allowing the users to choose which software works best for them.

Results: MetumpX is a Ubuntu-based software package that facilitate easy download and installation of 103 tools spread across the standard metabolomics pipeline. As far as the authors know MetumpX is the only solution of its kind where the focus lies on automating development of software workstations..

Keywords: *not available.*

2. Yu, X., Yan, J.D., Zhang, F., **Hammad, M.,** Zhang, Q. (2020). Sustainable development of sci-tech service intermediaries based on triple helix model of innovation. *International Journal of Sustainable Development and Planning*, Vol. 15, No. 4, pp. 513-519. https://doi.org/10.18280/ijsdp.150411. **(Hammad Mushtaq (Information Systems/SBE) SJR**

Abstract: Innovation is an important driver of sci-tech progress. In the innovation network, there are multiple challenges for the cooperation based on sci-tech resources, talents, and sharing mode. To cope with these challenges, it is imperative to promote the sustainable development of sci-tech service intermediaries, the external institutions that support innovation activities. Based on the triple helix model of innovation, this paper looks for the sustainable development path of sci-tech service intermediaries in the context of openness and innovation. Firstly, neural network analysis was performed to clarify the driving factors and their correlations in innovation activities. Next, the authors established an evolutionary game model of the sustainable development for the sci-tech service intermediary, and used the model to analyze the factors affecting the intermediary's cooperation strategies in innovation activities. After that, the influencing factors of the intermediary's sustainable development were identified through Matlab simulation. The results show that the sustainability of sci-tech service intermediaries depends on the information technology level, resource allocation capability, and operation and management level of its platform.

Keywords: *triple helix model of innovation, sci-tech service intermediaries, sustainable development, evolutionary game.*

Department of Marketing

Research Articles

1. Waheed, A., Zhang, Q., **Rashid, Y.,** & Zaman Khan, S. (2020). The impact of corporate social responsibility on buying tendencies from the perspective of stakeholder theory and practices. *Corporate Social Responsibility and Environmental Management, 27*(3), 1307-1315. doi: 10.1002/csr.1885. **(Yasir Rashid (Marketing/SBE) Web of Science JCR Listed (IF: 4.542)**

Abstract: This paper investigates the impact of corporate social responsibility (CSR) on buying behavior tendencies (BBTs), adopting two sub-tendencies of BBTs—exploratory acquisition of buying tendencies (EAPTs) and exploratory information seeking tendencies (EISTs)—based on the stakeholder theory and practices. Data were collected and examined using confirmatory factor analysis and structural equation modeling. The study revealed a positive relationship between CSR practices and BBTs, and a significant correlation of CSR on both EISTs and EAPTs. Additionally, it verified a positive linkage between CSR and BBTs through the mediation of EAPTs and EISTs. These results provide insights for managements, especially those in CSR-oriented firms, on how

incorporation of CSR activities may influence the BBTs of consumers. Finally, the paper discusses several implications for strategic management along with avenues for future research.

Keywords: *buying behavior tendencies, corporate social responsibility, information seeking tendencies, product acquisition tendencies, stakeholder theory, structural equation modeling.*

2. **Rashid, Y., Tanveer, A., Shaukat, Z. and Sadiq, I.** (2020), Value co-creation features: an empirical case study of B2B collaboration and interactions in New Zealand. *Digital Library Perspectives, Vol. ahead-of-print No. ahead-of-print.* https://doi.org/10.1108/DLP-02-2020-0006. **(Yasir Rashid, Anisha Tanveer, Zeeshan Shaukat, Imran Sadiq (Marketing/SBE) SJR**

Abstract: Purpose – This paper aims to highlight four features of value co-creation among actors in a business-tobusiness environment. Service-dominant (S-D) logic of marketing is used as a theoretical lens to view at the process of value co-creation. Design/methodology/approach – Using an interpretive methodological approach, the authors collected empirical material from a single case based in New Zealand. The case was based on the collaboration, interaction and relationship between vendor and client during an information and communication technology (ICT) systems integration project. The unit of analysis was "points of value creation." Empirical material came from observation, in-depth interviews and documents such as meeting notes and email logs. Interpretation highlighted four features of the value co-creation process: motivators, outcomes, disadvantages and management. Moreover, personal and network aspects of value co-creation process emerged. Findings – The findings of this study capture benefits, as well as conflicts and frustrations, in a value co-creation process. Furthermore, it provides future research motivations for researchers currently working to develop S-D logic of marketing. Originality/value – It is suggested that there is relatively little direction on how value co-creation process should be undertaken in different contexts such as retail, education, health care and ICT. There is a need to understand the dynamics and specification of value co-creation process, as the literature is scarce in this field.

Keywords: *resource integration, b2b collaboration, service-dominant logic of marketing, empirical materials marketing, qualitative methodology co-creation, value co-creation.*

3. **Sabir Sana, S.** (2020). Does product design stimulate customer satisfaction? Mediating role of affect. *Asia Pacific Journal of Marketing and Logistics*. doi: https://doi.org/10.1108/APJML-03-2019-0216. **(Sana Sameen Sabir (Marketing/SBE) Web of Science JCR Listed (IF: 2.511)**

Abstract: Purpose – Product design is a dynamic factor that triggers customers' experiential value which eventually escalates their satisfaction. Therefore, the purpose of this paper is to examine the impact of product design dimensions on customer satisfaction with the mediating role of affect. Design/methodology/approach – A survey on 225 smartphone users has been conducted to test the conceptualization empirically. Confirmatory factor analysis and structural equation modeling were performed using SPSS Amos-22.0 to confirm the hypotheses. Findings – The results indicate that affect fully mediates the relationship between symbolic dimension and satisfaction. Whereas, partial mediation of affect is observed in the relation between functional dimension and satisfaction. Practical implications – The framework of this research contributes towards the practice by facilitating managers in evaluating the impact of experiential value which product design dimensions create to influence customer satisfaction. Originality/value – This study is first of its kind to analyze how design dimensions create experiential value to influence customer satisfaction. It contributes to the literature by giving empirical evidence that affective responses like pleasure and arousal play an important role in assessing product design dimensions that influence customer satisfaction.

Keywords: *satisfaction, aesthetics, affect, symbolism, functionality.*

4. **Basharat, T.** (2020). Applying ISPAR Model of Service Dominant Logic on Mentoring a Part of Training and Development Function of HRM Functions. *International Journal of Service Science, Management, Engineering, and Technology (IJSSMET), 11*(1), 46-54. **(Taimoor Basharat (Marketing/SBE) SJR**

   Abstract: This is a conceptual article written to apply I-S-P-A-R model which was presented in 2009 by research scholars Maglio, Vargo, Caswel and Spohrer on the Mentoring in Service Dominant Logic (SDL) perspective. The author has taken a deep insight of mentoring which is a part of training and development: a function of the Human Resource Management in Good Dominant Logic (GDL) perspective. For this research, a wide range of literatures is reviewed and many disciplines have been explored which include mentoring roles, need, responsibilities, and context. Here, it is worthy to mention that mentoring and supervision are two different terms and both have different roles, too. Roles of supervisors are: boss, teacher, evaluator, expert and counselor; whereas mentoring consisted of assisting, befriending, guiding, advising and counseling. In service science, all the service systems do not fulfill the requirement to be a service system. There is also presented I-S-P-A-R which stands for Interact-Serve-Propose-Agree-Realize model of service system interactions episodes. This model is applied on mentoring in SDL perspective. At the end of this article, a conclusion is drawn and areas for further research have been mentioned.

   Keywords: *not available.*

5. Zameer, H., Yasmeen, H., Zafar, M. W., **Waheed, A.,** & Sinha, A. (2020). Analyzing the association between innovation, economic growth, and environment: divulging the importance of FDI and trade openness in India. *Environmental Science and Pollution Research*, 1-15. **(Abdul Waheed (Marketing/SBE) Web of Science JCR Listed (IF: 3.056)**

   Abstract: The objective of this paper is to explore the nexus of innovation–environment and economic growth in the context of the Indian economy. To achieve the study objective, we explored the role of technological innovation, FDI, trade openness, energy use, and economic growth toward carbon emissions. Using the data of 1985–2017, the study employed ARDL bound testing and vector error correction model (VECM) methods to capture the effects of technological innovation, trade openness, FDI, energy use, and economic growth on CO2 emissions. Empirical estimation has confirmed the existence of long-run cointegration. Similarly, in the long run, it is found that trade openness, energy use, and economic growth positively reinforce CO2 emissions. In contrast, technological innovation and FDI negatively reinforce CO2 emissions in the long run. Furthermore, VECM indicates that the relationship among innovation, trade openness, and energy use is bidirectional in the long run. Whereas, unidirectional relation has been found that is coming from GDP to carbon emissions, FDI, innovation, trade, and energy use. In the short run, unidirectional link found which is coming from FDI, innovation, and energy use to carbon emission. However, the association between emissions and trade openness is bidirectional. The conclusions put forward policy implications that innovation is a way to reduce environmental degradation.

   Keywords: *innovation, trade, CO2 emissions, growth, environment.*

6. Waheed, A., Zhang, Q., **Rashid, Y.,** Tahir, M. S., & Zafar, M. W. (2020). Impact of green manufacturing on consumer ecological behavior: Stakeholder engagement through green production and innovation. *Sustainable Development, n/a*(n/a). doi: 10.1002/sd.2093. **(Yasir Rashid (Marketing/SBE) Web of Science JCR Listed (IF: 4.082)**

   Abstract: To pursuit sustainability in all business operations is a notable challenge for firms to survive in today's competitive environment. Customers are the important stakeholders who are becoming mindful regarding the environment-friendly actions of the organizations. This study investigates the impact of green manufacturing practices (GMP) within two streams—pollution prevention practices (PPP) and product stewardship practices (PSP)—on ecological conscious consumer behavior (ECCB) along with the mediation influence of green product innovation (GPI). Data were gathered from Chinese consumers from those who prefer environment-friendly products. The findings affirmed the positive nexus between GMP and ECCB. Second, a positive mediation

influence of GPI was observed between GMP and ECCB. The multidimensional analysis revealed the positive relationships of PPP and PSP on ECCB, respectively. The findings furnish implications for green production on how organizations can accomplish stakeholder engagement incorporating green practices—GMP, PPP, PSP, and GPI— in their manufacturing operations. This study further suggests future avenues for academicians and practitioners.

Keywords: *ecological conscious consumer behavior, green manufacturing, stakeholder engagement, stakeholder theory, sustainable innovation.*

7. **Tariq, A., Rashid, Y., & Waseem, A.** (2020). Value Co-Creation in Travel Industry: Examining the Impact of Operand and Operant Resources on Actor Experience. *Journal of Management Sciences, 7*(1), 31-46. **(Amna Tariq, Yasir Rashid (Marketing/SBE) Ansar Waseem (Management/SBE) HEC Y CAT**

Abstract: The notion of value creation has now transformed into customer-centric approach. Its focus has been shifted towards the free will of customers and they are being engaged into value co-creation by means of different platforms. However, within this research, experiential innovation and human experiences have received little attention and very few studies have empirically investigated resource integration. This study explains the value of co-creation process within the travel industry by examining the impact of operand and operant resources on customers' experiences. Data was collected from 215 customers who had previously used the services of travel agents. The results indicate that both operand and operant resources are important in managing customers' experience. This study establishes the importance of human experience in creating value and guides modern firms to adopt service dominant logic instead of good dominant logic.

Keywords: *Value co-creation, resource integration, operant and operand resources, travel industry.*

8. Guo, C., Guo, J., Yu, C., Li, Z., Gong, C., & **Waheed, A.** (2020). A Safe and Reliable Routing Mechanism of LEO Satellite Based on SDN. *Computers, Materials & Continua, 64*(1), 439--454. **(Abdul Waheed (Marketing/SBE) Web of Science JCR Listed (IF: 4.890)**

Abstract: Satellite networks have high requirements for security and data processing speed. In order to improve the reliability of the network, software-defined network (SDN) technology is introduced and a central controller is set in the network. Due to the characteristics of global perspective, control data separation, and centralized control of SDN, the idea of SDN is introduced to the design of the satellite network model. As a result, satellite nodes are only responsible for data transmission, while the maintenance of the links and the calculation of routes are implemented by the controller. For the massive LEO satellite network based on SDN, a state evaluation decision routing mechanism is proposed. The designed mechanism monitors the status of the entire network effectively and reduces the on-board load on the satellite network. The best routing decision is made under the comprehensive consideration of the current and historical status of each intersatellite link between Low Earth Orbit (LEO) satellite network nodes. The calculation and storage requirements are controlled within a reasonable range. Based on the curve parameter transmission fuzzy encryption algorithm, a safe and reliable condition assessment decision routing mechanism (CADRM) is designed. It ensures that the personal information of the LEO satellite network can be transmitted safely and effectively. The experimental simulation results show the improvement of network throughput, the reduction of packet loss rate and the enhancing of network reliability.

Keywords: *Route, LEO satellite, SDN, state assessment, inter-satellite link.*

9. Akbar, K., Jin, Y., **Waheed, A.,** Afzal, F., & Mahsud, M. Impact of green practices on consumers' sustainable purchase intentions: Humans' management adopting green strategies in Pakistan. *Human Systems Management*(Preprint), 1-13. **(Abdul Waheed (Marketing/SBE) SJR**

Abstract: BACKGROUND:The rapid expansion in economies has resulted in overconsumption which is alarming for the environment. Patterns of consumption play a key role in the worsening environmental surroundings,

causing consumers to seek sustainable features in their buying patterns. Therefore, it is vital to understand the elements that lead to sustainable purchase intentions (SPI). OBJECTIVES:This study investigates the impact of distinct green practices – environment (EnV), perceived environmental responsibility (PreR), environmental advertisement (AvT), and eco-labeling (EcL) – on SPI. The originality of the present study lies in the investigation of distinct practices on SPI which has been ignored in past studies. METHODS:The data were collected from the main cities of Pakistan (n = 300) and analyzed using the partial least square and CFA. RESULTS:The results demonstrate the positive nexus of such practices – EnV, PreR, AvT, and EcL – on SPI. They provide extensive input into the growing literature of psychology in terms of humans' sustainable consumption behavior with empirical evidence from a developing nation. CONCLUSIONS:This study provided the implications for the marketers along with future research directions for academicians and practitioners.

Keywords: *sustainable consumption, perceived environmental responsibility, eco–labeling.*

10. Bashir, S., Khwaja, M. G., **Rashid, Y.,** Turi, J. A., & **Waheed, T.** (2020). Green Brand Benefits and Brand Outcomes: The Mediating Role of Green Brand Image. *SAGE Open, 10*(3), 2158244020953156. doi: 10.1177/2158244020953156. **(Yasir Rashid, Tariq Waheed (Marketing/SBE) Web of Science JCR Listed (IF: 0.715)**

Abstract: This study develops a test model that can conceptually contribute to the formation of a green brand image for the hospitality market. A conceptual model highlighting the mediating role of green brand image based on two antecedent constructs (consumer's perceived functional and emotional benefits of green hotels) and four outcome constructs (green brand preferences, trust, loyalty, and corporate image) was tested using 347 Malaysian lodging consumers. The findings indicate that the increase in consumer's perceived functional and emotional benefits will initially increase their green brand image, and eventually increase their green brand preferences, trust, loyalty, and corporate image. Moreover, the role of green brand image as a mediator exists between consumers' perceived benefits and their green brand preferences, trust, loyalty, and corporate image. Based on these findings, the managers can devise green branding strategies for their hotels, and show how green campaigns can highlight ecological concerns among green hotel consumers.

Keywords: *green brand image, green brand benefits, green brand outcomes, hospitality market.*

Conference Proceedings

1. Zakir, F., Wang, D., Rehman, A., **Waheed, A.,** Iffat, Z., & Wang, L. (2020, 29-30 Jan. 2020). *LNG supply chain: Challenges, Opportunities and Future Prospects.* Paper presented at the 2020 3rd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET). **(Abdul Waheed (Marketing/SBE) SJR**

Abstract: In the current energy challenges, natural gas (NG) has been emerged as eco-friendly source of energy with abundance of offshore and onshore reserves. Due to economic infeasibility of NG transportation via pipelines to far-off destinations, liquefied natural gas (LNG) has become one of the most promising candidates to transport natural NG around the globe. However, multiform distribution of NG reservoirs and geographical constraints among LNG exporters and importers emerged the cost-intensive challenges regarding LNG supply chains. In this research work, nature of current challenges like remote locations, cost escalations, LNG storage, scheduling and price convergence were identified. On the basis of identified issues, energy saving opportunities have been established in LNG supply chain. Design optimization of LNG process contributes to extract the energy saving opportunities and usage of jettyles LNG transfer concept is utilized for cost savings. Moreover, a way forward has been paved for possible improvements in the distinct contents of LNG supply chain.

Keywords: *liquefied natural gas, supply chain, cost savings, energy consumption.*

Department of Economics

Research Articles

1. **Zahid, T., Arshed, N., Munir, M., & Hameed, K.** (2020). Role of energy consumption preferences on human development: a study of SAARC region. *Economic Change and Restructuring*, 1-24. doi: https://doi.org/10.1007/s10644-020-09279-4. **(Tehmina Zahid, Noman Arshed (Economics/SBE) Mubbasher Munir (Quantitative Methods/SBE) Kamran Hameed (Management/SBE) Web of Science JCR Listed (IF: 1.500)**

   Abstract: A large number of studies evidenced the role of energy on growth and renewable energy as a cleaner input, which is the need of the hour as because of population and growth, the energy demand is on the rise in South Asia region. This study scrutinizes the quadratic efect of the non-renewable and renewable energy consumption mix and its impact on sustainable development while controlling for trade openness, development expenditures and industrialization. This study resorts to feasible generalized least squared model for the estimation of quadratic function for fve SAARC countries between 1990 and 2017. The results show that the non-renewable-torenewable energy mix ratio follows an inverted U-shaped relationship with HDI. Further renewable energy must be signifcantly higher than non-renewable energy in order to ensure that it is development promoting.

   Keywords: *energy mix, Asia, sustainable development.*

2. Anser, M. K., **Hanif, I.,** Vo, X. V., & Alharthi, M. (2020). The long-run and short-run influence of environmental pollution, energy consumption, and economic activities on health quality in emerging countries. *Environmental Science and Pollution Research*, 1-15. doi: https://doi.org/10.1007/s11356-020-09348-1. **(Imran Hanif (Economics/SBE) Web of Science JCR Listed (IF: 3.056)**

   Abstract: This study investigates the effect of energy utilization, greenhouses gasses emissions, and economic activities on health risks such as mortality rate and incidence of respiratory diseases in emerging Asian economies. The study analyzes a panel data from 1995 to 2018 to examine the long-run and short-run influence of environmental pollution on health issues. The empirical findings highlight that greenhouse gasses emissions, fossil fuel consumption, and natural resources depletion in the region are key factors to increasing health risks in the long-run period, while the use of clean energy and improvement in per capita economic growth is helping to improve the health status of the households. In a short period, greenhouse gasses emission is the only significant factor responsible for the high mortality rate and occurrence of respiratory diseases in the emerging economies of Asia. According to the results, there is a need for government intervention programs to rescue the region from the negative effects of environmental pollution and the utilization of nonrenewable energy. In emerging Asian countries, the combustion of fossil fuels, environmental pollution, and limited access to clean energy are such factors responsible for high mortality rate and stimulating incidence of respiratory diseases in the individuals. The study suggests that alternative green energy can prove helpful to control greenhouse gasses emissions and to control health issues by improving environmental quality. The study further suggests that the use of clean energy from water, wind, and sunlight may prove helpful to meet the energy requirement at the domestic level and improve the health status of the individuals by reducing the incidence of respiratory diseases in emerging countries of Asia.

   Keywords: *energy consumption, emerging economies, greenhouse gasses, mortality rate, respiratory diseases.*

3. **Arshed, N., Hassan, M. S.**, & Aziz, O. (2020). Does income inequality lead to education inequality? A cross sectional study of Pakistan. *UMT Education Review,* 3(1), 45–68. **(Noman Arshed, Muhammad Shahid Hassan (Economics/SBE) UMT JOURNAL**

Abstract: When firms do not know which labor is capable of efficient work, then paying all employees their average product as wage seems a feasible option. This simplest of waysdiscourages good workers and makes bad workers costly. Spence proposed to use educational attainment as the indicator of the labor force's capability to solve this problem. Since workers are randomly distributed in terms of their ability, Akerlof would lead us to believe that the level of educational attainment should be proportional to the individual's ability, which is not valid, practically. This study strives to find the determinants of educational inequality, where income inequality of the household is the prime suspect, and other indicators include gender, household size, and age. GMM instrumental variable approach was used to study the effect of income inequality on educational inequality. The results showed that it is income inequality, which restricts people from attaining higher education.

Keywords: *access to education, income inequality, GMM model, labor force survey.*

4. Suleman, S., **Sial, M. H.,** & Siddique, H. N. (2020). Nexus between Child labor, Sector-specific Growth and International Trade in Pakistan. *Journal of Business and Tourism, 6*(1), 313-326. **(Maqbool H. Sial (Economics/SBE) HEC Y CAT**

   Abstract: This study focused on analyzing the impacts of different sectors' growth and globalization on child labor in Pakistan. The order of integration variables was found mix as some were I(0) and some were I(1). That's why, the long run and short run dynamics were evaluated through ARDL mechanism using data from 1980-2014. The long run and short run inferences revealed that growth reduced child labor significantly in all sectors except services. The urban population growth significantly lessened the child labor as compared to rural population. The FDI significantly decreased the child labor growth while trade openness did opposite. Results suggest that trade policy and labor laws of ILO should be implemented.

   Keywords: *child labor, ARDL, FDI, ILO.*

5. **Ayaz, M.,** Jamal, K. F., **Shaheen, S., & Arshed, N.** (2020). Sources and Uses of Charity Fund Accounts: A Comparative Analysis of Islamic Banks in Pakistan. *COMSATS Journal of Islamic Finance, 5*(1), 14-40. **(Mohammad Ayaz, Sadaf Shaheen, Noman Arshed (Economics/SBE) HEC Y CAT**

   Abstract: Charity Fund Account (CFA) is a unique account of Islamic banks (IBs) where all Shari'ah non- compliant earnings of the banks are transferred. However, unfortunately, this has got the least attention in the academic literature so far. This case study explored the sources and uses of charity funds accounts of four Islamic banks in Pakistan. It also analyzed the disclosure level of information regarding these sources and uses of funds. The study applied content analysis technique on disclosures of charity fund composition. The study uses five-year secondary data (2014-2018) of four Islamic banks (Meezan Bank, Dubai Islamic Bank, Bank Al Barakah and Bank Islami) collected from their financial statements. The findings of the study were that there is no uniformity in the disclosure of sources and uses of charity accounts funds of the selected banks. The Meezan Bank's disclosure level was higher than the rest of the three banks. Further, among these four banks, the Dubai Islamic banks' late payment charges showed more decreasing trend over time. It means that Dubai Islamic banks performed better in controls and monitoring. The SBP as a regulator should make a detailed policy regarding disclosure of charity funds account to ensure uniformity and ultimately the comparability of these accounts.

   Keywords: *sources, uses, charity fund accounts, Islamic banks.*

6. **Arshed, N., & Kalim, R.** Modelling demand and supply of Islamic banking deposits. *International Journal of Finance & Economics, n/a*(n/a). doi: 10.1002/ijfe.1936. **(Noman Arshed, Rukhsana Kalim (Economics/SBE) Web of Science JCR Listed (IF: 0.943)**

Abstract: The purpose of the study is to assess the market of Islamic banking deposits. As banking intermediation ensures efficient allocation of excess capital, but stable availability of deposit resource helps banks to manage long-term capital structure portfolio. Unlike conventional banks, Islamic banks also have to meet the Shari'ah requirements. This study works under the domain of Islamic economics and intends to explore the demand and supply model of deposits of Islamic banks using data from financial statements, World Development Indicators and Thomson Reuters. The results using panel feasible generalized least squares model with two-way fixed effect showed that deposits are supply-elastic and demand-elastic with respect to returns to deposits. While other factors like inflation, money market rate and knowledge significantly affect supply of deposit and banking profitability and Islamic financial development significantly affect demand for deposits. This study concludes that the global Islamic banking deposit market is stable and converging hence, banks must ensure their relationship with price while devising a strategy to attract deposits.

Keywords: *convergence, deposit market equilibrium, Islamic banks, panel FGLS, price elasticity.*

7. Tara, N., **Arshed, N.,** Aziz, O., & Yamin, M. (2020). Can Financial Assistance Mediate the Training and Human Capital Relationship for Pakistani Women Micro Entrepreneurs? *International Journal of Economics and Financial Issues, 10*(4), 80-87. **(Noman Arshed (Economics/SBE) SJR**

   Abstract: Women participation in the economy can help accumulate capital formation and ideation which helps them in becoming a tool for socio-economic uplift for poor people working in the informal sector of the economy. The current research has examined the impact of financial assistance programs provided to micro and small women entrepreneurs, on the economic capital formation. Assistance programs include training and financial assistance. This research also aimed to investigate the mediating role of financial assistance between training assistance and economic capital. The methodology included empirical study, collection of data from 350 women micro-entrepreneurs from Southern Punjab in Pakistan, and analysis is conducted with the help of SPSS. Findings revealed that training assistance program has a significant impact on capital formation. While the mediation test confirmed the mediation of financial assistance between the training and economic capital.

   Keywords: *economic capital, financial assistance, informal economy, vocational training, women micro entrepreneurs.*

8. Abduqayumov, S., **Arshed, N., & Bukhari, S.** (2020). Economic Impact of Institutional Quality on Environmental Performance in Post-Soviet Countries. *Journal Transition Studies Review, 27*(2), 13-24. **(Noman Arshed, Samra Bukhari (Economics/SBE) SJR**

   Abstract: Maintaining the balance between economic growth and environmental performance is a new trend of challenges for developing countries. The economic impact of institutional quality on environmental performance is analyzed from 2001 to 2017 using multinational panel data for 15 Post Soviet-Countries. The indicators of institutional quality are government effectiveness and regulatory quality and this research is first of its kind utilizing a comprehensive Environmental Performance Index as an empirical paper for post-Soviet-Countries. This study has utilized an instrumental variable method in Generalized Method of Moments, in order to introduce dynamics and then check for endogeneity. Other controlling factors include GDP per capita, industrial manufacturing, energy efficiency, urbanization, and secondary education. The results indicate that institutional quality have a significant positive impact on environmental performance. It is suggested that the post-Soviet-Countries must ensure better institutions in order to sustain an environment for future generations.

   Keywords: *Panel GMM, Industrialization, Urbanization.*

9. **Hassan, M. S.,** Meo, M. S., Abd Karim, M. Z., & **Arshed, N.** (2020). Prospects of Environmental Kuznets Curve and Green Growth: The Role of Globalization in Developed and Developing Economies. *Studies of Applied Economics/ESTUDIOS DE ECONOMIA APLICADA, 38*(3). **(Muhammad Shahid Hassan, Noman Arshed (Economics/SBE) MJL**

Abstract: The study empirically investigated the determinants of carbon dioxide (CO2) emissions by using energy utilization intensity, and globalization. The investigation to determine linear, inverted U shaped or N shaped relationship between CO2 emission and GDP is conducted using a panel ARDL approach. 64 countries are selected for making two panel data models of developed economies and developing economies for the time period 1970-2015. The outcomes showed that in long run increase in the energy use intensity and the global integration lead to increase in the CO2 emissions. In the case of GDP, study has confirmed inverted U shape relationship proposing prospects of green growth. Hence, results of the study found that there is a significant evidence of global environmental Kuznets curve for both economies. In comparison, developing economies pollute more with increase in GDP but they are also expected to revert faster towards green growth as compared to developed economies.

Keywords: *CO2 emissions, environmental kuznets curve, green growth.*

10. Khallid, S., Asghar, N., & **Hafeez-ur-Rehman.** (2020). A Comparative Analysis of MPI Through Socio Economic Indicators in Punjab and Sindh Provinces of Pakistan. *Journal of the Research Society of Pakistan, 57*(1), 261-270. **(Hafeez-ur-Rehman (Economics/SBE) HEC X CAT**

Abstract: This study analyzes multidimensional deprivations and vulnerability in two major provinces of Pakistan using the data of Pakistan Social and Living Standard Measurement (PSLM) 2014. It compiles a Multidimensional Poverty Index (MPI) for provincial and regional levels on the basis of identification and equal weight approach as conceptual framework. The study proposes a comprehensive operationalization of a Multidimensional Poverty Index for developing countries like Pakistan, including a justification for several social and economic dimensions. This study may be helpful for structuring new policy metrics, and may provide useful information to human development experts and statisticians for assessing and using poverty indices M0 , M1 and M2 .

Keywords: *MPI, social dimensions, vulnerability, poverty indices.*

11. Shahid, M. G., Nadeem, M., **Gulzar, A.,** Saleem, M., **Hafeez-ur-Rehman**, Ghafoor, G. Z., . . . Nelofer, R. (2020). Novel Ergot Alkaloids Production from Penicillium citrinum Employing Response Surface Methodology Technique. *Toxins, 12*(7), 427. doi: 10.3390/toxins12070427. **(Ahmed Gulzar, Hafeez-ur-Rehman (Economics/SBE) Web of Science JCR Listed (IF: 3.531)**

Abstract: Ergot alkaloids are novel pharmaceutical and therapeutic agents synthesized in this study using fungal species *Penicillium citrinum.* To get the maximum yield of ergot alkaloids a statistical process of response surface methodology was employed using surface culture fermentation technique. Initially, the strain of *Penicillium* was improved using physical (ultraviolet (UV) and chemical (ethyl methane sulfonate (EMS) treatments to get the maximum yield of ergot alkaloids through surface culture fermentation technique. After improving the strain, survival rate of colonies of *Penicillium citrinum* treated with UV and EMS was observed. Only 2.04% living colonies were observed after 150 min of exposure of *Penicillium citrinum* in UV light and 3.2% living colonies were observed after 20 min of the exposure in EMS. The mutated strains of *Penicillium citrinum* were screened for their production of ergot alkaloids and after fermentation experiments, maximum yield was obtained from PCUV-4 and PCEMS-1 strains. After strain improvement, Plackett-Burman design (PBD) and Box-Behnken design (BBD) of RSM were employed and 10-fold yield enhancement (35.60 mg/100 mL) of ergot alkaloids was achieved. This enhancement in yield of ergot alkaloids proved the positive impacts of RSM and UV on the yield of ergot alkaloids. The study provides a cost effective, economical and sustainable process to produce medically important ergot alkaloids which can be used in various pharmaceutical formulations to treat human diseases.

Keywords: *BBD, EMS, PBD, Penicillium citrinum, UV, ergot alkaloids, response surface methodology, strain improvement.*

12. Batool, H., **Hafeez-ur-Rehman,** Ashagar, N. (2020). Key Dimensions and Determinants of women's Empowerment in Pakistan: Empirical Evidence from Southern Punjab. *Journal of the Research Society of*

Pakistan, 57(1), 149-169. **(Hafeez-ur-Rehman (Economics/SBE) HEC X CAT**

Abstract: Women empowerment is indispensable for attaining sustainable development goals (SDGs) 2030. This study empirically identified the key dimensions and determinants of women empowerment in Southern Punjab using primary data taken through multi stage cluster sampling technique. Considering the multidimensional nature and context a comprehensive cumulative women empowerment index is constructed through polychoric principle component analysis with six dimensions of women empowerment. The empirical results revealed that women empowerment is positively influenced by age and job of women, advertency of legal rights, access to medical facilities, participation in social gatherings, safe and clean environment, communication behavior, participation in politics and negatively by area of residence, unpaid domestic care work and fear of violence.

Keywords: *women empowerment, determinant factors, polychoric principle, component analysis, cumulative women empowerment index.*

13. Asghar, N., Batool, M., Farooq, F., & **Hafeez-ur-Rehman**. (2020). Covid-19 Pandemic and Pakistan Economy: A Preliminary Survey. *Review of Economics and Development Studies*, *6*(2), 447-459. https://doi.org/10.47067/reads.v6i2.222. **(Hafeez-ur-Rehman (Economics/SBE) HEC Y CAT**

Abstract: *The impact of pandemic Covid-19 appears to be quite uncertain across globe. The nations are trying to overcome its impact on their economies. It has affected the production, distribution and life style. Coronavirus pandemic has taken more than 5 lacs lives globally and paralysed the global economy. The developing countries like Pakistan expect to face substantial economic set back from this situation. This study analyses the impact of Covid-19 pandemic on Pakistan economy through observing the relationship between incidence of cases and number of tests conducted. Furthermore, it examines the impact of the demand-side and supply-side shocks due to Covid-19 pandemic on Pakistan economy. On supply side, this pandemic has halted the domestic and international supply chain, causing a shortage of inputs and necessities. On demand-side, decreased domestic and international demand have resulted in massive layoffs and poverty scares. Government and State Bank of Pakistan have announced different relief packages for controlling the situation but due to poor health infrastructure and lack of social protection, the people remain vulnerable to medical and financial misery. These unprecedented circumstances call for immediate policy changes for saving millions of people from virus and poverty*.

Keywords: *COVID-19, Pandemic, Pakistan, Economy.*

14. Shahid, M., & **Kalim, R.** (2020). Decentralized Tax Revenue, Institutional Complementarity and Economic Growth: A Time Series Analysis of Pakistan. *International Journal of Economics and Financial Issues, 10*(4), 25-33. **(Rukhsana Kalim (Economics/SBE) Not HEC Recognized**

Abstract: Fiscal decentralization is one of the major policy variables to attain economic efficiency. The present study examines the impact of decentralized taxes on the economic growth of Pakistan from 1976 to 2018. For examining the stationarity of variables, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Ng-Perron unit root Tests are used. Autoregressive Distributed Lag Approach (ARDL) is used for co-integration among the variables of the model. The results suggest that decentralized tax revenue i.e. income tax decentralization and sales tax revenue with political institutions have growth promoting impact on the economy of Pakistan. With strong institutions, provincial governments can give better results while transferring responsibility of collecting income tax from federal to provincial level.

Keywords: *Stationarity, Income tax and sales tax, decentralization, political institutions, economic growth.*

15. **Arshed, N.,** Meo, M. S., & Farooq, F. (2020). Empirical assessment of government policies and flattening of the COVID19 curve. *Journal of Public Affairs, n/a*(n/a), e2333. doi: 10.1002/pa.2333. **(Noman Arshed (Economics/SBE) SJR**

Abstract: The objective of the study is 2-fold. First, it estimates the 2019 new coronavirus disease (COVID19) flattening curve using Panel Random Coefficient Model. This allows each country to have its trajectory while allowing for random error effects to transfer across countries. Second, it calculates the expected number of days to reach the flattening point of COVID19 curve and estimate the empirical effectiveness of government policies around the world using Poisson regression. This study avails global COVID19 incidence data for 190 countries between January 22, 2020 and May 11, 2020. In the absence of a vaccine or of more appropriate treatment options, non-pharmaceutical approaches must be used to control the spread of the COVID19. This study proposed that the contact tracing, stay at home restrictions and international movement restrictions are most effective in controlling the spread and flattening the COIVD19 curve. At the same time, habits that hurt the immune system like smoking have a negative effect on the flattening of the curve. The government should integrate these policies in their lockdown plan to make it smart lockdown.
Keywords: *not available.*

16. Anser, M., **Hanif, I.,** Alharthi, M., & Chaudhry, I. (2020). Impact of fossil fuels, renewable energy consumption and industrial growth on carbon emissions in Latin American and Caribbean economies. *Atmósfera, 33*(3), 201-213. doi:**https://doi.org/10.20937/ATM.52732**. **(Imran Hanif (Economics/SBE) Web of Science JCR Listed (IF: 1.106)**
Abstract: This study examines the impact of fossil fuels consumption, renewable energy use and industrial growth on carbon emissions in the developing economies of Latin America and the Caribbean. An industrial growth index is developed using competitive industrial indicators, and a two-step system generalized method of moments robust estimator is employed, involving a panel of 16 middle- and lower-middle-income economies for the period 1990 to 2015. The empirical results show an Inverted-U shaped relationship between economic growth and carbon emissions and confirm the existence of the environmental Kuznets curve for the region. The results indicate that industrial growth and consumption of fossil fuels are significantly contributing to carbon emissions in the region. The results highlight that, based on competitiveness in manufacturing and the transition from simple to sophisticated technologies, advance technology-based industrial growth increases the potential to produce goods competitively with lower carbon emissions. The findings suggest that such advanced industrial growth is unavoidable to attain sustainable economic growth. Thus, technological advancement and consumption of renewable energies have the potential to both meet the rising demand for goods and energy and to control carbon emissions in the developing countries of Latin America and the Caribbean.
Keywords: *carbon emissions, fossil fuels, economic growth, industrial growth, renewable energy.*

17. Rafiq, M. Y., **Azad, Mueen Ud-Din**, Rafique, A., Chang, Lu S. (2020). Development of a Model for Retention of MS/MPhil Students at Virtual University (VU) of Pakistan. *International Journal of Distance Education Technologies (IJDET), 18*(2), 01-18. doi**:** **10.4018/IJDET.2020040101.** **(Mueen Ud-Din Azad (Economics/SBE) SJR**
Abstract: Due to the of use of ICTs and ODL, Virtual University (VU) has become one of leading distance learning university in Pakistan. However, the retention rate among online learners found considerably low. The primary objective of this research was to dig out determinants of retention of MS/MPhil students at VU and modeling their retention by considering important influences. For sampling purpose, three departments with the most students were considered and complete enumeration was done. There were 4,608 students from three departments; Computer Science & Technology, Management Sciences and Education have been included in this study. To dig out the important retention factors, this research has used a Chi-Square test, optimal scaling, a decision tree using CHAID analysis, and then developed a suitable model for student retention. Binary logistic regression techniques were applied. Results have revealed that gender, scholarship, province, location, and

division are significant factors and contributing in predicting students' retention at VU. Detailed outputs are shown in respective tables and figures. At the end, different recommendations and suggestions are proposed.
Keywords: *binary logistic regression, distance education, icts, Pakistan, retention, VU.*

18. He, W., Abbas, Q., Alharthi, M., Mohsin, M., **Hanif, I.,** Vinh Vo, X., & Taghizadeh-Hesary, F. (2020). Integration of renewable hydrogen in light-duty vehicle: Nexus between energy security and low carbon emission resources. *International Journal of Hydrogen Energy, 45*(51), 27958-27968. doi: https://doi.org/10.1016/j.ijhydene.2020.06.177. **(Imran Hanif (Economics/SBE) Web of Science JCR Listed (IF: 4.939)**
Abstract: Climate change challenges associated with global warming are an increasing concern for developing countries. Pakistan is experiencing severe energy crises, and global warming effects have considerably changed its climate, especially the temperature, which has risen significantly. Renewable energy is uninterrupted, clean, and strengthens energy security. This study employed a linear programming model to assess the potential of renewable hydrogen power and its impact on electricity prices, measured the possible demand of wind-generated renewable hydrogen for light-duty vehicles. The findings demonstrate that Pakistan has sufficient wind-generated renewable power potential, and its light-duty vehicles could shift to renewable energy. The findings of this research recommend a policy shift to light-duty hydrogen-based vehicles to eliminate fossil fuel imports and ensure green supplies. With a shift to hydrogen-based vehicles, the government could ensure maximum revenue and green supplies. The study provides valuable guidelines for decision-makers.
Keywords: *energy crises, energy security, renewable hydrogen, economic viability, energy policy.*

Book/Book Chapters

1. **Kalim, R.** (2020). Sukuk as an Alternative Source of Public Debt *Handbook of Research on Theory and Practice of Global Islamic Finance* (pp. 788-802): IGI Global. **(Rukhsana Kalim (Economics/SBE)**
Abstract: Public debt is a prime source of government revenue to finance budget deficit. Developing countries have been relying on public debt to cater the needs of fiscal expenditure. With the emergence of Islamic banking and finance across the globe, Muslim governments have introduced Sukuk (Islamic Bonds) to generate funds by the governments to meet their expenditure. The present study aims to discuss the possibilities of introducing Sukuk as an alternative way of financing public expenditure in Pakistan by replacing other conventional modes of financing in the future. The study will discuss the viable options available to the Government of Pakistan to offer Sukuk instead of bonds as a means of raising funds from abroad.
Keywords: *not available.*

2. **Arshed, N.** (2020). *Applied Cross-Sectional Econometrics*: KSP Books. **(Noman Arshed (Economics/SBE)**
Abstract: The project to write a book on applied Econometrics when I was granted with the Econometrics II course to teach to MPhil Economics, the contents of this book were developed from the lecture material which is competitive to course contents of The University of Edinburgh UK, a university where I did MSc in Economics, exploring other books, personal experience and the critical discussion by the students. The variety of contents which this book covers meet no competition with other universities in the city.
This book is an attempt to provide straight forward application based illustration of popular econometric models which are popular and available in the literature. I started this work with the idea that a research practitioner who is not versed with the basics of mathematics and statistics. He might not be able to understand the complex econometric model. This book provides firstly with some background to the model regarding what are the conditions which lead to this model selection. Secondly, basic mathematical derivations which are necessary for the concept. Lastly, STATA software-based example and its interpretation. The approach this book uses it that it

delivers the concepts of the econometric models as well as it provides guidelines to use the STATA software using coding.

This book is especially designed for the MPhil / PhD students of all social science disciplines. And researchers who want to avail the skills of latest econometric models to be used in subjects like Sociology, Psychology, Finance and Banking.

This book uses a unique way to categorize the econometric models, which makes it different from other Econometrics books available in the market. In the first chapter, it provides an example of the simple regression model, and explains what information it provides and what information it lacks, the information which is lacking is called post regression issues in Econometrics. Unlike other econometric text books, it advocates the regression issues as missing information which model needs to incorporate rather than presenting them as a disease in a model. Then this book practically explains what each issue means and then categorizes the advanced model based on its incorporation (solution) to the regression issue.

This book constitutes of chapter 1, which provides brief and necessary background knowledge of Econometrics and regression analysis. The second part includes chapters 2–5, which are provided illustrations for the cross-sectional based models.

Keywords: *not available.*

3. **Sohail, H., & Arshed, N.** (2020). Cost-Efficiency Analysis of Mudarabah Companies. In A. Rafay (Ed.), *Handbook of Research on Theory and Practice of Global Islamic Finance* (pp. 25): IGI Global. **(Hadia Sohail, Noman Arshed (Economics/SBE)**

   Abstract: The economic system recognizes the role of the financial system as an important cog in its machinery. Several theoretical and empirical studies have evidenced its contributing role to the economy. Within the overall financial system, the Islamic financial system ensures the increase in productivity of capital as well as in the synchronization between the incomes of the rich and the poor. Mudarabah companies stay at the forefront of the Islamic financial system. Their knowledge-intensive approach helps the allocation of resources in long-term ventures and, because of their participation-based setup, they can theoretically cause a trickle-down effect via their redistribution process from the borrower to the lender. Practically, though, this requires the financial institutes such as Mudarabah to be cost-efficient. This chapter explores specifically how efficient Mudarabah companies of Pakistan are in terms of cost minimization, and investigates whether different dimensions of intellectual capital can improve cost efficiency.

   Keywords: *not available.*

Department of Quantitative Methods

Research Articles

1. **Iqbal, K., Moeen, M., Ali, A.,** & Iqbal, A. (2020). Mixture regression cum ratio estimators of population mean under stratified random sampling. *Journal of Statistical Computation and Simulation, 90*(5), 854-868. doi: 10.1080/00949655.2019.1710149.**(Kanwal Iqbal, Muhammad Moeen, Asad Ali (Quantitative Methods/SBE)** **Web of Science JCR Listed (IF: 0.918)**

   Abstract: In this paper, single-phase mixture regression cum ratio estimators are presented by utilizing auxiliary variables and auxiliary attributes simultaneously under stratified random sampling. Special cases of these estimators are discussed and further mean square errors are extracted mathematically. Also, to observe the properties of proposed estimators, simulation technique is used which shows that the distribution of the proposed estimators is approximately normal. To differentiate the performance of the proposed estimators, an empirical study has been conducted by incorporating quantitative and qualitative characteristics in the form of auxiliary attributes and variables simultaneously. Comparisons are made with single-phase mixture regression cum ratio estimators under simple random sampling. It has been found that the mixture regression cum ratio

estimators employing multiple auxiliary variables and attributes, simultaneously, under stratified random sampling are more efficient than mixture regression cum ratio estimator under simple random sampling.
Keywords: *auxiliary information, mean square error, stratified random sampling, study variate, attribute.*

2. Ali, S., Altaf, N., Shah, I., Wang, L., & **Raza, S. M. M.** (2020). On the Effect of Estimation Error for the Risk-Adjusted Charts. *Complexity, 2020*, 6258010. doi: 10.1155/2020/6258010. **(Syed Muhammad Muslim Raza (Quantitative Methods/SBE) Web of Science JCR Listed (IF: 2.462)**
Abstract: Control charts are a popular statistical process control (SPC) technique for monitoring to detect the unusual variations in different processes. Contrary to the classical charts, control charts have also been modified to include covariates using regression approaches. This study assesses the performance of risk-adjusted control charts under the complexity of estimation error by considering logistic and negative binomial regression models. To be more precise, risk-adjusted Cumulative Sum (CUSUM) and Exponentially Weighted Moving Average (EWMA) charts are used to evaluate the impact of the estimation error. To compute the average run length (ARL), Markov Chain Monte Carlo simulations are conducted. Furthermore, a bootstrap method is also used to compute the ARL assuming different Phase-I data sets to minimize the effect of estimation error on risk-adjusted control charts. The results for cardiac surgery and respiratory disease data sets show that the modified control charts improve the performance in detecting small shifts.
Keywords: *not available.*

3. **Raza, S. M. M.,** Ali, S., Shah, I., & **Butt, M. M.** (2020). Conditional mean- and median-based cumulative sum control charts for Weibull data. *Quality and Reliability Engineering International, n/a*(n/a). doi: 10.1002/qre.2746. **(Syed Muhammad Muslim Raza, Muhammad Moeen Butt (Quantitative Methods/SBE) Web of Science JCR Listed (IF: 1.718)**
Abstract: This article deals with the monitoring of censored data using the cumulative sum (CUSUM) control charts for Weibull lifetimes under type-I censoring. To develop an efficient CUSUM structure for censored data, we use the conditional expected value (CEV) and conditional median (CM) approaches. In particular, we focus on the detection of shifts in the mean of Weibull lifetimes assuming censored data. In addition to fixed/known parameter values, the effect of estimation is assessed on the detection power of control charts. The performance of the proposed charts is evaluated by the average run length (ARL). Furthermore, the ARL performance of CUSUM charts is compared with CEV- and CM-based exponentially weighted moving average (EWMA) control charts. Besides an extensive simulation study, the significance of the current work is illustrated by a data set on the response time of a thermostat experiment.
Keywords: *average run length, censored CUSUM, censored EWMA, CEV CUSUM, CM CUSUM, CM EWMA, conditional expected values, conditional median, maximum likelihood estimate, type-I censoring.*

4. **Raza, S. M. M.,** Ali, S., Shah, I., Wang, L., & Yue, Z. (2020). On Efficient Monitoring of Weibull Lifetimes Using Censored Median Hybrid DEWMA Chart. *Complexity, 2020*, 9232506. doi: 10.1155/2020/9232506. **(Syed Muhammad Muslim Raza (Quantitative Methods/SBE) Web of Science JCR Listed (IF: 2.462)**
Abstract: A control chart named as the hybrid double exponentially weighted moving average (HDEWMA) to monitor the mean of Weibull distribution in the presence of type-I censored data is proposed in this study. In particular, the focus of this study is to use the conditional median (CM) for the imputation of censored observations. The control chart performance is assessed by the average run length (ARL). A comparison between CM-DEWMA control chart and CM-based HDEWMA control chart is also presented in this article. Assuming different shift sizes and censoring rates, it is observed that the proposed control chart outperforms the CM-DEWMA chart. The effect of estimation, particularly the scale parameter estimation, on ARL is also a part of this

study. Finally, a practical example is provided to understand the application and to investigate the performance of the proposal in practical scenarios.

Keywords: *not available.*

Department of Finance

Research Articles

1. **Rafay, A., Farid, S., Yasser, F.,** & Safdar, S. (2020). Social Collateral and Repayment Performance: Evidence from Islamic Micro Finance. *Iranian Economic Review (IER), 24*(1), 41-74. **(Abdul Rafay, Saqib Farid (Finance/SBE) Farah Yasser (SCA) SJR**

   Abstract: In this study we designed to test the remarkable repayment performance of Akhuwat in Pakistan; the most successful Islamic Microfinance Institution (IMFI), which offers interest-free loans in order to improve the quality of life and alleviate poverty. The model of Akhuwat is based on Muakhaat (brotherhood) and Qard-e-Hasan (offering financial assistance to somebody in need without interest). The primary objective of this study was to investigate the determinants of microfinance repayment performance. The study examined the borrowers' characteristics, loan attributes, lender/institutional characteristics and the social collateral characteristics related to the Akhuwat and the data of 387 borrowers is obtained from microfinance programs carried out on a continuous basis by Akhuwat. The findings depicted that among the socio-demographic factors like gender, marital status, number of dependents and numbers of previous loans are significantly and positively associated with loan repayment performance. However, previous loan default and religion are significantly and inversely associated with the loan repayment performance. The findings of the study supported the role of social ties in improving repayment performance and hold key insights and directions about microfinance policymaking in Pakistan.

   Keywords: *Islamic microfinance, repayments, Pakistan, social collateral.*

2. **Anwer, Z.,** Khan, S., & Abu Bakar, M. (2020). Sharīʿah-compliant central banking practices: lessons from Muslim countries' experience. *ISRA International Journal of Islamic Finance, 12*(1), 7-26. doi: 10.1108/IJIF-01-2019-0007. **(Zaheer Anwer (Finance/SBE) Farah Yasser (SCA) SJR**

   Abstract: Purpose – The purpose of this study is to document how a central bank can perform its primary and secondary functions in a Sharīʿah-compliant manner. It also seeks to investigate the outcomes of the experiments of Muslim-majority countries in this regard. Design/methodology/approach – As a first step, a detailed review of existing literature is conducted, which discusses the views of scholars and practitioners on the central banking mechanism in a fully Sharīʿahcompliant financial system. Moving further, the case studies of Iran, Sudan and Pakistan are presented to highlight experiences of regulators from three Muslim-majority countries, which aimed to achieve full compliance with Sharīʿah (Islamic law) principles related to Islamic finance. To evaluate their models, an assessment of their practices is performed in the light of Sharīʿah rules and principles based on existing literature. Finally, the issues involved in establishing a Sharīʿah-compliant central bank (SCCB) are discussed and improvements are suggested. Findings – It is found that Iran played an effective role in pursuing broader objectives of monetary policy by setting priorities for credit allocation and assisting the government in reducing expenses; however, with respect to instruments, its experience is limited to the rebranding of conventional products. Sudan has not only used monetary policy to effectively curb inflation but also it has introduced various indirect instruments to perform monetary operations. Pakistan succeeded in formulating a theoretical roadmap to establish a SCCB but the desired objectives could not be achieved because of multiple factors. Practical implications – This study has important policy implications for regulators and policymakers from Muslim countries, who can use the findings in shaping effective Sharīʿah-compliant central banking practices in their respective countries. Originality/value – This study discusses the salient features of an important Islamic

financial institution, the central bank and evaluates the experiments of three Muslim-majority countries in implementing Sharīʿah- compliant central banking practices. To the best of the knowledge, this evaluation has not been performed in the existing literature and the present study fills in this gap.
Keywords: *Pakistan, Sudan, Islamic finance, monetary policy, iran, Sharīʿah-compliant central bank.*

3. **Ajmal, M. M., Rafay, A.,** & Ajmal, M. M. (2020). Managing International Communication: Ji Trading Company. *Asian Journal of Management Cases, 17*(1), 52-60. doi: 10.1177/0972820119892704. **(Muhammad Mobeen Ajmal, Abdul Rafay (Finance/SBE) SJR**
Abstract: On 16 January 2015, Zohaib Akhtar, the company secretary and PA to the CEO of Ji Trading Company was analysing what went wrong during the day. Ji Trading Company imported heavy machinery from China for its clients in Pakistan. This year the company tried to attract more investment from their existing Chinese partners and raise new capital from local investors. Zohaib and his associate, Sheng, had been working on this deal for more than a year. They worked on understanding the Chinese culture as well as understanding the inherent differences between the Chinese and Pakistanis. Yet, on the first day, the Chinese partners came to the firm and it was a fiasco. Now he had to think about ways to stop further problems during the next month the Chinese partners were in Pakistan.
Keywords: *Investment, partnership, China, trading, Pakistan.*

4. **Khan, T. M., Nosheen, S., & ul Haq, N.** (2020). Corporate governance mechanism and comparative analysis of one-tier and two-tier board structures: evidence from ASEAN countries. *International Journal of Disclosure and Governance*. doi: 10.1057/s41310-020-00075-0. **(Tahseen Mohsan Khan, Safia Nosheen Naveed ul Haq (Finance/SBE) SJR**
Abstract: The study investigates and compares the determinants of disclosure quality of one-tier and two-tier board structures in selected ASEAN countries. We measure the significance of different corporate governance mechanism of top 50 companies from Malaysia, Indonesia, Thailand, and Singapore from 2011 to 2015. The results of independent sample *t* test prove that the variances of the disclosure quality scores of one-tier and two-tier board structures are different. In order to avoid problems of omitted variable bias, unobserved heterogeneity and endogeneity, we use the Tobit regression model with random effects. The results confirm that the disclosure quality has a dependence on board size, board expertise, board meetings, board diversity, the timeline for both one-tier and two-tier board structures. The female board members and free cash flows have sole dependence on the one-tier board, whereas board power and block holders have sole dependence on two-tier boards. The study also establishes the relationship between board independence with disclosure quality of board structures.
Keywords: *disclosure quality, board structures, asean countries, tobit regression.*

5. **Sadiq, R., Nosheen, S.,** & Akhtar, W. (2020). The Influence of Governance on Intellectual Capital in Textile Industry. *International Journal of Business and Society, 21* (1), 1-24. **(Ramla Sadiq, Safia Nosheen Naveed (Finance/SBE) SJR**
Abstract: This study is aimed to evaluate the impact of corporate governance index on intellectual capital performance by developing the index from five sub-indices and incorporating the value-added intellectual coefficient (VAIC) methodology for intellectual capital performance. Fixed and Random Effect Regression techniques have been used to analyze the data of the textile sector in Pakistan from 2010 to 2014. The findings suggest a negatively significant impact of corporate governance index on intellectual capital performance while subindices give mixed results. The study also investigates the relationship of individual variables in each subindex with performance and results show a significant relationship for five variables namely independent director, independent audit committee, foreign shareholders ownership, gratuity, and remuneration committee. This study contributed empirical work in the literature of corporate governance and intellectual capital performance.

The outcomes of this study can be used by policymakers as an attempt to boost the performance of the textile sector. A modified value-added intellectual coefficient (M-VAIC) methodology can be used in future research.
Keywords: *corporate governance, intellectual capital performance, related party transactions, textile industry, value added intellectual coefficient.*

6. Ramzan, M., Ahmed, I., & **Rafay, A.** (2020). Is auditor independence influenced by non-audit services? A stakeholders viewpoint. *Pakistan Journal of Commerce and Social Sciences (PJCSS), 14*(1), 388-408. **(Abdul Rafay (Finance/SBE) SJR**
Abstract: The auditor may provide numerous services to their clients covering audit and non-audit services (NAS). These services have been considered as a combination of services offering varying results for client firms. The mixed results reported by past studies in measuring the relation between NAS and auditor independence had generated the need of further investigation. Moreover, the dearth of literary evidence from a developing country like Pakistan also created a need for such a study. Considering the gaps left unaddressed in past studies, the current study aims at investigating the possible relationship between NAS and auditor independence. Data of the study was collected from three stakeholders of audit (i.e. accountants, finance managers, and internal auditors). Data collected through the questionnaire proved that various respondent groups have different opinions about the said relationship. It was observed that NAS were believed to have positive, negative and no effects on auditor independence. Moreover, occupational level, experience and educational level of the respondents was also observed to have significant bearing on the opinion about NAS and auditor independence relationship. The changing dynamics of the audit profession with abridged trust in its services, caused by NAS, have created the need for investigation focusing on views of various stakeholders of such services. This study attempts to provide empirical evidence on the varied perspectives.
Keywords: *auditor independence, internal auditors, non-audit services, Pakistan.*

7. Naeem, M. A., **Farid, S.,** Balli, F., & Hussain Shahzad, S. J. (2020). Hedging the downside risk of commodities through cryptocurrencies. *Applied Economics Letters*, 1-8. doi: 10.1080/13504851.2020.1739609. **(Saqib Farid (Finance/SBE) Web of Science JCR Listed (IF: 0.752)**
Abstract: Today, commodities are exposed to ever-increasing price volatilities due to extreme market uncertainties linked with financialization. The paper addresses a timely question of whether cryptocurrencies are hedge and safe-haven for commodities. We focus on this literature gap by using individual commodities from four groups, including metal, agriculture, precious metal, and energy. Further, we also consider four major cryptocurrencies, namely, Bitcoin, Ethereum, Litecoin, and Ripple for our analysis. Our findings show the functional role of cryptocurrencies as hedge and safe-haven for individual commodities. Moreover, the underlying properties are persistent during the crisis period.
Keywords: *cryptocurrencies, commodities, hedge, safe-haven.*

8. **Nosheen, S., Naveed-ul-Haq, & Khan, T. M.** (2020). ASEAN countries CG disclosure practices: a comparative analysis of one-tier and two-tier board structures. *International Journal of Business Governance and Ethics, 14*(3), 317-335. **(Safia Nosheen, Naveed-ul-Haq,Tahseen Mohsan Khan (Finance/SBE) SJR**
Abstract: Study focal point is to access the influence of CEO characteristics and audit quality on disclosure quality in the comparison between one-tier and two-tier board structures. Tobit regression model with the random effect is used to access influence on disclosure quality by using the sample of 200 non-financial firms of Indonesia, Malaysia, Thailand, and Singapore for the period from FY 2011 to FY 2015. The study empirically analyses the various characteristics of one and two-tier board structures. Findings of the study observe CEO dual role inversely and audit committee expertise directly impact disclosure quality for both structures. Further, observed audit committee size and firm size directly impact disclosure quality for one-tier structure and CEO age and leverage

inversely impact two-tier structure. Finally, CEO tenure, audit quality and audit committee independence having no impact on disclosure quality for both board structure.

Keywords: *disclosure quality, CEO characteristics; one-tier boards, two-tier boards, audit quality characteristics, non-financial firms.*

9. **Nosheen, S., Khan, T. M., & Fazal-Ur-Rehman.** (2020). SMEs Exports are Influenced by Different Risk Factors: Empirical Study of Emerging Economy. *Journal of Accounting and Finance in Emerging Economies, 6*(1), 201-218. **(Safia Nosheen, Tahseen Mohsan Khan, Fazal-Ur-Rehman (Finance/SBE) HEC Y CAT**

Abstract: Study intent to identify the direct (indirect) risk factors that can influence the export of medical instruments from SMEs sector of Pakistan by using the time series monthly data sample for a period of fifteen years that is from FY 2003 to FY 2017. Empirically a strong long term relation between the export of medical instruments with operational risk, market risk, export refinance schemes and steel prices are proven by Johansen co-integration. Study also establishes a direct positive relation of operational risk and market risk with the export of medical instruments as a result of Vector Error Correction Model.

Keywords: *medical instruments, market risk, operational risk, export refinance, smes.*

10. Naeem, M. A., **Farid, S.,** Faruk, B., & Shahzad, S. J. H. (2020). Can happiness predict future volatility in stock markets? *Research in International Business and Finance, 54*, 101298. doi: https://doi.org/10.1016/j.ribaf.2020.101298. **(Saqib Farid (Finance/SBE) Web of Science JCR Listed (IF: 1.801)**

Abstract: In this paper, we use the Twitter based happiness index as a proxy for investor sentiment in order to examine whether happiness influences future market volatility of country VIX indexes. Our sample includes the major stock markets of the USA, Canada, UK, Germany, France, Netherlands, Switzerland, Japan, China, Hong Kong, India, Brazil, South Korea, and South Africa. Using linear and nonlinear causality tests, we find that Twitter happiness significantly causes the future volatility of the sample countries. The robustness checks show no divergence from our primary findings and provide strong evidence of a nonlinear relationship between investor sentiment and future stock market volatility.

Keywords: *G12, G14.*

11. Liu, C., Muhammad Abubakr, N., Mobeen Ur, R., **Farid, S.,** & Syed Jawad Hussain, S. (2020). Oil as Hedge, Safe-Haven, and Diversifier for Conventional Currencies. *Energies, 13*(17), 4354. doi: http://dx.doi.org/10.3390/en13174354. **(Saqib Farid (Finance/SBE) Web of Science JCR Listed (IF: 2.702)**

Abstract: The research investigates the safe-haven, hedging, and diversification function of crude oil for conventional currencies, among which five are major oil exporters, and six are major oil importers. In order to model time-varying dynamic correlations between crude oil and currencies, the study uses the Asymmetric-DCC model. The findings highlight low or negative correlations, especially during the crisis period. Next, we employ a quantile based regression framework and conclude distinct safe-haven and hedge functions of oil for major currencies. We provide additional evidence on the safe-haven, hedging, and diversification function of crude oil using the cross-quantilogram framework. The findings of out of sample analysis illustrate that the hedging effectiveness of oil is greater for oil-exporting countries. In addition, the conditional diversification benefit of oil is higher in the lower quantiles, i.e., when both foreign exchange and oil markets are in a bearish state. Finally, implications for investors, portfolio managers, and policymakers are further discussed.

Keywords: *hedge, safe haven, crude oil, currency.*

12. **Anwer, Z.** (2020). Salam for import operations: mitigating commodity macro risk. *Journal of Islamic Accounting and Business Research, 11*(8), 1497-1514. doi: 10.1108/JIABR-09-2018-0142. **(Zaheer Anwer (Finance/SBE) SJR**

Abstract: Purpose: This paper aims to present the idea of using classic Islamic finance instrument *Salam* to conduct import transactions. It documents the complete framework of the proposed model. At present, this mode is not used by Islamic Financial Services Industry although it is capable of becoming a viable risk-sharing instrument.

Design/methodology/approach: First, the features of existing import financing products are explored and compared with various contractual features of *Salam*. Second, a discussion on why banks are reluctant in practicing *Salam* is included. Third, the pricing techniques, accounting treatment and collateral arrangements related to proposed product are discussed. Finally, the feasibility of this product in present industry environment is assessed.

Findings: The proposed model carries certain features that make it a true risk-sharing product. For example, it suggests changing bank's role from intermediary to entrepreneur and favours better alignment of risk between the related parties. This work has also proposed using market-based returns, instead of the existing interest-based benchmarks, for pricing the contract. To practice this product, a dedicated effort of all the stakeholders is required. The product features can contribute to the goal of practicing responsible financing, engrained in true economic reality.

Research limitations/implications: The present work is a technical paper, and the product features may be improved in the light of feedback from the industry and academia.

Practical implications: The proposed model views Islamic bank as a trader instead of a lender, who will assume the effective ownership of imported goods before selling them to the customers. The pricing structure will also be unique, as the margins will be decided upon the basis of market-driven returns of the underlying assets. Indeed, by entering into such contract, Islamic Banks will be exposed to market-related risks. They will be required to design their risk management frameworks accordingly.

Originality/value: It is widely argued that many Islamic finance products are similar to their conventional counterparts in substance. There is a need for the instruments that carry risk sharing attributes. This paper aims to bridge this gap by investigating the potential of classical Islamic finance product *Salam* for conducting foreign trade transactions.

Keywords: *Islamic banking, Islamic finance, Salam, Foreign trade.*

13. Ahad, M., & **Anwer, Z.** (2020). Do movements in macroeconomic determinants affect American depository receipt prices? Evidence from France. *International Journal of Finance & Economics, n/a*(n/a). doi: 10.1002/ijfe.2237. **(Zaheer Anwer (Finance/SBE) Web of Science JCR Listed (IF: 0.943)**

Abstract: This study investigates the impact of home country macroeconomics variables on American Depository Receipt (ADR) prices for the period 2000–2016 for France using combined cointegration approach. The results reveal strong association between ADR prices and macroeconomic variables. It is observed that, in the long run, money supply, oil price, real exchange rate and market index increase ADR prices while inflation and economic growth significantly decrease ADR prices. Similarly, the short run results reveal that exchange rate and share price index exert positive and significant effect on ADR prices whereas economic growth has negative and significant effect on ADR prices. Furthermore, bi-directional causality between ADR prices and explanatory variables is observed. This study highlights some significant policy implications for ADR investors. **Keywords:** *American depository receipts, economic growth, France, inflation.*

14. Ahad, M., & Anwer, Z. (2020). Asymmetric impact of oil price on trade balance in BRICS countries: Multiplier dynamic analysis. *International Journal of Finance & Economics, n/a*(n/a). doi: 10.1002/ijfe.1900. **(Zaheer Anwer (Finance/SBE) Web of Science JCR Listed (IF: 0.943)**

Abstract: This paper examines the impact of oil prices on the trade balance by incorporating wholesale prices and an industrial production proxy for economic activity as supporting variables for the BRICS countries. Quarter

frequency data from 1992 to 2015 is used. Keeping in view the structural breaks and resulting asymmetries, long-run and short-run dynamic estimations are conducted using the nonlinear ARDL approach proposed by Shin, Yu, and Greenwood-Nimmo. We find a positive and significant asymmetric relationship between oil prices and the trade balance in Brazil, India, China and South Africa. The asymmetries of wholesale prices also have a positive and significant effect on the trade balance in the cases of Russia, India and South Africa. The asymmetries of industrial production have a significant but negative impact on the trade balance for India and South Africa. These nonlinear and diverse relationships of oil prices, wholesale prices and economic activity with the trade balance are also confirmed by long-run parameters for BRICS countries. This study opens some new insights for policy making.

Keywords: *Asymmetries, BRICS, oil prices, trade deficit.*

15. **Anwer, Z.,** Mohamad, S., Paltrinieri, A., & Hassan, M. K. (2020). Dividend payout policy of Shariah compliant firms: Evidence from United States. *Pacific-Basin Finance Journal*, 101422. doi: https://doi.org/10.1016/j.pacfin.2020.101422. **(Zaheer Anwer (Finance/SBE) Web of Science JCR Listed (IF: 2.382)**

Abstract: This paper investigates the effects of religious screening on payout behavior of US firms. *Shariah* compliant (SC) indices serve as suitable sample as they are emerging as alternative investment class in the last two decades. Through an analysis of a sample of US firms belonging to Dow Jones proprietary database for the period 2006–2018, this study provides evidence that SC firms are more prone to make total payout, cash dividends and repurchases. We use panel logistic regressions with industry and year fixed effects. The findings reveal that the drivers of higher propensity of total payout are higher profitability, higher retained earnings, lower debt capital structure and lower asset growth. The factors that contribute to likelihood of paying higher cash dividends are higher profitability, lower governance levels and lower market/book assets ratio. Moreover, better governance, lower asset growth and lower equity/assets increase the propensity of SC firms to make higher repurchases. These findings are important contribution to the Islamic corporate finance and dividend policy literature.

Keywords: *dividend policy, Islamic finance, stock screening, portfolio management, shariah compliant firms.*

Book/Book Chapters

1. **Rafay, A.** (2020). *Growth and Emerging Prospects of International Islamic Banking*. IGI Global. http://doi:10.4018/978-1-7998-1611-9. **(Abdul Rafay (Finance/SBE)**

Abstract: As an ever-growing international business, Islamic banking has changed the face of economics in recent years. As more and more industries embrace Islamic principles, the industry will unquestionably influence modern economic practices and techniques across the globe.

Growth and Emerging Prospects of International Islamic Banking is a collection of innovative research on the methods and applications of Islamic banking interests on a global economic scale. While highlighting topics including asset diversification, profit sharing, and financial reporting, this book is ideally designed for bankers, banking analysts, international business managers, financiers, industry professionals, economists, government officials, academicians, students, and researchers seeking current research on Islamic banking perspectives and approaches to finances.

Keywords: *asset diversification, banking governance, financial reporting, global business, islamic law, limited purpose banking, ownership risk, profit sharing, return rate, risk management.*

Conference Proceedings

1. **Haq, N. U.,** Ullah, R., & Todeva, E. (2020). *From R&D to Innovation and Economic Growth: An Empirical-Based Analysis from Top Five Most Innovative Countries of the World.* Proceedings of the II International

Triple Helix Summit, Lecture Notes in Civil Engineering 43, Springer Nature Switzerland AG. **(Naveed ul Haq (Finance/SBE)** **SJR**

Abstract: This paper discusses the linkage between innovation and the economic growth of a country and what are the factors that shape largely the technology and technological advances of a country. We look at the effect of innovation policies in Pakistan on developing the innovation system and on innovation spillover effects at organizational and institutional levels.The present study undertakes the world's most innovative countries for finding the relationship between R&D, innovation and economic growth. Among the countries discussed are Sweeden, Switzerland, and the United Kingdom.

Keywords: *R&D, Innovation, Economic growth, GMM, Innovative countries of the world.*

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Research Articles

1. **Mehmood, U.,** & Tariq, S. (2020). Globalization and CO2 emissions nexus: evidence from the EKC hypothesis in South Asian countries. *Environmental Science and Pollution Research*. doi: 10.1007/s11356-020-09774-1.**(Usman Mehmood (DPSIR/SSSH)** **Web of Science JCR Listed (IF: 3.056)**

Abstract: In the last few decades, developing countries continued to increase their manufacturing industries' phenomenal growth rate. Due to the emergence of globalization, these developing countries are getting economic growth at the cost of environmental pollution. In this context, the extent of linkages between globalization and carbon dioxide (CO2) emissions has been investigated over the time period of 1972–2013 in South Asian countries. The econometric and graphical analyses are found U-shape association between globalization and CO2 emissions in Nepal, Afghanistan, Bangladesh, and Sri Lanka, and an inverted U-shape relationship is observed in Pakistan and Bhutan. Moreover, results have shown that there exists a bi-directional causality between globalization and CO2 emissions in Pakistan, Bangladesh, and Nepal. This indicates that globalization is increasing CO2 emissions and CO2 emissions impact globalization by economic growth. However, after some threshold level, globalization is responsible for decreasing CO2 emissions in Pakistan and Bhutan. For the first time, globalization is incorporated in the economic analysis, showing the U-shape and inverted U-shape associations between globalization and CO2 emissions. This study suggests some strong policy recommendations to consider globalization as cost-effective tool to achieve sustainable economic growth in South Asian countries.

Keywords: *Globalization, CO2 emissions, South Asia, EKC.*

2. **Shehvaar, D. e., Idris, W., & Ahmed, M.** (2020). Climate Change and the Surge for Pandemics. *Journal of Sustainable Development, 13*(3). doi: DOI:10.5539/jsd.v13n3p138. **(Durr e Shehvaar, Wardah Idris Mubashira Ahmed (DPSIR/SSSH)** **Not HEC Recognized**

Abstract: The pandemic of the century has caused great concern about the global environmental crisis. The article outlines the various aspects of the surge of pandemic its link to climate change along with the prospects for the nation-states and how they have seen it as a challenge as it is being seen as taking thousands of lives. In the literature review, the research problem that has been tailored is if the pandemic can create a common awareness about the global climate crisis that has destructive projections for the globe itself. A causal link between the surge of pandemics and climate change that helps spread the viruses has been created. In addition to this, we further argue that the nation-states and their exploitative corporate goals that are manipulating the environment should be curbed through decisive steps.

Keywords: *climate change, environmental crisis, nation-states, pandemic.*

3. **Sajjad, F., & Ahmad, S.** (2020). The Policy and Practice of'Enlightened Moderation': Representations in

International Print Media. *Pakistan Horizon, 73*(1) 101-110. **(Fatima Sajjad, Sara Ahmad (DPSIR/SSSH) HEC X CAT**

Abstract: This study discusses President Pervez Musharraf's policy of Enlightened Moderation (EM) which he formulated after the incident of 9/11, for the Muslim world as well as for the western world. Elaborating on his policy of EM, president Musharraf appealed to the world to eradicate global violence by putting an end to political disputes in the Muslim world. He also suggested that in order to promote peace, the West should help the Muslim world for their socio-economic betterment. This study analyses the representations in the international print media on the policy of Enlightened Moderation which pointed out that Musharraf's policy of EM was self-contradictory because he did not implement his idea in his own country. It also disclosed that, contrary to popular perception, Musharraf's policy of EM was mostly criticized in the media, despite his support for the internationally sanctioned Global War on Terror.

Keywords: *not available.*

4. **Qureshi, A.** (2020). Countering Extremism and Radicalization: The Role of Muslim Women Activists in informing Ethno-Religious Minority Policies in the UK (2001-2016). *Pakistan Horizon, 73*(1), 79-100. **(Abeeda Qureshi (DPSIR/SSSH) HEC X CAT**

Abstract: This article examines the role of Muslim women in informing ethnoreligious minority policies in the UK (2001-2016). Using Muslim women activists as a case study, it explores how this relationship works in practice and whether the role played by Muslim women is symbolic or substantive. Specifying the 'decentred' theory of policymaking, I employ a 'hybrid' approach and take further insight from Saward's 'representation' theory to answer the aforementioned questions. Using evidence from the documentary analysis of public records and in-depth elite interviews of Muslim women activists, community leaders and government officials, this article highlights the presence of a systematic and institutionalized nature of the engagement between the government and Muslim women activists. It concludes by highlighting the positive role of non-elected Muslim women in the promotion of dialogue between the wider Muslim population and a variety of government departments.

Keywords: *multiculturalism, integration, preventing violent extremism, radicalization, muslim women activists, policy debates. terrorism.*

5. **Shabbir, M. O.,** Shabbir, M. F., **Rizvi, S. Z., & Asghar, Z.** (2020). Rise of Xenophobia in West: Indian exploitation and its implication on Pakistani Diaspora. *Journal of Indian Studies, 6*(1), 47– 56. **(Muhammad Omer Shabbir (DPSIR/SSSH) Syeda Zahida Rizvi, Zainab Asghar (ILA) HEC Z CAT**

Abstract: The world is witnessing the rise of xenophobia in the Western society and culture that is massively deteriorating the social fabric of the western society and creating a gulf between the natives of different countries and the locals. A considerable number of Political Scientists including the famous Noam Chomsky are of the view that it is nothing but a planned manipulation of minds of the local people by the ruling elite for getting their electoral gains and portray Muslims as a monster that are serious threat for the stability and security of the Western society. The paper intends to unfold the xenophobic trends and the Indian role in fueling the xenophobia against the Pakistani Diaspora. The theoretical lens that will magnify the literature would be the Social Constructivism. The paper will highlight the exploitation of minds by the Western political parties that ultimately help them to get the desired results in the electoral process with primary focus on the Pakistani Diaspora. The paper will also illuminate the fears of the Western society about the decaying trends in their culture and linguistics.

Keywords: *xenophobia, West, Indian role, Pakistani diaspora.*

6. **Owais, M.** (2020). Indian Ocean and Indo-China Rivalry: Challenges for Pakistan. *Journal of Indian Studies, 6*(1), 91-100. **(Muhammad Owais (DPSIR/SSSH) HEC Z CAT**

Abstract: Indian Ocean is the third largest Ocean of the world providing sea route for almost half of the global

trade. It has also become a reason of conflict for regional powers such as China and India, as well as for external powers. Both countries are trying to secure their interests at every cost challenging the peace and security. This paper gives an analytical review on the interest of world powers specially the interests and ambitions of China and India. Based on their interest and geo-political rivalry, this paper aimed at discussing the challenges associated for Pakistan. This paper concluded that the role played by the rival and regional powers is endangering the existence of many states including Pakistan in this region.

Keywords: *Indian Ocean, China, India, Pakistan.*

7. **Tariq, A., & Owais, M.** (2020). A Case Study of Operation Gibraltar and Indo-Pak War of 1965: An Application of Decision-Making Models. *Journal of Indian Studies, 6*(1), 131-138. **(Azeem Tariq, Muhammad Owais (DPSIR/SSSH) HEC Z CAT**

   Abstract: This paper focused on the real reasons and objectives behind the launch of Operation Gibraltar and Grand Slam. It also throws light on the trigger points of Indo-Pak war of 1965. The primary objective of this paper is to apply the various decision-making models on the case study of Operation Gibraltar and 1965 war. What were the real issues that forced Pakistan to choose the alternative of secret mission to infiltrate into Indian Occupied Kashmir? In this article, the authors tried to give different explanations of Operation Gibraltar. These explanations include: rational choice explanation, cybernetic explanation, prospect theory explanation, poliheuristic explanation, bureaucratic explanation, and organizational explanation from the best alternatives for conducting Operation Gibraltar.

   Keywords: *Indian Occupied Kashmir, Operation Gibraltar, Rann of Kutch, Akhnur.*

8. Farrukh, A., & **Owais, M.** (2020). Brexit implosion: will UK survive the unity of kingdom? *Journal of European Studies, 36*(1), 93-112. **(Muhammad Owais (DPSIR/SSSH) HEC Y CAT**

   Abstract: The UK decided to leave European Union. In fact, it had triggered the Article 50 in 2017, which acts as the exit button for any EU member if it wants to leave the Union. So far, it has been an unprecedented move by the UK as no country has ever left the EU. The study is focused on the phenomenon of Brexit and the aftershocks it is likely to cause in times to come. The purpose of this research is to analyse the future scenario that could take shape in the aftermath of the British referendum of 2016, both for the EU and the likely future of the UK itself. Brexit is an ongoing phenomenon. I shall use an empirical method while using the data collected from the various sources such as newspapers, the magazines, journals and the research articles. Besides, the online sources including the government sources will also be used. The method of this research is qualitative. Although I have written this research in the light of the reference used and the nature of this work is predictive. With the lens of realist perspective, this article concludes that the future of the EU is bleak if Brexit happens, even bleaker for the UK itself regarding the integration of the country.

   Keywords: *not available.*

Conference Paper

1. **Qureshi, A.** (2020). '*Countering Extremism and Radicalization: The Role of Muslim Women Activists in Informing Ethno-Religious Minority Policies in the UK'(2001-2016)*. Paper presented at the 1st International Conference 2020 Advances and Challenges in Basic & Social Sciences in Contemporary Research under Higher Education Commission of Pakistan at Government Islamiyah College, Coper road, Lahore. February 12– 13, 2020**. (Abeeda Qureshi (DPSIR/SSSH)**

   Abstract: This article examines the role of Muslim women in the implementation of ethno-religious minority policies in the UK from 2001-2014. Using Muslim women as a case study, I aim to understand how this relationship works in practiceand whether the role played by Muslim women is symbolic or substantive.Also, I attempt to explore whether the engagement between the government and Muslim women has increased since

2010, with the change in the government from New Labour to the Coalition.Last but not least, the representative claims of the women involved in the policy process is examined to determine the legitimacy of the whole process. Specifying the 'decentred' theory of policy making, I employ a 'hybrid' approach to policy implementation and take further insight from 'Saward's (2006; 2009) 'representation' theory to answer the aforementioned questions.The theoretical framework helps meto justify thethree level analysis, e.g. national, local and individual case studies. Using evidence from the documentary analysis and in-depth elite interviews, I highlight the positive role of non-elected Muslim women in the implementation of policies towards the Muslim community. The particular importance of the thesis lies in the way I apply the 'decentred' government' approach and the 'hybrid' model of policy implementation to appreciate how Muslim women and local actors can 'twist' national policy to suit local needs. The empirical findings on how women approached engagement through Prevent, and how local actors negotiated a 'grey space' to pursue more locally appropriate approaches, are both significant interventions in the wider debate on Prevent and its implications for Muslim women's and state-Muslim engagement.

Keywords: *multiculturalism, integration, preventing violent extremism, radicalization, muslim women activists, policy debates. terrorism.*

Department of Sociology

Research Articles

1. **Malik, B.**, Lyndon, N., & Yew, V. W. (2020). Understanding the Relationship between Refugees and the Host Community Through Afghan Refugees' Lived Experiences in Pakistan. *Asia-Pacific Social Science Review, 20*(1). **(Beenish Malik (Sociology/SSSH) SJR**

Abstract: With massive forced displacement, hosting refugees has become one of the leading concerns for developing countries like Pakistan. In the given context, this article is an attempt to unfold the nature of the relationship between the Afghan refugees and their Punjabi host community. To understand, describe, and interpret the essence of the refugees' lived experiences, 31 adult Afghan refugee scavengers were involved in this qualitative study through semi-structured in-depth interviews. The collected data revealed that while being in exile, the Afghans had formed new relationships with their hosts. These relationships were generally positive and reciprocal in nature. The Afghans confirmed the absence of discrimination and harassment from the hosts and highlighted both the monetary and nonmonetary help that they receive from the native residents at times. However, despite being in good terms, Afghan refugees reported restricted movements with the host community. The reasons were predominantly grounded in Afghan traditions of protecting the honor of the women and the privacy of the household by limiting the contact with native residents. It emphasizes the need to further enhance the interaction among refugees and hosts.

Keywords: *Afghan refugee, scavenger, lived experience, host community.*

2. **Jamil, M. F., & Sohail, T.** (2020). Role of Socialization Patterns towards Adopting Rigid Sectarian Identities. *Journal of Islamic Thought and Civilization (JITC)*, *10*(1). Retrieved from https://journals.umt.edu.pk/index.php/JITC/article/view/651. **(Muhammad Faizan Jamil, Tayyaba Sohail (Sociology/SSSH) SJR**

Abstract: Religion is an essential part of individuals' daily routine practices in the Pakistani society. People rigorously own and defend their particular religious beliefs in the extremely diversified population of the country. The induction of sectarian ideologies in the mindset of children begins with their early socialization. This process further develops with the passage of time and the mindset of children becomes extremely rigid. Sectarian rigidity advances the elements of disrespect and intolerance among the believers of adverse sectarian groups. This study was aimed to explain the role of socialization patterns (religious ideological orientation, cultural socialization and

peer group pressure) in enhancing sectarian rigidity in the society. Survey research was conducted in two high ranking universities of Lahore (one government university and one private university). It was based on the responses collected from 250 participants who were selected through the application of simple ransom sampling technique. Two hypotheses were tested to evaluate the relationship and the predictive role of socialization patterns in enhancing the element of sectarian rigidity in individuals. The results of the current study revealed that there was a significant positive relationship between socialization patterns and sectarian rigidity after the application of Pearson product-moment correlation test. Furthermore, the results computed through multilinear regression analysis showed a significant and positive predictive role of socialization patterns in enhancing sectarian rigidity. Thus, religious ideological orientation, cultural socialization and peer group pressure influenced the behavior of individuals that generate rigid sectarian identities in the society.

Keywords: *not available.*

3. **Hussain, B.,** Sheikh, A., Timmons, S., Stickley, T., & Repper, J. (2020). Workforce diversity, diversity training and ethnic minorities: The case of the UK National Health Service. *International Journal of Cross Cultural Management, 20*(2), 201-221. doi: 10.1177/1470595820938412. **(Basharat Hussain (Sociology/SSSH)** SJR

Abstract: This research studied an NHS organization as a case to explore how it is responding to cross-cultural issues against a backdrop of policy expectations about equitable and good quality mental health service provision to service users of a minority ethno-cultural group in the UK. Data were collected by conducting semi-structured interviews with 20 participants from three hierarchical levels of the organization. The research found that the concepts of culture and ethnicity are used in a fixed way in the interventions (staff diversity training and ethnic matching) taken by the case organization. It is argued that this fixed understanding of cultural concepts and related interventions may not be helpful in meeting the needs of service users, especially in the context of United Kingdom, which is characterized as a super-diverse society. It appears that the interventions are developed and implemented on the conceptualization of cultural identity as generic and fixed. Organizations working in a multicultural society, or where they have service users from a variety of ethnic and cultural backgrounds, need to develop and implement interventions based on individualized and fluid understanding of such concepts. The findings of this study contribute to cross-cultural management scholarship by taking a critical stance on the concept of culture, as it is operationalized by a large organization. We show how, even when required by national policy, this one-dimensional model of culture causes human resource management interventions, intended to address cultural diversity, to be perceived as ineffective.

Keywords: *cross-cultural issues, cultural identity, cultural diversity training, ethnic-matching, mental healthcare, NHS.*

Department of Education

Research Articles

1. **Arif, S.,** Asghar, Z., & Mukhtar, S.(2020). Interactive effect of school principals' leadership styles and teacher characteristics on curriculum implementation at public secondary schools of Punjab. *UMT Education Review,* 3(1), 95–119. **(Seema Arif (Education/SSSH)** UMT JOURNAL

Abstract: The research was conducted in the positivist paradigm to determine the interactive effect of school principals' leadership style and the teaching characteristics (traditional Vs. Progressive) of school teachers on curriculum implementation. The research further explores how teaching characteristics mediate between school principals' leadership style and curriculum implementation. Higher secondary school teachers' perceptions were collected from 600 teachers teaching at secondary schools in six districts of Punjab. Multistage sampling was used to draw a sample from a large and diverse population. Descriptive and inferential statistics were used to determine the relationship among various constructs leadership styles, teacher

characteristics, and strategies used for the curriculum implementation at secondary schools of Punjab. Path analysis using Structure Equation Modeling with AMOS yielded unique relationships among leadership styles of school principals and teacher characteristics for curriculum implementation. Democratic style of school principals was found to exert maximum direct influence on curriculum implementation with no teacher characteristics mediation. However, it is found that both teacher characteristics play a significant mediating role in curriculum implementation; the visionary style was best mediated through progressive characteristics, and 2) commanding style was mediated through traditional characteristics. The research draws attention to existing gaps in developing teacher expertise for curriculum implementation, which need to be addressed to prepare future teacher leadership in Pakistan.

Keywords: *curriculum implementation, progressive teaching, secondary school principals, traditional teaching.*

2. **Khokhar, A. J., & Muhammad, Y.** (2020). Islamic Habitus in English Language Textbooks Produced by Boards in Pakistan. *Journal of Islamic Thought and Civilization (JITC)*, *10*(1). Retrieved from https://journals.umt.edu.pk/index.php/JITC/article/view/653. **(Ashar Johnson Khokhar, Yaar Muhammad (Education/SSSH) SJR**

Abstract: The textbook is an important and powerful tool used by the state to reproduce the social and cultural habits of a group, most often, of the majority group's social and cultural imaginations. The habitus produces and instills the world-view about society, the social and cultural values that a state valorized and would like pupils to internalize and make it part of their world-view. This study analyzes the English textbook published by the state textbook boards (Punjab, Khyber Pakhtunkhwa, and Sindh) for the academic year 2018-2019 for pupils of classes four to eight. The textbook content was analyzed using the Qualitative Content Analysis method. The content of 15 textbooks was digitized (scanned and made readable) to electronically categorized the text into categories using Nvivo 12 Plus software. The analysis revealed that the content is focused on developing and promoting Islamic habitus through stories weaved around family, making it a core component of a Muslim country. The family members practiced Islamic values, social and cultural, not only through their everyday lives at home, in school, and at other public places but also within their community through the celebration of cultural and religious festivals. The textbooks presented the Prophet Muhammad (PBUH) and his family's life as an ideal life to be lead by all, whether Muslims or non-Muslims. The textbook highlighted the 'good,' the 'bad,' valorizing the former and stigmatizing the latter to encourage pupils to develop an Islamic world-view. The textbooks fail to look into the micro-level national habitus, that is, portraying the habitus of its minorities, ethnic and religious, as the content did not integrate their habitus into the national habitus of Pakistan, making it the habitus of the majority. The current fast globalizing world needed to be presented to pupils a world-view, and this required, broadening the scope of textbook content to make it reflective of true Pakistani habitus aligned and rooted in the humane global world-view.

Keywords: *not available.*

3. **Nadeem, M., Arif, S.,** & Naeem, M. (2020). The Role of Principals and Administrators in Performance Appraisal of School Teachers in Punjab. *Sir Syed journal of Education and Social Research* (*sjesr), 3*(2), 132-142. doi: https://doi.org/10.36902/sjesr-vol3-iss2-2020(132-142). **(Muhammad Nadeem, Seema Arif (Education/SSSH) HEC Y CAT**

Abstract: *Qualitative research was conducted in the interpretive paradigm using phenomenology as an approach to check the execution of the performance appraisal system (PAS) at higher secondary schools in Punjab. The population of the study consisted of key stakeholders of appraisal, higher secondary school principals, teachers, and district administration. 6 out of 36 districts were selected from school district rankings, each falling in poor, good, and average criterion. Participants of one district served as a pilot and the rest for the main study. A total of 35 participants were selected from five districts purposively; a selection criterion was used to select a set of one*

administrator, one principal and five teachers from each of the five districts. After obtaining consent from the participants, structured interviews were conducted with the school principals and district administrators, while the focus group was held with the teachers of each district using self-constructed interview protocols. Thematic analysis was performed on data obtained from different sources. Seven themes emerged during analysis reflected that the principals and teachers have enough knowledge and experience to conduct the PAS. It is a positive activity that must be continued; however, the procedure needs improvement. PAS should be planned and conducted with the consultation of teachers, motivating them for further improvement.

Keywords: *performance appraisal, stakeholders, satisfaction, dissatisfaction, professional development.*

4. Latif, M. Z., Hussain, I., Khan, R. A., Mehboob, U., **Nizami, R.,** & Ali, S. (2020). Use of social media for medical education; perspective of medical faculty from Sialkot, Pakistan. *Journal Of Medical Sciences,* 28(2), 171-175. **(Rahila Nizami (Education/SSSH) Web of Science JCR Listed (IF: 0.754)**

   Abstract: Objective: To study the perspective of faculty members about the use of social media in medical education. Material and Methods: Across sectional descriptive study was conducted among the faculty of three medical colleges from Sialkot. After ethical approval and informed consent, a structured, pretested questionnaire was used for data collection. Data was entered in IBM SPSS version 23 and analyzed by the use of statistical tools. Results: Out of the total of 123 participants of this study, 65 (52.8%) were males and 58 (47.2%) were females. Mean age of the males was 41.43±10.91years and females were of 32.84±7.83years.Faculty members' use of Social Media in teaching was more in private colleges than public college (P-value 0.018). Benefits score was higher in private institution (p-value 0.300). Barriers score was higher in public institutions but difference was not statistically significant (p-value 0.638).Use of social media score was higher in females but the difference was not statistically significant (p-value 0.965). Conclusion: Majority of the medical faculty in private sector use social media for education whereas the public-sector faculty is also engaged in the process of education through social media tools.

   Keywords: *social media, medical, faculty, education, smart phones, students.*

Department of Gender Studies

Research Articles

1. **Salahuddin, A.** (2020). Mystic Language and Symbols. *Journal of Islamic Thought and Civilization (JITC)*, *10*(1). Retrieved from https://journals.umt.edu.pk/index.php/JITC/article/view/646. **(Ambreen Salahuddin (Gender Studies/SSSH) SJR**

   Abstract: This article explores the concept of unity of being in fiction by Pakistani women writers. The usage of mystic language and depiction of mystical and Sūfi symbols in literature can be traced back to ancient texts. However, it has been deemed alien for women to be Sūfis and have mystic experience, apart from a few exceptions. Indulging in formulating mystical symbols and using mystic language by women has not been perceived as too womanly. The main reason for this is the fact that women's world-view has been restricted and thus deemed limited. Complete works of fiction by Pakistani women writers writing in Urdu have been explored for this research. There are two steps in sample selection i.e. women fiction writers and their fiction. Women writers are selected on the basis of set criteria. Selection of text is done through theoretical sampling. Women fiction writers have used mystic symbols meaningfully at innumerable places in their works. By the study of these works, it can be concluded that women writers have indulged in using mystical language and symbols and have done it in a crafty manner, though retaining the traditional usage of these symbols and metaphors.

   Keywords: *not available.*

Department of Islamic Thought & Civilization

Research Articles

1. **Shaukat, M. A., & Ahmad, H.** (2020). A Historical Survey of Evolution in the Concept and Status of "Man" Greek to Modern Times. *Journal of Islamic Thought and Civilization (JITC)*, *10*(1). Retrieved from https://journals.umt.edu.pk/index.php/JITC/article/view/650. **(Muhammad Awais Shaukat, Humaira Ahmad (Islamic Thought & Civilization/SSSH)** **SJR**

Abstract: Study of human nature has been one of the most important questions to which man has come across. Right from the period when man started thinking rationally, because of his curious and enquiring nature, he meditated about Universe, existence and nature of Man and his ultimate reality. The religious tradition claims that when Man first came to earth, he knew the answer to these questions in the light of divine guidance. It declared "Man" as the crown of all the creations and all the other things are created to serve him. The civilizations that didn't have the luxury of divine guidance developed mythological explanations. It were the Greeks who for the first time developed an intellectual discourse to answer the basic question about the reality of Man and the Universe. The medieval period was dominated by religious traditions. All these traditions, though different from one another, seem to agree to the point that Man is a special creation and the center of the Universe with some amount of divinity attributed to him. But after Renaissance, this view changed radically and the status of "Man" shrunk to an animal only who was thought-to-be guided by his own instincts and who was through and through a profane creation. This research aims at studying the concept of "Man" in different civilizations and explores the evolution of this concept from Greek to Modern times through analytical research method.

Keywords: *not available.*

School of Health Sciences (SHS)

Department of Health Science

Research Articles

1. Paramastri, R., Pratama, S. A., Ho, D. K. N., Purnamasari, S. D., Mohammed, A. Z., Galvin, C. J., **Tanweer, A.** . . . Iqbal, U. (2020). Use of mobile applications to improve nutrition behaviour: A systematic review. *Computer Methods and Programs in Biomedicine, 192*, 105459. doi: https://doi.org/10.1016/j.cmpb.2020.105459. **(Afifa Tanweer (SHS)** **Web of Science JCR Listed (IF: 3.632)**

Abstract: Background and Objective

Mobile applications could be effectively used for dietary intake assessment, physical activity monitoring, behavior improvement, and nutrition education. The aim of this review is to determine the effectiveness of mobile applications in improving nutrition behaviors through a systematic review of literature.

Methods

The review protocol was registered with PROSPERO: registration number CRD42018118809, and followed PRISMA guidelines. We involved original articles including mobile electronic devices for improving dietary intake, physical activity, and weight management in adult populations in this review. Data were retrieved from January 2010 to December 2018 with PubMed, Web of Science, Excerpta Medica Database (Embase), and Cumulative Index to Nursing and Allied Health Literature (CINAHL) as data sources. Authors individually screened the titles and abstracts, then full articles in order to obtain papers that met inclusion criteria.

Results

The database search yielded 2962 records. After removing the duplicates and analyzing the full text papers a total of 8 original articles were reviewed. Two articles showed obvious bias and were not included in our results or discussion. The remaining six articles with low to moderate bias risk were included in this systematic review. Three selected studies were randomized control trials (RCTs) with over 180 participants each. The other three

studies were a nested trial, a case-control trial, and a pilot RCT with 36, 162, and 24 participants respectively. All larger RCTs and the small case control trail showed significant improvements in some nutritional-health objectives measured. The other two trials showed insignificant improvements in outcomes measured between groups.

Conclusion

This study highlights the potential significant health benefits acquirable through mobile health application-assisted nutrition interventions. Some of these studies required significant financial and time input from providers for the application's utilization. Further studies, perhaps with multiple intervention arms, are required to compare across programs the elements that are essential for health benefits observed.

Keywords: *mobile application, mhealth, apps, nutrition, dietary behavior, healthcare technology.*

2. Poulsen, P. R., **Murtaza, G.,** Worm, E. S., Ravkilde, T., O'Brien, R., Grau, C., . . . Keall, P. (2020). Simulated multileaf collimator tracking for stereotactic liver radiotherapy guided by kilovoltage intrafraction monitoring: Dosimetric gain and target overdose trends. *Radiotherapy and Oncology, 144*, 93-100. doi: https://doi.org/10.1016/j.radonc.2019.11.008. **(Ghulam Murtaza (SHS) Web of Science JCR Listed (IF: 4.856)**

Abstract: Purpose: To investigate the potential benefit of multileaf collimator (MLC) tracking guided by kilovoltage intrafraction monitoring (KIM) during stereotactic body radiotherapy (SBRT) in the liver, and to understand trends of target overdose with MLC tracking. Methods: Six liver SBRT patients with 2–3 implanted gold markers received SBRT delivered with volumetric modulated arc therapy (VMAT) in three fractions using daily cone-beam CT setup. The CTV-toPTV margins were 5 mm in the axial plane and 10 mm in the cranio-caudal directions, and the plans were designed to give minimum target doses of 95% (CTV) and 67% (PTV). The three-dimensional marker trajectory estimated by post-treatment analysis of kV fluoroscopy images acquired throughout treatment delivery was assumed to represent the tumor motion. MLC tracking guided by real-time KIM was simulated. The reduction in CTV D95 (minimum dose to 95% of the clinical target volume) relative to the planned D95 (DD95) was compared between actual non-tracking and simulated MLC tracking treatments. Results: MLC tracking maintained a high CTV dose coverage for all 18 fractions with DD95 (mean: 0.2 percentage points (pp), range: 1.7 to 1.9 pp) being significantly lower than for the actual nontracking treatments (mean: 6.3 pp range: 0.6–16.0 pp) ($p = 0.002$). MLC tracking of large target motion perpendicular to the MLC leaves created dose artifacts with regions of overdose in the CTV. As a result, the mean dose in spherical volumes centered in the middle of the CTV was on average 2.4 pp (5 mm radius sphere) and 1.3 pp (15 mm radius sphere) higher than planned ($p = 0.002$). Conclusions: Intrafraction tumor motion can deteriorate the CTV dose of liver SBRT. The planned CTV dose coverage may be restored with KIM-guided MLC tracking. However, MLC tracking may have a tendency to create hotspots in the CTV.

Keywords: *image-guided radiation therapy, radiotherapy target organ alignment, intrafraction motion, kilovoltage intrafraction monitoring, multileaf collimator tracking.*

3. Chughtai, A., & **Tanweer, A.** (2020). Improving research capacity of practicing dietitians through interactive sessions: evidence from a pilot study. *Journal of Biological Education*, 1-8. doi: 10.1080/00219266.2020.1756897. **(Afifa Tanweer (SHS) Web of Science JCR Listed (IF: 0.764)**

Abstract: Knowledge about research in medical and allied health fields is an integral part of professional development in patient care practice. However, completion of an exclusive research degree is not always feasible for clinicians. In such a scenario, short interactive educational sessions may serve to effectively enhance research knowledge in clinicians. Our study aimed at determining the impact of short, interactive educational sessions on knowledge about quantitative and qualitative research in dietetic professionals. In a pre–post-test single group interventional design, 34 clinical dietitians were pre-tested, exposed to interactive educational interventions, followed by a post-test. The scores were compared using paired samples *t*-test. There were significant

improvements in the knowledge during post-test compared with pre-test. A greater overall improvement was observed in participants who were graduates, as well as those who were clinicians compared to postgraduates and academicians, respectively. A series of short, interactive educational sessions on research may provide an effective way to enhance research interest and knowledge of clinical professionals. Such sessions may play a vital part in improving the chances of better, and research-informed, patient health care provision.

Keywords: *evidence based practice, capacity building, patient care, informed decisions.*

4. **Murtaza, G., Mehmood, S.,** Silvia Favretto, M., & Cora, S. (2020). Optimal VMAT Delivery for Elekta MLC Beam Modulator: A Study of Collimator Rotation for Head and Neck Planning. *Journal of Medical Imaging and Radiation Sciences, 51*(2), 289-298. doi: https://doi.org/10.1016/j.jmir.2020.02.001. **(Ghulam Murtaza, Shahid Mehmood (Medical Imaging Department/SHS) SJR**

Abstract: Background: Well-optimized treatment planning parameters are vital for optimum beam delivery in advanced radiotherapy techniques. The Elekta "Beam-Modulator" (BM) is a high-resolution multileaf collimation system where each individual leaf is 4 mm wide at the isocentre, without backup diaphragms and jaws. Its maximum aperture is 21 × 16 cm^2, which results in a limited clinical use for the target geometry of maximum 20 cm in length. The collimator rotation provides an opportunity to treat slightly extended treatment length with optimal target coverage. The study aims to observe the collimator rotation influence on volumetric modulated arc therapy (VMAT) plan quality for different head and neck target geometries using limited field collimator of BM.

Methods: Ten patients with head and neck cancer were planned by means of simultaneous integrated boost to deliver VMAT for five patients with three dose levels (70/60/56) and five patients with two dose levels (60/54). The single arc, dual arc, and combined two independent single arcs of 356° each were well optimized for four collimator angles (C) 15°,30°, 45°, and 90°. The plans were prepared for BM with SmartArc module of Pinnacle³ treatment planning system. Statistical significance ($P \leq .05$) among collimator angles for planning target volume dose-volume indices was calculated with Student's *t*-test. Organ-at-risk doses were compared and monitor units were also evaluated as a parameter for dose-delivery efficiency and out-of-field dose index.

Results: The dual arc and combined two independent single arcs achieved planning objectives for C15°, C30°, and C45°. Single arc for all collimator angles and C90° for all VMAT schemes failed to achieve planning objectives. The spread of low dose bath 20, 35, and 40 Gy and deterioration of doses were higher towards periphery at C90° and statistically significant.

Conclusion: The small and medium collimator angles for dual-arc VMAT scheme(s) are suitable, whereas single arc and C90° are not suitable in VMAT implementation for Elekta Beam-Modulator collimation system

Keywords: *VMAT, treatment planning, collimator rotation, limited field collimation.*

Book/Book Chapters

1. **Bacha, U.,** Rozman, U., & Turk, S. Š. (Eds.). (2020). *Healthcare Access: Regional Overviews*: intechopen. **(Umar Bacha (Nutrition Sciences/SHS)**

Abstract: Healthcare Access - Regional Overviews is a compilation of ten chapters consisting of case studies, research works, reviews, and expert opinions providing insight on the previous and current developments in the field of hygiene and infection control with practices to prevent or minimize the spread of infectious diseases. The book also addresses the status and healthcare access of the most neglecte.

Keywords: *not available.*

School of Food and Agricultural Sciences (SFAS)

Department of Food and Agricultural Science

Research Articles

1. Ma, Z., Zhao, Y., **Khalid, N.,** Shu, G., Neves, M. A., Kobayashi, I., & Nakajima, M. (2020). Comparative study of oil-in-water emulsions encapsulating fucoxanthin formulated by microchannel emulsification and high-pressure homogenization. *Food Hydrocolloids, 108*, 105977. doi: https://doi.org/10.1016/j.foodhyd.2020.105977. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 7.053)**

   Abstract: In this study, we investigated the formulation and stability characteristics of monodisperse oil-in-water (O/W) emulsions encapsulating fucoxanthin using straight-through microchannel emulsification (MCE). Monodisperse O/W emulsions stabilized by hydrophilically modified lecithin (ML), whey protein isolate (WPI), or polyoxyethylene (20) sorbitan monolaurate (Tw20) were stably formulated using straight-through MCE. The resulting emulsions maintained the droplet sizes steadily at 30.3 ± 0.2 μm (ML), 32.3 ± 0.1 μm (WPI) and 29.0 ± 0.8 μm (Tw20) and the relative span factor (RSF) < 0.5 after 30 days storage at 25 °C. The fucoxanthin retention (RT_f) in the collected emulsions, decreased from 100% to 44.3 ± 0.1% (ML), 90.7 ± 5.4% (WPI) and 51.4 ± 10.6% (Tw20) after storage. Subsequently, we compared the characteristics of O/W emulsions which were formulated by 1 wt% Tw20 using high-pressure homogenization (HPH) and MCE under the same storage and digestion conditions. After 15 days storage at 4, 25 and 50 °C, all emulsions revealed good physical stability, and there was no drastic change in the droplet sizes. In terms of chemical stability, MCE was pronouncedly better than HPH at the same level of storage temperature. In contrast, the free fatty acids (FFAs) release and fucoxanthin bioaccessibility in emulsions using HPH were significantly higher than MCE. The findings of our study give useful information for food and pharmaceutical industries which express more concern about the natural bioactive compounds for usage.

   Keywords: *monodisperse emulsions, fucoxanthin, microchannel emulsification, droplet generation, physical and chemical stability, bioaccessibility.*

2. Khan, F., Iqbal, S., **Khalid, N.,** Hussain, I., Hussain, Z., Szmigielski, R., & Janjua, H. A. (2020). Screening and stability testing of commercially applicable Heliotropium crispum silver nanoparticle formulation with control over aging and biostability. *Applied Nanoscience, 10*(6), 1941-1956. doi: 10.1007/s13204-020-01333-x. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 2.880)**

   Abstract: *Heliotropium crispum*-mediated assembly of silver nanoparticles exhibit profound antibacterial and anti-biofilm effects against multiple drug-resistant bacteria, but its stability and biocompatibility remain a hurdle in commercialization. Herein, we adopted a surface chemistry-based steric repulsion approach to investigate the colloidal stability of *H. crispum* silver nanoparticles (HC-AgNPs) and determine its application as a commercial antibacterial formulation. Two primary silver nanoparticles (AgNPs) were synthesized, i.e., HC-AgNPs and citrate-HC-AgNPs initially, which were then modulated to assemble various derivatives of AgNPs using polyethylene glycol (PEG) and polyvinylpyrrolidone (PVP) as stabilizing agents. Various parameters were assessed to investigate the morphology, colloidal physio-chemistry, and surface capping using various analytical techniques, such as UV–Vis spectrophotometer, zeta–dynamic light scattering (DLS), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM, and transmission electron microscopy (TEM). Selective AgNPs were then screened on the basis of stability for up to 8 months, heat resistance at 100 °C, and bioactivity via MTT assay using HEP-2, MCF-7, and HCEC cell lines. The UV–Vis and electron microscope results revealed that HC-AgNPs confer near-spherical and slight triangular-shaped morphology and the size of all synthesized AgNPs is in the range of 400–450 nm. All AgNPs synthesized from HC-source have characteristic FTIR peaks recorded near 2931 cm^{-1}, 1996 cm^{-1}, and 825 cm^{-1}. This study highlights promising evidence for the commercial application of

HC-AgNPs as an antimicrobial agent. Additionally, it provides a methodology for modulating the surface capping of biological nanoparticles and assesses its corresponding effect on the stability.

Keywords: *heliotropium crispum, silver nanoparticles, bioactivity, surface capping, biostability.*

3. Amin, A., Ahmed, I., **Khalid, N.,** Khan, I. U., Ali, A., Dahlawi, S. M., & Li, W.-J. (2020). Insights on comparative bacterial diversity between different arid zones of Cholistan Desert, Pakistan. *3 Biotech,* 10(5), 224. doi: 10.1007/s13205-020-02204-6. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 1.798)**

   Abstract: The present study was conducted to analyze bacterial diversity profle of Cholistan desert located in Pakistan. The study investigates the infuence of physicochemical parameters of soil on distribution of diferent bacteria at all taxonomic levels and also study the distribution pattern between diferent desert environments, particularly rhizospheric and bulk desert sands. Species richness showed phyla Proteobacteria and Chlorofexi as the dominant OTUs in all the samples. Besides the two phyla, the rhizospheric soils with root remnants were dominated by Firmicutes, Deinococcus-Thermus, Actinobacteria and Acidobacteri, while phylum Thermotogae was present in signifcant quantity in rhizosheaths devoid of roots. In nonrhizospheric desert soils, a considerable number of OTUs belonged to phyla Proteobacteria, Chlorofexi, Bacteroidetes and Acidobacteria. An important fnding from this study is that a bulk portion of the OTUs were assigned to unclassifed taxa, indicating a large repertoire of unexplored taxa in the desert ecology of Pakistan. Distribution of taxonomic groups among various regions of the desert was collaborating well with the physicochemical parameters of the sites. The fndings of this study establish the fundamental relationships between desert ecosystem, specifc native plant and the total bacterial fora. This is the frst study of microbial community analysis of any desert in Pakistan and thus, will serve as a future platform to explore further on desert ecosystem functioning by employing the ever-changing biotechnological tools.

   Keywords: *bacterial community, desert sand, pyrosequencing, rhizosphere, 16S rRNA.*

4. Collaborators, L. D. B. o. M. (2020). Mapping local patterns of childhood overweight and wasting in low-and middle-income countries between 2000 and 2017. *Nature medicine, 26*(5), 750-759. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 36.130)**

   Abstract: A double burden of malnutrition occurs when individuals, household members or communities experience both undernutrition and overweight. Here, we show geospatial estimates of overweight and wasting prevalence among children under 5 years of age in 105 low- and middle-income countries (LMICs) from 2000 to 2017 and aggregate these to policy-relevant administrative units. Wasting decreased overall across LMICs between 2000 and 2017, from 8.4% (62.3 (55.1–70.8) million) to 6.4% (58.3 (47.6–70.7) million), but is predicted to remain above the World Health Organization's Global Nutrition Target of <5% in over half of LMICs by 2025. Prevalence of overweight increased from 5.2% (30 (22.8–38.5) million) in 2000 to 6.0% (55.5 (44.8–67.9) million) children aged under 5 years in 2017. Areas most affected by double burden of malnutrition were located in Indonesia, Thailand, southeastern China, Botswana, Cameroon and central Nigeria. Our estimates provide a new perspective to researchers, policy makers and public health agencies in their efforts to address this global childhood syndemic.

   Keywords: *obesity, risk factors, signs and symptoms, malnutrition.*

5. Lara, G. R., Uemura, K., **Khalid, N.,** Kobayashi, I., Takahashi, C., Nakajima, M., & Neves, M. A. (2020). Layer-by-Layer Electrostatic Deposition of Edible Coatings for Enhancing the Storage Stability of Fresh-Cut Lotus Root (Nelumbo nucifera). *Food and Bioprocess Technology, 13*(4), 722-726. doi: 10.1007/s11947-020-02410-3. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 3.356)**

   Abstract: *Various strategies have been employed to improve the storage stability of fresh-cut lotus root, which is prone to undesirable changes such as enzymatic oxidation. In our research, we targeted the formulation of polysaccharide-based edible coatings with different ionic charges from natural gum sources, such as guar gum,*

xanthan gum, and chitosan, due to the limited information regarding its application as coating material for fresh-cut lotus root. We have also compared the effect of single layer coatings versus layer-by-layer deposition as edible coating techniques for fresh-cut lotus root. Our results have shown that layer-by-layer coatings consisting of xanthan gum and chitosan were the most effective among all treatments, thereby reducing whiteness color (L) changes and weight loss up to 60% and 86%, respectively. Overall, the layer-by-layer coating technique was more effective than single layer coating, which shows a promising strategy to increase the storage stability of fresh-cut lotus root especially during transport and distribution*.

Keywords: *edible coating, layer-by-layer deposition, stability, fresh-cut, enzymatic browning.*

6. **Khan, S.** (2020). Plague of Smog in Lahore, Pakistan: A Choking Situation. *Asia Pacific Journal of Public Health, 32*(2-3), 133-133. doi: 10.1177/1010539520917814. **(Sipper Khan (SFAS) Web of Science JCR Listed (IF: 1.255) (Letter to editor)**

   Abstract: Not available.

   Keywords: *not available.*

7. Ishaq, A., **Rahman, U. u.,** Sahar, A., Perveen, R., Deering, A. J., Khalil, A. A., . . . Siddique, U. (2020). Potentiality of analytical approaches to determine gelatin authenticity in food systems: A review. *LWT- food science and technology, 121*, 108968. doi: https://doi.org/10.1016/j.lwt.2019.108968. **(Ubaid ur Rahman (SFAS) Web of Science JCR Listed (IF: 4.006)**

   Abstract: Authentication of gelatin in food matrices comes in prominence since various religious and cultural communities have selectivity and sensitivity regarding the consumption of various ingredients. Globally, several methods have been investigated to classify unknown gelatin into its species of origin. The most common techniques employed to distinguish different gelatin sources include calcium phosphate precipitation, amino acid analysis and ELISA but the major bottlenecks associated with the use of these approaches are the need of repeated results, intensive labor requirements and experience. To overcome the nuisance, other reliable, fast and modern techniques have also been introduced which have shown the potential to differentiate the various gelatin sources. These approaches include FTIR spectroscopy, HPLC, PCR, ELISA, ESI-LC-MS/MS, MALDI-TOF, Nano-UPLC-ESIQ-TOF-MSE, UPLC/Q-TOF-MS and SPR biosensors. Accordingly, the major desideratum of the current treatise is to highlight the potential of various methods to discern the origin of gelatin.

   Keywords: *gelatin authenticity, ftir spectroscopy, real-time PCR, MALDI-TOF, ELISA.*

8. Taarji, N., Vodo, S., Bouhoute, M., **Khalid, N.,** Hafidi, A., Kobayashi, I., . . . Nakajima, M. (2020). Preparation of monodisperse O/W emulsions using a crude surface-active extract from argan by-products in microchannel emulsification. *Colloids and Surfaces A: Physicochemical and Engineering Aspects, 585*, 124050. doi: https://doi.org/10.1016/j.colsurfa.2019.124050. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 3.990)**

   Abstract: In this study, we evaluated the performance of a mildly derived extract from argan by-products in microchannel emulsification (MCE). Our aim is to produce stable monodisperse O/W emulsions using this extract as a sole emulsifier. Preliminary investigations about the characteristics of argan extract indicated the potential interaction between surface-active components (i.e. saponins, proteins), in bulk phase prior to adsorption at the oil/water interface, resulting in the formation of biogenic complexes with strong interfacial properties. This is important for successful MCE as this technique depends exclusively on dynamic interfacial tension reduction for droplet formation. Nevertheless, upon performance of emulsification experiments, we also found that the complex composition of this extract could counteract its emulsifying efficiency, by creating a hydrophobic, or slightly hydrophilic, layer on the MC array plate surface. This resulted in unsuccessful emulsification using short MCs but did not affect the emulsification behavior in longer ones. Using longer MCs, we could produce stable monodisperse O/W emulsions, with similar droplet size (~ 36 µm) and droplet size distribution (Relative span

factor <0.25) to those obtained using Tween 80, and for up to 10 h of continuous emulsification.
Keywords: *argan by-products, crude emulsifying extract, monodisperse emulsion, microchannel emulsification.*

9. Rafiq, L., Zahoor, T., Sagheer, A., Khalid, N., **Rahman, U. U.,** & Liaqat, A. (2020). Augmenting yogurt quality attributes through hydrocolloidal gums. *Asian-Australasian journal of animal sciences, 33*(2), 323-331. doi: 10.5713/ajas.18.0218. **(Ubaid ur Rahman (SFAS) Web of Science JCR Listed (IF: 1.664)**
Abstract: Objective: The present work was undertaken to determine the possibility of using xanthan and guar gums as stabilizers to enhance the yogurt quality. Methods: Yogurt was manufactured from standardized milk (3.5% fat, 8.5% solid-not-fat contents) with the addition of 2% to 3% starter culture. Enzyme-hydrolyzed xanthan gum (0.1%, 0.5%, 1.0%) and guar gum (0.1%, 0.5%, 1.0%) were added to the yogurt as stabilizers. Prepared yogurt samples were kept at refrigeration temperature (4°C±2°C) for 21 days and various quality and sensory parameters were studied at regular intervals (7 days). Results: Results showed that yogurt with 0.5% xanthan gum (T5) was best in terms of preventing syneresis and improving the viscosity, water holding capacity and texture of the product. Additionally, adding gums did not adversely affect the sensorial attributes of the product. Conclusion: Modified gums were found useful in augmenting yogurt quality and therefore addition of gums is highly recommended for manufacturing yogurt.
Keywords: *yogurt, syneresis, viscosity, xanthan gum, guar gum.*

10. Melanie, H., Taarji, N., Zhao, Y., **Khalid, N.,** Neves, M. A., Kobayashi, I., . . . Nakajima, M. (2020). Formulation and characterisation of O/W emulsions stabilised with modified seaweed polysaccharides. *International Journal of Food Science & Technology, 55*(1), 211-221. doi: 10.1111/ijfs.14264. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 2.773)**
Abstract: In this study, seaweed polysaccharides (alginate and carrageenan) were modified with dodecenylsuccinic anhydride (DSA), and their stabilising properties in oil-in-water (O/W) emulsion system were evaluated. The physicochemical characteristics were determined by droplet size, interfacial tension and ζ-potential and structurally verified by Fourier transform infrared spectroscopy (FTIR). Both CRG-DSA and ALG-DSA applied in O/W emulsion system exhibited smaller droplet sizes over the increasing concentration and were more stable during storage than native ones. The ζ-potential of DSA-modified seaweed polysaccharides has more negative charge compared with their native forms, owing to the additional carboxyl groups from modification reaction. In addition, DSA-modified seaweed polysaccharides decreased the interfacial tension at soybean oil–water interface from 23.1 and 23.9 mN m^{-1} to 14.2 and 13.6 mN m^{-1}, respectively. The successful modification reaction was confirmed by FTIR analysis. This study demonstrated that DSA-modified seaweed polysaccharides may serve as prospective emulsifiers in food, pharmaceutical and other industrial fields.
Keywords: *Alginate, carrageenan, dodecenylsuccinic anhydride, O/W emulsion, physicochemical property.*

11. Ishaq, A., Ebner, P. D., Syed, Q. A., & **Ubaid-ur-Rahman, H**. (2020). Employing list-shield bacteriophage as a bio-control intervention for Listeria monocytogenes from raw beef surface and maintain meat quality during refrigeration storage. *LWT, 132*, 109784. doi: https://doi.org/10.1016/j.lwt.2020.109784. **(Hafiz Ubaid-ur-Rahman (SFAS) Web of Science JCR Listed (IF: 4.006)**
Abstract: Meat and meat-based products represent augmented food safety concern due to their high susceptibility towards spoilage and ideal growth conditions for microorganisms. Therefore, it is vital to introduce safe, environment-friendly and economic antimicrobial strategies for ensuring the safety of meat. In this regard, biological interventions are gaining attention globally. In the present exploration, we found that *Listeria monocytogenes* can survive and grow on raw beef surface at refrigeration temperature i.e., 4 ± 1 °C. Additionally, we examined the effect of applying List-Shield bacteriophage on reducing *L. monocytogenes* numbers in experimentally contaminated beef samples. A significant reduction of approximately 2.3 logs was recorded in

phage-treated beef samples during the storage period of 15 days. Furthermore, phage did not adversely affect the color and pH values of stored beef samples. In addition, a significantly lower purge (3.37%) and nitrogenous losses (TVBN = 22.82 mg N/100 g) were attained by the beef samples treated with bacteriophage at the termination stage of storage. The study concluded that use of bacteriophage can be adopted as an innovative antimicrobial strategy to mitigate the growth of pathogenic bacteria from meat surface.

Keywords: *meat safety, food pathogens, bacteriophage, food biocontrol, meat quality.*

12. **Iqbal, R.,** Mehmood, Z., Baig, A., & **Khalid, N.** (2020). Formulation and characterization of food grade O/W nanoemulsions encapsulating quercetin and curcumin: Insights on enhancing solubility characteristics. *Food and Bioproducts Processing, 123*, 304-311. doi: https://doi.org/10.1016/j.fbp.2020.07.013. **(Rashid Iqbal, Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 3.726)**

Abstract: Solubility of bioactive compounds (curcumin and quercetin) in aqueous phase is challenging while developing an emulsion-based delivery system. Therefore, this study was designed to enhance the solubility of curcumin and quercetin in oil-in-water (O/W) nanoemulsions using modified starch (HI-Cap-100) as an emulsifier. The effect of different processing conditions (pH, ionic strength and temperature) were investigated on the mean droplet diameter and ζ-potential over the period of 5 months. It was found that the nanoemulsions containing 5% (w/w) HI-CAP-100 along with 10% oil (w/w) yielded the most stable formulation with a mean particle size of 175.44 nm. Solubility of quercetin and curcumin was found to be maximum in nanoemulsions (2.07 and 39 times respectively) as compared to oil and water. Furthermore, stability of the emulsions under varying ionic strength (0.1−1 M NaCl) and pH (2–7) was found to be higher. Overall, it can be concluded that stability of nanoemulsions can be enhanced using natural ingredients.

Keywords: *nanoemulsions, solubility, modified starch, curcumin, quercetin, droplet diameter.*

13. Reiner, R. C., Wiens, K. E., Deshpande, A., Baumann, M. M., Lindstedt, P. A., **Khalid, N.,** . . . Hay, S. I. (2020). Mapping geographical inequalities in childhood diarrhoeal morbidity and mortality in low-income and middle-income countries, 2000–17: analysis for the Global Burden of Disease Study 2017. *The Lancet, 395*(10239), 1779-1801. doi: https://doi.org/10.1016/S0140-6736(20)30114-8. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 60.392)**

Abstract: Background: Across low-income and middle-income countries (LMICs), one in ten deaths in children younger than 5 years is attributable to diarrhoea. The substantial between-country variation in both diarrhoea incidence and mortality is attributable to interventions that protect children, prevent infection, and treat disease. Identifying subnational regions with the highest burden and mapping associated risk factors can aid in reducing preventable childhood diarrhoea.

Methods: We used Bayesian model-based geostatistics and a geolocated dataset comprising 15 072 746 children younger than 5 years from 466 surveys in 94 LMICs, in combination with findings of the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2017, to estimate posterior distributions of diarrhoea prevalence, incidence, and mortality from 2000 to 2017. From these data, we estimated the burden of diarrhoea at varying subnational levels (termed units) by spatially aggregating draws, and we investigated the drivers of subnational patterns by creating aggregated risk factor estimates.

Findings: The greatest declines in diarrhoeal mortality were seen in south and southeast Asia and South America, where 54·0% (95% uncertainty interval [UI] 38·1–65·8), 17·4% (7·7–28·4), and 59·5% (34·2–86·9) of units, respectively, recorded decreases in deaths from diarrhoea greater than 10%. Although children in much of Africa remain at high risk of death due to diarrhoea, regions with the most deaths were outside Africa, with the highest mortality units located in Pakistan. Indonesia showed the greatest within-country geographical inequality; some regions had mortality rates nearly four times the average country rate. Reductions in mortality were correlated to improvements in water, sanitation, and hygiene (WASH) or reductions in child growth failure (CGF). Similarly,

most high-risk areas had poor WASH, high CGF, or low oral rehydration therapy coverage.

Interpretation: By co-analysing geospatial trends in diarrhoeal burden and its key risk factors, we could assess candidate drivers of subnational death reduction. Further, by doing a counterfactual analysis of the remaining disease burden using key risk factors, we identified potential intervention strategies for vulnerable populations. In view of the demands for limited resources in LMICs, accurately quantifying the burden of diarrhoea and its drivers is important for precision public health.

Keywords: *not available.*

14. Tsogtoo, B., Taarji, N., Melanie, H., **Khalid, N.,** . . . Nakajima, M. (2020). Emulsion-based extraction of β-sitosterol and carotenoids from sea buckthorn (Hippophae rhamnoides) pomace. *International Food Research Journal, 27*(1), 55-65. **(Nauman Khalid (SFAS) Web of Science JCR Listed (IF: 0.610)**

Abstract: In the present work, we investigated oil-in-water (O/W) emulsion-based extraction of β-sitosterol and carotenoids from sea buckthorn pomace. We compared this new green extraction method with conventional extraction using organic solvents and oils. The objective of the present work was to evaluate the efficiency of these different extraction systems on the yields of bioactive compounds from plant-based materials, and to determine the optimum extraction conditions for maximum extraction yield. Our results indicated that O/W emulsions, prepared without emulsifier using a high-pressure homogeniser, had the highest extraction capability for β-sitosterol and carotenoids, as compared to the other extraction systems. The optimum conditions were 65°C for 1 h extraction, using emulsifier-free soybean O/W emulsions. Under these conditions, the extracted amounts were up to 32.0 mg/g dw (dry weight) for β-sitosterol and 1.44 mg/g dw for total carotenoids. The obtained compounds were relatively stable at 5°C and 25°C for up to 28 days of storage. This emulsion-based extraction method is promising for the extraction of β-sitosterol and carotenoids that can be further applied into dietary nutritional supplements and fortified food.

Keywords: *green extraction method, bioactive compound, triacylglycerol, oil-in-water emulsion, organic solvent, extraction yield.*

School of Textile & Design (STD)

Department of Textile & Design

Research Articles

1. Saleemi, S., **Naveed, T.,** Riaz, T., Memon, H., Awan, J. A., Siyal, M. I., . . . Bae, J. (2020). Surface Functionalization of Cotton and PC Fabrics Using SiO2 and ZnO Nanoparticles for Durable Flame Retardant Properties. *Coatings, 10*(2), 124. **(Tayab Naveed (STD) Web of Science JCR Listed (IF: 2.436)**

Abstract: In recent years, the use of functional textiles has attained attention due to their advantageous health and safety issues. Therefore, this study investigated the flame retardancy on cotton (COT) and polyester-cotton (PC) fabrics treated with different concentrations of silica and zinc nanoparticles through a sol-gel finishing technique. FTIR, SEM, and TGA were conducted for the characterization of coated fabric samples. The FTIR and SEM of Pristine and Treated Cotton and PC fabrics illustrated that the SiO₂ (silica dioxide) and ZnO (Zinc oxide) nanoparticles were homogeneously attached to the fiber surface, which contributed to the enhancement of the thermal stability. The starting thermal degradation improved from 320 to 350 °C and maximum degradation was observed from 400 to 428 °C for the COT-2 cotton substrate. However, the initial thermal degradation improved from 310 to 319 °C and the highest degradation from 500 to 524 °C for the PC substrate PC-2. The outcomes revealed that the silica has a greater influence on the thermal properties of COT and PC fabric samples. Additionally, the tensile strength and flexural rigidity of the treated samples were improved with an insignificant decrease in air permeability.

Keywords: *flame retardant, sol-gel coating, silica and zinc oxide nanoparticles, cotton, PC, fabric.*

2. Naeem, M. A., Siddiqui, Q., Khan, M. R., Mushtaq, M., Wasim, M., **Naveed, T.**, . . . Wei, Q. (2020). Bacterial cellulose-natural fiber composites produced by fibers extracted from banana peel waste. *Journal of Industrial Textiles, 0*(0), 1528083720925848. doi: 10.1177/1528083720925848. **(Tayab Naveed (STD) Web of Science JCR Listed (IF: 2.010)**

   Abstract: In recent times, there is a growing demand for low-cost raw materials, renewable resources, and eco-friendly end products. Natural fibers are considered as strong candidates to be used as a potential reinforcement for composite manufacturing. In the current study, natural fibers extracted from banana peel were coated with bacterial cellulose through a green biosynthesis approach as well as by a simple slurry dipping method. Thus, natural fibers from banana peel waste were used the first time, to produce bacterial cellulose-natural fiber composites. SEM analysis revealed good interaction between the hybrid fibers and the epoxy matrix. Thermal gravimetric analysis results revealed that the degradation temperature increases because of the addition of bacterial cellulose on fiber surface, which improves the thermal stability. The maximum thermal decomposition temperature (405°C) was noticed for nanocomposites reinforced by banana fibers with bacterial cellulose deposited on their surface. Whereas the lowest weight loss was also found for the same sample group. The highest tensile strength (57.95 MPa) was found for SBC-BP/epoxy, followed by DBC-BP/epoxy (54.73 MPa) and NBP/epoxy (45.32 MPa) composites, respectively. Composites reinforced by both types of hybrid banana fibers shown comparatively higher tensile performance as compared with the neat banana peel fiber-epoxy composites, which can be attributed to the high strength and stiffness associated with the bacterial cellulose. Overall, this study suggests a successful and green route for the fabrication of natural fiber-reinforced composites with improved properties such as tensile strength and thermal stability.

   Keywords: *bacterial cellulose, banana peel, natural fiber composites, biosynthesis, epoxy matrix.*

3. Assefi Pour, R., Bagheri, R., **Naveed, T.,** Ali, N., Rehman, F., & He, J. (2020). Surface functionalization of wool via microbial-transglutaminase and bentonite as bio-nano-mordant to achieve multi objective wool and improve dyeability with madder. *Heliyon, 6*(9), e04911. doi: https://doi.org/10.1016/j.heliyon.2020.e04911. **(Tayab Naveed (STD) SJR**

   Abstract: Recently, natural dyes have a widening scope in various traditional and advanced applications due to their eco-friendly environment. However, improved dyeability of natural dyes still remains a challenging task. This research was aimed to achieve multi-objective wool with improved dyeability using bio-nano-mordant composed of m-Trans-glutaminase, m-TGase, and bentonite nanoclay. Wool fiber was treated through sonochemical method using different concentrations of m-TGase and bentonite. The surface morphology of wool fabric samples was examined by field emission-scanning electron microscopy (FESEM), and Fourier transform Infrared Radiation (FTIR). Further, wool samples treated at different conditions were applied to madder for dyeability examination. The optimum conditions of color coordinates, color strength, K/S, and washing fastness of madder on treated wool fabric with m-TGase and bentonite, were also examined. The results revealed well-made interactions among m-TGase, bentonite, and wool fibers. In addition, surface morphology was strongly influenced by variations in enzyme concentrations so that extra addition of m-TGase lead to clear damage scales or less cuticle surface in SEM images. Moreover, the results showed that the value of K/S for treated wool samples was better than untreated samples. Indeed, amongst all, 5% concentrations of bio-nano-mordant for m-TGase and bentonite have the most constructive K/S values. Similarly, results of **Δ**E and antibacterial investigations also confirmed its superiority.

   Keywords: *materials science, nanotechnology, biotechnology, bio-nano mordant, bentonite nanoclay, microbial transglutaminase, wool, natural dye, madder.*

4. Tusief, M. Q., **Malik, M. H.,** Mohsin, M., Asghar, H. N., Iqbal, M., & Mahmood, N. (2020). Eco-Friendly Degradation of Reactive Blue Dye Enriched Textile Water by Floating Treatment Wetlands (FTWs) System Applying the Strategy of Plant-Bacteria Partnership (Part-B). *Pakistan Journal of Scientific and Industrial Research Series A: Physical Sciences, 63*, 40+. **(Mumtaz Hasan Malik (STD)** SJR

Abstract: Textile dye enriched effluents have been credited to be heavily polluted and highly hazardousto environment. Cleaning of textile wastewater from these dangerous pollutants is a deeply concernedissue of the industry. Various physico-chemical and biological techniques are being practiced to remediatethese effluents. But all these strategies have limitations at any corner of their application. Floating treatmentwetlands (FTWs) are acknowledged as economical treatment options for various kinds of wastewater.Their efficacy has been ascribed in many lab-scale and pilot-scale studies, however scarceness of publisheddata lies in sense of application of this technique using free floating aquatic plants for treating majorprimary reactive blue dye enriched textile water. So, the present study attempted to evaluate the performanceof this method using two free floating aquatic plants, “Eichhornia crassipes” and “ Pistia stratiotes” todevelop a lab scale FTWs system augmented with two pollutant degrading and plant growth promotingbacteria, “Bacillus cereus” and “Bacillus subtilis” after four retention times, 0, 24, 48 and 72 h. One controland eight FTW treatment reactors were established containing plants and bacteria separately or incombination. This system was applied to treat reactive blue dye enriched textile wastewater preparedsynthetically. A remarkable reduction in pollutant indicating parameters, BOD, COD and colour concentrationwas observed for treatment reactor having Eichhornia crassipes and Bacillus cereus combination for72 h retention time. All this stamped the authenticity of this plant-microbial enhanced FTWs techniqueto treat textile wastewater and opened an era of its on-site application.

Keywords: *floating treatment wetlands, plant-bacteria partnership, textile wastewater treatment, reactiveblue dye.*

Institute of Liberal Arts (ILA)

Department of Linguistics and Communications

Research Articles

1. **Sarfraz, R., Ashfaq, N., Abid, F., Riaz, S., & Niazi, A.** (2020). Tracing the patriotic streaks among the national anthem of Pakistan and Turkey: A depiction of nationalism. *International Journal of Psychosocial Rehabilitation, 24*(6), 694-703. doi: 10.37200/IJPR/V24I6/PR260071. **(Rida Sarfraz, Naheed Ashfaq, Faiza Abid, Sadia Riaz, Aisha Niazi (Department of Linguistics and Communications/ILA)** SJR

Abstract: The national anthem is always sung at the learning institutions or during the country’s special occasions. Various countries regard their national anthem as the back bone of patriotism and expression of their strength of national identity. National anthem reveals entities that have a special noble role to play in the country’s prosperity. This paper will probe the highly defined patriotic streaks among the national anthem of two Muslim countries that are Pakistan and Turkey. Due to the enriched heritage and significant historical affiliation of both aforementioned countries, their respective national anthem is specifically portraying the various aspects exhibited via the mode of language. Furthermore; the paper will explore the linguistic aspects as well as pragmatic paradigms to peel out the layers of the meaning mentioned in these anthems. For the analysis of these anthems, an analytical framework was formulated and used which has been adapted from So (2005). It also incorporates both contextual and linguistic analyses of the text under discussion. Moreover, it will look for the notion of metafunctions of language (Halliday&Hasan, 1989), in order to examine relation between language use and context of situation. This framework will help us to determine many dimensions like nationalism, patriotism, refuge, faith, determination, wishes etc which draws us towards the exactness of the meaning of the national anthems of both countries.

Keywords: *nationalism, patriotic streaks, independence, national anthem.*

2. **Rafi, M. S.,** (2020). Dialogic Content Analysis of Misinformation about COVID-19 on Social Media in Pakistan. *Linguistics and Literature Review 6*(Special Issue): 1-11. **(Muhammad Shaban Rafi (Department of Linguistics and Communications/ILA) UMT JOURNAL**

Abstract: This study aims to explore the most common misinformation topics about COVID-19, people's perceptions concerning disinformation, and its consequences. A purposive sample of 50 posts and thousands of comments on coronavirus was drawn from social media networking sites. The data were also collected through informal interviews of 30 participants of different demographic backgrounds. The selected data were analyzed as dialogic communicative content between the participants. The study reveals that the most common topics regarding coronavirus misinformation are about cure and conspiracy theories. The participants have shown a mixed response towards the misinformation. The study has concluded the severe consequences of misinformation concerning the virus. Hence, I would like to recommend compulsory social media education for the internet users regarding how to respond to such a crisis while abiding by the Internet regulations.

Keywords: *misinformation, conspiracy theories, social media, covid-19, racism, social media education.*

3. **Khan, A. A., Khalid, A.,** & Rahman, G. (2020). Tense Driven Asymmetries and Clitic Placement in Compound Verbs of Pashto. *Global Language Review, V*(I), 67-75. doi: 10.31703/glr.2020(V-I).08. **(Arshad Ali Khan, Amina Khalid(Department of Linguistics and Communications/ILA) HEC Y CAT**

Abstract: The tense driven asymmetry of the Pashto clause is analyzed from the perspective of the minimalist framework. The study proves that the split ergativity in Pashto is tense based and does not have the aspect driven features proposed by Roberts (2000). The study argues that the object is assigned a theta role by the V and the subject is assigned a theta role by the little v. The accusative case is assigned by the little v but the nominative and ergative cases are assigned by T. It claims that the T head assigns multiple cases as the split ergativity is tense driven. It highlights the syntactic effects of the possible phonological processes in combining some of the closely adjacent words and making a single phonological word. The study also discusses clitic placement and prosodic inversion to refute the assumption that perfective feature is a strong feature in Pashto.

Keywords: *tense driven asymmetry, split ergativity, compound verb, perfective and imperfective aspects.*

4. **Khan, A. A., Khalid, A.,** & Rahman, G. (2020). The Integration of Embedded Language Islands in Pashto-English Bilingual data. *Hamdard Islamicus, 43*(1), 439-459. **(Arshad Ali Khan, Amina Khalid(Department of Linguistics and Communications/ILA) HEC X CAT**

Abstract: This study offers a discussion on the integration of English Embedded Language islands in Pashto-English bilingual data. It investigates the function of Embedded Language islands, in the morphsyntax of Pashto language. It also shows the types and pragmatic force behind English EL islands. The study use Matrix Language Frame model to explore the role of the two languages in the process of codeswitching. It also explains the pragmatic force behind the selection of the EL islands. A data of 14 hours is collected from AVT Khyber; YouTube channel, which covers a wide range of take shows and interviews. The data is analyzed for the research question: How do Embedded Language islands figure in overall clause structure of Pashto-English Codeswitching? The data is also analyzed for the types of EL islands and the pragmatic force behind the speakers' intention. The findings of the study show English (islands) multiword insertion is following the structure dependency rule of the Embedded Language in order to retain the well-formedness with the overall grammatical frame of Pashto langue. Most of the Embedded Language islands are fixed expressions and the multiword are collocated with each other. In most cases the Embedded Language Islands is used as its counterpart in Pashto language lack the same pragmatic force.

Keywords: *morphsyntax, embedded Language Islands, Pashto-English, bilingual, codeswitching.*

5. Shahabullah, Rahman, G., & **Khan, A. A.** (2020). Syllabification of English Words by Pashto Speakers. *Global Language Review, V*(I), 18-28. doi: 10.31703/glr.2020(V-I).03. **(Arshad Ali Khan (Department of Linguistics and Communications/ILA) HEC Y CAT**

   Abstract: Syllabification of words plays a vital role in learning native like pronunciation. The present study tried to explore the syllabification of English words by Pashto speakers. The study aimed to put light on the problematic areas for Pashto speakers in terms of syllabification of English words. The data was collected from twenty undergraduate students and analyzed with reliable scientific tools. The analyzed data proved that English words having triphthongs were problematic for Pashto speakers. In addition to it, words having syllabic consonants were also problematic for Pashto speakers. Furthermore, words containing 'x' in spelling also proved to be problematic for Pashto speakers. English words having the syllable structure CVC.VC were incorrectly syllabified CV.CVC. Pashto speakers faced problems in the identification of syllable boundaries in words where consonant clusters are used. The study recommends that Pashto speakers need proper training for learning correct syllabification of English words.

   Keywords: *English Words, Syllabification, Pashto Speakers.*

6. **Khan, A. A.,** Anees. M., & Rahman, G. (2020). The Patterns of Code-Switching in Pashto-English Bilingual Data. *Global Social Science Review*, V(I), 123-133. doi:10.31703/gssr.2020(V-I).13. **(Arshad Ali Khan (Department of Linguistics and Communications/ILA) HEC X CAT**

   Abstract: This study investigated the most dominant patterns of code switching in Pashto English bilingual data. The data was collected in the form of a semi-structured interview and analyzed in the light of the framework of the Matrix Language Frame model. The study found out that insertion is the dominant pattern of code switching. The Embedded Language noun was the most prevalent switched element in the morpho-syntax frame of Matrix Language. The second most embedded language insertion in the matrix language was the English nonfinite verbs in Pashto light verb construction. The Embedded language island was the third most dominant pattern. The switched elements in the bare DP and the bilingual VP are content words following the Morpheme Order and System Morpheme principles of Pashto.

   Keywords: *alternation, congruent lexicalization, insertion, patterns of code, switching, morphosyntactic constraints.*

7. Rahman, G., Anees. M., & **Khan, A., A.** (2020). Topicalization in Pashto. *Global Social Sciences Review,* V(I), 163-171. doi:10.31703/gssr.2020(V-I).17. **(Arshad Ali Khan (Department of Linguistics and Communications/ILA) HEC X CAT**

   Abstract: The present study is concerned with the phenomenon of topicalization in Pashto. It analyzed the information status of the referents in a sentence and their grammatical functions. The study is another contribution after the work of Roberts (2000) and Rahman (2014). The study was descriptive in nature and it found out the relationship between subject and topic in a sentence. The grammatical function of the subject and the topic were found out coincidentally occurring with the topic of the sentence. Both the subject and topic were found out commonly appearing at the initial position of the sentence. If the topic was any other constituent than the subject, then topicalization happened. The topicalized element is moved to the second or initial position of the sentence. Word order is determined by the information status of the referents where the topic comes first followed by the focused constituents, if not overruled by intonational prominence.

   Keywords: *grammatical function, information status, pashto, topicalization.*

8. **Khan, S., Khan, A. A.** (2020). Morphosyntactic influence of L1 (Punjabi) on L2 English: a study of possessive adjectives. *Hamdard Islamicus, 43*(2), 700-720. **(Sarwar Khan, Arshad Ali Khan (Department of Linguistics and Communications/ILA) HEC X CAT**

Abstract: The paper investigates the Morphosyntactic influence of L1 (Punjabi) on L2 (English) in the use of possessive adjectives by intermediate level students in ESL Class room setting. It also focuses how the difference between the possessive adjectives of both the languages creates hurdles in the process of learning of second language. It further suggests effective procedure to control the erroneous constructions of second language learners in the use of possessive adjectives. It also concentrates on improving the writing and speaking skills of the learners by removing the chances of errors in the use of possessive adjectives of second language. It also implies that the effective teaching of possessive adjectives promotes the process of second language learning. For the study, a questionnaire was distributed among randomly selected 36 students of intermediate level to record their second language constructions in which they were to use possessive adjectives. In the light of evidence found in this research, it is concluded that for aggrandizing the process of L2 learning and for developing the writing and speaking skills of the learners, the appropriate use of possessive adjectives of L2 cannot be ignored.

Keywords: *not available.*

9. **Khan, A. A.** Rukhsana, K., **Abid, F., Khalid, A.** (2020). A counter-orientalistic approach: comparative exploration ofthematic universality in English poet John Keats and Pashto poet Ghani Khan. *Hamdard Islamicus, 43*(2), 818-832. **(Arshad Ali Khan, Faiza Abid, Amina Khalid (Department of Linguistics and Communications/ILA) HEC X CAT**

   Abstract: Western literary schoolsmostly relegateoriental literature, especially that which is in local oriental languages, as regional, communal and/or lacking universality in its appeal –and thus not to be regarded as mainstream. The Indian sub-continent, though having a profoundly rich literary legacy in its local languages, is no exception from such marginalizing treatment. Adopting a counter-orientalistic approach, this study,however, argues similarities betweenthe profundity and complexities of sensibilities and perceptions of the famous Englishpoet John Keats and Pashtopoet Ghani Khan. Thepoets represent diverse cultureswith diverse ideologies,but it is hypothesized that theyhavestraits of resemblance in their poetry; affection, loveliness, nature and eternityrepresent to the both of them strikingly similar meanings of life.This assumptioncontradicts the traditional colonialist and the neo-imperialist discourse that considerseastern literary worksas secondary to the mainstream between the two transcend the stereotypically drawn boundary of binary polarity that privileges „us" over „them".

   Keywords: *counter-orientalism, thematic Affinity, cultural diversity, Johan Keats, Ghani Khan.*

10. Khan, N. W., **Rizvi, S. Z.,** Farooq, M. (2020). The Study of English Loan Word Phonology in Urdu. *International Journal of Psychosocial Rehabilitation, 24*(9), 4720-4728. doi: 10.37200/IJPR/V24I9/PR290502. **(Syeda Zahida Rizvi (Department of Linguistics and Communications/ILA) SJR**

    Abstract: This paper elucidates the exploration of loan word phonology in Urdu language. It is an attempt to examine loan words in Urdu language specifically that have been taken from English language. The paper attempts to trace the innateness of loan words in Urdu and its gradually becoming "native" through the phonological phenomena of variation in vowels, insertion, borrowing, deletion of vowels and conversion in morphosyntactic features of the loan word phonology. The words studied; are the most frequently used in Urdu language by native speakers so that these loan words have become an integral part of daily conversation these words are spoken under the umbrella of Urdu words' pronunciation influence. The paper culminations with an analysis and discussion of the factors behind naturalization of loan words in a specific language.

    Keywords: *loan words, morphological, phonological, Urdu language.*

11. **Rizvi, S. Z.,** Khan, N. W., Farooq, M. (2020). A multimodal discourse analysis of e-advertisement visuals. *International Journal of Psychosocial Rehabilitation, 24*(10), 4473-4492. doi: 10.37200/IJPR/V24I10/PR300443. **(Syeda Zahida Rizvi (Department of Linguistics and Communications/ILA) SJR**

Abstract: This research tends to investigate the persuasive and attractive modes used in an e-advertisement visual by the advertisers to persuade and affect the buyers or viewers. As the study deals with semiotic modes along with language in a visual, to that end, the Multimodal Discourse Analysis of Kress & Leeuven, (1996) is employed as a framework for analyzing the collected data. Three Meta functions will help in interpreting three meanings, i.e., representational, interactional and compositional given through different elements of the selected visuals and meaning of each element which in some way influences the others in the context. The data for the research includes six e-advertisement visuals, taken from different online shopping sites through random sampling. The data was analyzed like semiotic resources, focus on the font, capitalization, boldness etc. in detail. The findings will help the consumers to have an insight about the advertisement tactics adopted by the advertisers.
Keywords: *e-advertisement, multimodal discourse analysis, three meta functions, manipulative language.*

12. **Farooq, M.,** Mahmood, A., & **Khan, A. A.** (2020). Re-syllabification and Multiple Pronunciations in Urdu. *Al-Qalam, 25*(1), 290-310. **(Mahwish Farooq, Arshad Ali Khan (Department of Linguistics and Communications/ILA) HEC X CAT**

Abstract: This is a sequel work deals with the confirmation of phonological rules for re-syllabification and multiple pronunciations of Urdu vocabulary, at larger scale, in speech of Pakistani speakers. The motivation of study is the identification of re-syllabification and multiple pronunciations in 10 hours audio-corpus of a native Pakistani Urdu speaker. This speech corpus has identified 103902 words with different annotations. The observations have identified the multiple pronunciations of same tokens (Farooq & Mumtaz, 2016), (Farooq & Mahmood, 2020). These tokens have same parts-of-speech (POS), spellings and meanings but different pronunciations which ultimately becomes the cause of re-syllabification in different contexts. CLE annotated speech corpus has been used as baseline of this research (Mumtaz, et al., 2014), (Habib, Hijab, Hussain, & Adeeba, 2014). Later, the multiple pronunciations and re-syllabification phenomenon have been cross checked in the speech of 29 native Pakistani Urdu speakers for the identification and confirmation. Consequently, the results of data analysis have also confirmed; the re-syllabification is more context dependent rather than speaker dependent. Moreover, stress is major supra-segmental feature which becomes the reason of multiple pronunciations by causing segmental substitution and attain the status of alternative pronunciations (Farooq & Mumtaz, 2016). Multilingual effect also causes re-syllabification in Urdu lexical items in mental lexicon of speakers. The alternative pronunciations have been triggered by restructuring and re-syllabifications of Urdu vocabulary in speech of 30 Pakistani Urdu speakers. But this paper currently deals with the re-syllabification of Urdu vocabulary depending only on the phoneme or segment alternation. Finally, it is concluded that stress alternation is one major cause to raise re-syllabification and multiple pronunciations on Urdu speech in Pakistan. The multiple pronunciations will identified the rules of 'word-level phonology' in Urdu; based on some special rules as exceptions.
Keywords: *tokens, restructuring, re-syllabification, alternativeor multiplepronunciations, phonemic alternation.*

13. **Abid, F., Sarfraz, R., Ashfaq, N.,** & Niazi, A. (2020). Multimodal analysis of the political posters before election campaign (2018) in pakistan. *International Journal of Psychosocial Rehabilitation, 24*(8), 11682-11689. doi: 10.37200/IJPR/V24I8/PR281142. **(Faiza Abid, Rida Sarfraz, Naheed Ashfaq (Department of Linguistics and Communications/ILA) SJR**

Abstract: This paper will analyze the political posters used for election campaignsof different but prominent Pakistani political parties like Pakistan Peoples Party (PPP), Pakistan Tehreek e Insaaf (PTI) and Pakistan Muslim League Noon (PML-N).The study will supremely focus on the representation of their leader through posters and later on it will pinpoint the similarities and possible differences between each of the poster especially emphasizing on what they denote. To instigate the target audience to vote for the particular party itis significant to study the main linguistic and visual strategies. That is used to highlight the power and presence of a politician.

While keeping in mind the cult of persuasion we must concentrate that how these parties grip the audience/ voters to an emotional extent that they actually get seriously attached with the concerned party.For the analysis, this research will focus on nine significant posters that have been selected randomly. These posters belong to three prominent Political parties that are present in the country. They will use these postersin the election campaigns'2018 and will roll these throughout the country for their target audience. Therefore, the researcher has used critical discourse analysis tools to identify the discursive strategies used. These strategies will help to persuade the Pakistani population to vote for their preferred politician. Van Leeuwen's (2008), social actor theory will assist in order to understand of how participants are representedAs far as images are concernedKress and van Leeuwen's(2006) visual grammar will be use.These politicians have been symbolically treated as to inspire the masses and presented as warriors and saviors that can lift up the misery from people. These posters have chronic impact on the psychology of the people that instigate them to vote or to support their respective party Furthermore, this study will also probe various tactics that have been implied by the political partiesin their posters to create a powerful discourse that hit audience emotionally and provoke them for specific action.

Keywords: *Critical discourse analysis, Political discourse, Posters, Social actors' theory, Visual grammar.*

14. **Ahmad, S.S.,** Asim Mahmood, M., Azhar, W. (2020). A corpus based transitivity analysis of newspaper articles on floods. *International Journal of Psychosocial Rehabilitation, 24*(8), 7242-7263. doi: 10.37200/IJPR/V24I8/PR280740. **(Sumera Shan Ahmad (Department of Linguistics and Communications/ILA) SJR**

Abstract: Aim of the current research is to explore distributions and functions of six processes of transitivity analysis in flood related Newspaper articles. No matter a country is developed, developing or under developed, floods bring drastic results in the whole world without discrimination. They are one of major causes of social unrest. Since, newspapers can be considered as a good and authentic source of information, so a small corpus of twenty (20) English newspaper articles addressing the issue of floods in Pakistan has been collected for the above purpose. Data was analyzed by transitivity analysis proposed by Halliday and Matthiessen (2014). It has six functions which have been further subdivided into many functions to explore any text. This analysis helps out in finding writing patterns which are followed in writing newspaper articles on the topic of floods. This study explores which procedure they use to follow in order to convey such pieces of news and do they suggest possible strategies too to overcome them. The study reflects that material and mental processes remained more dominant in the data and with the help of them, usually media partners try to sensationalize the writings and blame government officials as responsible of this undesirable situation. Verbal, behavioral and existential processes have been used very little.

Keywords: *floods, newspaper articles, transitivity analysis.*

Department of English and Literary Studies

Research Articles

1. **Safdar, M.,** & Yasmin, M. COVID-19: A threat to educated Muslim women's negotiated identity in Pakistan. *Gender, Work & Organization, n/a*(n/a). doi: 10.1111/gwao.12457. **(Muhammad Safdar (English and Literary Studies) Web of Science JCR Listed (IF: 3.101) (SKT Campus)**

Abstract: This study attempts to explore how the lockdown/containment measures taken by the government during the COVID-19 pandemic have threatened educated Muslim women's negotiated identity regarding wifehood and motherhood in urban Pakistan and how they struggle to reposition to reconstruct it. Through semi-structured interviews, making an in-depth comparative study of three differently situated cases (Muslim women), this study argues that the abnormal situation that has ensued from the pandemic has reinforced the vulnerability of women's nascent negotiated identity by landing them in a space where they are supposed by the

normative structures to step back to carrying out their traditional responsibilities as 'good' wife and mother during the crisis. It has found that the pandemic has similarity in its impacts for the women in their familial lives, despite their being variously situated and resistive, due to the general religio-culturally defined patriarchal social behaviour of the place (Pakistan) toward women and lack of action on the part of the state for implementing its laws of women's empowerment..

Keywords: *COVID-19, identity, motherhood, muslim women, Pakistan, wifehood.*

2. **Safdar, M.,** Yasmin, M., & Anwar, B. English for specific purpose through facilitated and nonfacilitated MOOCs: An analysis of the learners' perspectives. *Computer Applications in Engineering Education, n/a*(n/a). doi: 10.1002/cae.22246. **(Muhammad Safdar (English and Literary Studies) Web of Science JCR Listed (IF: 0.856) (SKT Campus)**

Abstract: Massive Open Online Courses (MOOCs) have gained attention from learners and teachers across the globe, but high dropout rate is a matter of concern, which makes it imperative to understand the reasons. From the theoretical perspective that learners learn more effectively through collaborative and socially cohesive communities, this qualitative study is focused to understand how learners experience facilitated and nonfacilitated MOOCs. It attempts to explore learners' perspectives from two different groups of learners learning the same MOOC of English for journalism. One of the groups is facilitated for the first week of the course by instructors through face-to-face interactions, whereas the other is not. The perspectives of the learners from both groups regarding their experiences are analyzed through comparative and contrastive thematic analysis of the data collected through participant observation and semistructured interviews of focus groups selected through purposive sampling technique. Though learning the same ESP MOOC, the learners (18–35 in age; all of them university students), register partly similar and largely contrastive learning experiences across the facilitated and nonfacilitated MOOC environments. It is found that the learners, when facilitated, develop a stronger sense of belongingness, accountability, responsibility, peer competition, networking, and solution of issues, which results in retention of the learners. This study foregrounds the effectiveness of hybrid MOOCs, in terms of retention and satisfaction of learners.

Keywords: *English for specific purposes, facilitated MOOC, learner autonomy, MOOC, MOOC learners.*

School of Professional Psychology (SPP)

Department of Clinical Psychology (ICP)

Research Articles

1. **Mukhtar, S.** (2020). Are individuals with cardiovascular disease at risk of COVID-19-related mental health problems or individuals with cardiovascular disease at risk of cardiovascular disease-related mental health problems during COVID-19? A psychological-psychiatric perspective. *Medical hypotheses, 144*, 109919-109919. doi: 10.1016/j.mehy.2020.109919. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 1.375) (Letter to editor)**

Abstract: Not available.

Keywords: *not available.*

2. **Mukhtar, S.,** & Rana, W. (2020). COVID-19 and individuals with mental illness in psychiatric facilities. *Psychiatry research, 289*, 113075-113075. doi: 10.1016/j.psychres.2020.113075. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 2.118) (Letter to editor)**

Abstract: Not available.

Keywords: *not available.*

3. **Mukhtar, S.,** & Mukhtar, S. (2020). Mental Health and Psychological Distress in People with Diabetes during COVID-19. *Metabolism - Clinical and Experimental, 108*. doi: 10.1016/j.metabol.2020.154248. **(Sonia Mukhtar (ICP/SPP) SJR (Letter to editor)**
   Abstract: Not available.
   Keywords: *not available.*

4. **Mukhtar, S.** (2020). Pakistanis' mental health during the COVID-19. *Asian journal of psychiatry, 51*, 102127-102127. doi: 10.1016/j.ajp.2020.102127. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 2.529) (Letter to editor)**
   Abstract: Not available.
   Keywords: *not available.*

5. **Mukhtar, S.** (2020). Mental Health and Psychosocial Aspects of Coronavirus Outbreak in Pakistan: Psychological Intervention for Public Mental Health Crisis. *Asian journal of psychiatry, 51*, 102069-102069. doi: 10.1016/j.ajp.2020.102069. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 2.529) (Letter to editor)**
   Abstract: Not available.
   Keywords: *not available.*
6. Rana, W., **Mukhtar, S.,** & Mukhtar, S. (2020). Mental health of medical workers in Pakistan during the pandemic COVID-19 outbreak. *Asian journal of psychiatry, 51*, 102080-102080. doi: 10.1016/j.ajp.2020.102080. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 2.529) (Letter to editor)**
   Abstract: Not available.
   Keywords: *not available.*

7. **Zulfiqar, L., & Rafiq, M.** (2020). Exploring experiences and coping strategies of nurses working in intensive care unit: A qualitative study. *Anaesthesia, Pain & Intensive Care, 24*(1), 42-49. **(Lamae Zulfiqar, Muhammad Rafiq (ICP/SPP) SJR**
   Abstract: Background: The nursing profession is in its developing stages in the country yet when it comes to the work itself, the environment can be very competitive. Though nurses, in general, go through a tough time, it is the intensive care unit (ICU) nurses who have to be on their toes all the time. Those working in the pediatric department, deal with young patients requiring constant supervision and care compared to other ICUs.
   The aim of the current project was to explore the experiences and coping strategies of nurses working in pediatric ICUs in a public sector hospital of Lahore, Pakistan.
   Methodology: Semi structured in-depth interviews were conducted with 5 nurses who were working in pediatric ICU (PICU) in a public sector hospital. All the nurses were female.
   Results: The data was managed and analyzed using NVivo 12 version. The four superordinate themes, e.g. vocational problems, psychological problems, biosocial problems and coping had 11 master themes and 70 sub themes.
   Conclusion: Nurses in PICU face a lot of problems in their everyday work life, yet they have found their own ways to cope with their stress. Regardless the shortage of staff and constant complaints against them, nurses of PICU find solace in religious coping and socialization (as much as they can get). These results will help authorities to look into the problems and provide suitable solutions.
   Keywords: *pediatric intensive care unit, nurses, stress, hospital, public sector, coping, phenomenology.*

8. **Rafiq, M.** (2020). Circle therapy for headache management: case studies. *Anaesthesia, Pain & Intensive Care, 24*(1), 101-104. DOI: https://doi.org/10.35975/apic.v24i1. **(Muhammad Rafiq (ICP/SPP)SJR**

Abstract: Recent findings have indicated that hypnotic interventions produce significant decrease in pain intensity. This current case studies are focused to highlight significant impact on pain management including headache. All the patients underwent a complete observation and clinical interview and only patients with psychological pain were included in the study group. For the management of headache, a novel hypnotic intervention - Circle Therapy (CT), was applied on a group of ten patients indicating their pain intensity in the range of 8-10 on subjective pain rating scale. According to rating scale, headache above 8 was considered as severe, 5-8 moderate and < 5 as mild. CT is a brief hypnotic technique limited to about 10 min. Post hypnosis ratings were also measured. The pre and post hypnosis data were recorded and analyzed by paired samples t test.Use of CT showed significant results between pre and post rating e.g. 9 ± 0.25 vs. 1 ± 0.21 ($p < 0.001$). This brief CT intervention provided an immediate relief from headache, however, this is limited to few case studies focusing on just headache. So, we recommend large sample studies to document the effects of CT in different types of pain.

Keywords: *pain management, circle therapy, headache, suggestibility, hypnosis, brief psychotherapy.*

9. **Mukhtar, S.** (2020). Psychosocial Impact of COVID-19 on Older Adults: A Cultural Geriatric Mental Health-Care Perspectived. *Journal of Gerontological Social Work*, 1-3. doi: 10.1080/01634372.2020.1779159. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 0.833) (Letter)**

   Abstract: Not available.

   Keywords: *not available.*

10. **Mukhtar, S.** (2020). Feminism and gendered impact of COVID-19: Perspective of a counselling psychologist. *Gender, Work & Organization, n/a*(n/a). doi: 10.1111/gwao.12482. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 3.101)**

    Abstract: When women, girls and gender-diverse people — who have been disproportionately impacted by the COVID-19 pandemic outbreak since the public health crisis has also become a crisis for feminism — will identify and acknowledge their organismic phenomenological self, wholeness and growth will be fully functioning. Psychological aspects for the public health emergency operated through counselling psychologists to manage mental health, emotional, psychological, cognitive, behavioural, relational and social impacts are fundamental. And the role of counselling psychologists in maintaining personal mental health and their clients is a crucial indicator of collective wellbeing. This perspective is embedded in the gendered approach and feminist framework which attempts to explore and offer the embodied intersectional and divergent impact on living during the COVID-19 pandemic lockdown.

    Keywords: *awareness, counselling psychologist, COVID-19 (coronavirus), feminism, gendered impact, growth mental health.*

11. **Mukhtar, S.** (2020). Psychological health during the coronavirus disease 2019 pandemic outbreak. *International Journal of Social Psychiatry*, 1-5. doi: 10.1177/0020764020925835. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 1.439)**

    Abstract: Background: The current ongoing pandemic outbreak of COVID-19 (Coronavirus Disease 2019) has globally affected 213 countries and territories with more than 2.5 million confirmed cases and thousands of casualties. The unpredictable and uncertain COVID-19 outbreak has the potential of adversely affecting the psychological health on individual and community level. Currently all efforts are focused on the understanding of epidemiology, clinical features, mode of transmission, counteract the spread of the virus, and challenges of global health, while crucially significant mental health has been overlooked in this endeavor. Method: This review is to evaluate past outbreaks to understand the extent of adverse effects on psychological health, psychological crisis intervention, and mental health management plans. Published previous and current articles on PubMed,

EMBASE, Google Scholar, and Elsevier about psychological impact of infectious diseases outbreaks and COVID-19 has been considered and reviewed. Comments: COVID-19 is leading to intense psychosocial issues and comprising mental health marking a secondary health concern all around the world. Globally implementing preventive and controlling measures, and cultivating coping and resilience are challenging factors; modified lifestyle (lockdown curfew, self-isolation, social distancing and quarantine); conspiracy theories, misinformation and disinformation about the origin, scale, signs, symptoms, transmission, prevention and treatment; global socioeconomic crisis; travel restrictions; workplace hazard control; postponement and cancellation of religious, sports, cultural and entertainment events; panic buying and hoarding; incidents of racism, xenophobia, discrimination, stigma, psychological pressure of productivity, marginalization and violence; overwhelmed medical centers and health organizations, and general impact on education, politics, socioeconomic, culture, environment and climate – are some of the risk factors to aggravate further problems.

Keywords: *COVID-19, coronavirus pandemic, mental health, social and behavioral epidemiology, psychological problems, psychosocial issues, misinfodemics, stigma, resilience, coping, mindfulness and well-being.*

12. **Mukhtar, S.** (2020). Preparedness and proactive infection control measures of Pakistan during COVID-19 pandemic outbreak. *Research in social & administrative pharmacy : RSAP*, S1551-7411(1520)30373-30379. doi: 10.1016/j.sapharm.2020.04.011. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 2.844)**
    Abstract: Not available.
    Keywords: *not available.*

13. **Mukhtar, S.** (2020). Mental health and emotional impact of COVID-19: Applying Health Belief Model for medical staff to general public of Pakistan. *Brain, behavior, and immunity, 87*, 28-29. doi: 10.1016/j.bbi.2020.04.012. **(Sonia Mukhtar (ICP/SPP) Web of Science JCR Listed (IF: 6.633) (Letter to editor)**
    Abstract: Not available.
    Keywords: *not available.*

14. **Rasool, A., & Mahmood, Z.** (2020). Post-traumatic Stress Reaction and Internally Displaced Persons: A Psychosocial Approach. *Clinical and Counseling Psychology Review (CCPR), 2*(1). **(Aisha Rasool, Zahid Mahmood (ICP/SPP) UMT JOURNAL**
    Abstract: The concept of involuntary displacement inside the country is growing day by day. Globally, researchers have suggested that due to prolonged internal displacement the Internally Displaced Persons (IDPs) usually suffer from mental health issues. The current study was carried out with the purpose of investigating the psychosocial reactions of trauma in IDPs, who were subjected to displacement due to the military operation in the region, with no concurrent aim of diagnosing them with Post-traumatic Stress Disorder (PTSD). It was a cross-sectional study and 104 (*M*= 31.20, *SD*=9.32) IDPs were sampled for it. Post-traumatic Stress Diagnostic Scale (PDS) was administered on IDPs. The findings revealed that around 17% of them showed severe symptoms. The women were at more risk for PTSD as compared to men. Although no significant differences were found in both genders when it was about impairment in daily life functioning and both were equally affected. The satisfaction of life was decreased; too, on many symptoms results were significant. It was revealed that symptom severity decreased when the duration of displacement increased. The results were described according to cultural manifestation.
    Keywords: *not available.*

15. **Zahra, S. T., Saleem, S., Subhan, S., & Mahmood, Z.** (2020). Interpersonal skills scale: Development and validation in urbanized sample of adolescents. *Social Development, n/a*(n/a). doi: 10.1111/sode.12475. **(Sayyeda Taskeen Zahra, Sadia Saleem, Sara Subhan, Zahid Mahmood (ICP/SPP) Web of Science JCR Listed (IF: 1.552)**

Abstract: Interpersonal skills play a vital role in the growth and development of adolescents. The current study explored the experience and manifestation of interpersonal skills in Pakistani adolescents. In phase I, using open-ended phenomenological approach, key components of interpersonal skills were elicited from 32 adolescents (boys = 16; girls = 16) aged 11–19 years (*M* = 14.48; *SD* = 1.06). In phase II, Content Validity Index for items (I-CVIs) and scale (S-CVI) was established. In phase III, pilot testing was carried out on 21 adolescents (boys = 11; girls = 10). In Phase IV, a sample of 674 adolescents (boys = 47%; girls = 53%) aged 11–19 years (*M* = 14.88; *SD* = 1.33) were tested for psychometric properties of Interpersonal Skills Scale along with Social Intelligence Scale for Adolescents and Self-Esteem Scale for Children. Exploratory Factor Analysis (*n* = 221) generated three factors of the Interpersonal Skills Scale *social engagement*, *sociability*, and *social etiquettes*. Confirmatory Factor Analysis (*n* = 453) also supported the three-factor structure of the Interpersonal Skills Scale. Furthermore, the scale found to have high internal consistency, construct validity, discriminant validity, split-half reliability, and test–retest reliability. The results are discussed in the light of factorial structure in the Pakistani cultural context.
Keywords: *adolescence, interpersonal skills, reliability, sociability, social engagement, social etiquettes, validity.*

16. **Saleem, S., Asghar, A., & Mahmood, Z.** (2020). Perceived Parental Rearing Practices, Interpersonal Relationships and Psychological Problems in College Students. *Bahria Journal of Professional Psychology, 19*(2), 01-11. **(Sadia Saleem, Ayesha Asghar, Zahid Mahmood (ICP/SPP) HEC Y CAT**
Abstract: The need of belongingness is said to be one of the basic human need. The quality of parent-child relationship provides a base to develop long term, intimate and deep emotional bonds among individuals. The current study is aimed to explore the predictive relationship of perception of parental practices and quality of interpersonal relationship with psychological problems among college students. In a quantitative correlation survey research design, 321 participants (54 % boys & 46% girls) from different colleges of Lahore were selected through stratified random sampling. The age range of the participants was 15-20 years (*M*=17.32; *SD*=1.00). Three scales Egna Minnen Betraffenda Uppdostran – A **(**EMBU-A; Gerlsma, Arrindell, Veen, & Emmelkamp, 1991), Interpersonal Difficulties Scale (Saleem, Ihsan, & Mahmood, 2014) and General Health Questionnaire-30 (Goldberg & Williams, 1988) and a demographic form were given to participants. Findings of the study showed that perceived parental rejection and interpersonal problems are the significant predictors of psychological problems in college students. Results are discussed in terms of counseling and cultural perspectives.
Keywords: *Perceived parental rearing practices, interpersonal relationships, psychological problems, college students.*

17. **Rafiq, M.,** Wasay, M., Ramos, Raúl Pérez. (2020). Management of spasticity and psychological symptoms through hypnosis in stroke survivors. *Anaesthesia, Pain & Intensive Care, 24*(3), 291-301. DOI: https://doi.org/10.35975/apic.v24i3.1278. **(Muhammad Rafiq (ICP/SPP) SJR**
Abstract: Studies have shown that stroke survivors are associated with physical as well as psychological symptoms. Spasticity is the main physical issue associated with stroke survivors and stress, anxiety, and depression are common.
This study was conducted to investigate any effect of hypnosis on the psychological symptoms (anxiety, stress, and depression) and on the spasticity in the stroke survivors.
Keywords: *psychological symptoms, anxiety, stress, depression, spasticity, hypnosis, circle technique, stroke.*

Department of Applied Psychology

Research Articles

1. Waseem, F., **Jibeen, T.,** & Iqbal, W. Z. (2020). Determinants of Life Satisfaction: Role of Living Arrangements,

Social Status, and Perceived Satisfaction in Women. *Journal of International Migration and Integration, 21*(2), 335-349. doi: 10.1007/s12134-019-00654-3. **(Tahira Jibeen (Psychology\SPP)** **SJR**

Abstract: Living arrangements, social status, and perceived freedom may have a powerful effect on women's satisfaction with life. Perceptions of satisfaction were studied by testing these independent variables: living arrangements (living with in-laws vs. separately) and social status (being married to army officer vs. civilian), with the dependent variables of perceived freedom and satisfaction with life. The sample comprised 104 women (age = 32.36, SD = 6.59) married to civilians (51%) and army officers (48%) in Lahore, Pakistan. Women married to army officers and not sharing with in-laws were more likely to indicate a higher level of freedom and satisfaction compared to women married to civilians and living with in-laws. Further, a mediational analysis revealed that the effect of living arrangements on satisfaction was mediated by womens' reported freedom.

Keywords: *living arrangements, social status, freedom, satisfaction, socio-cultural norms, changed family roles.*

2. Ashraf, F., **Jibeen, T.,** & Masood, A. (2020). Perceived Stress in Relation to Obsessions and Compulsions in South Asian Adults: Moderating Role of Socio-demographic Characteristics. *Community Mental Health Journal, 56*(4), 680-691. doi: 10.1007/s10597-019-00529-y. **(Tahira Jibeen (Psychology\SPP)** **Web of Science JCR Listed (IF: 1.292)**

Abstract: This study examines perceived stress associated with obsessions and compulsions (OC) in a normative sample of adults. The aim was to discover whether socio-demographic characteristics (i.e., gender, marital status, employment status, age and education) had a moderating effect on perceived stress and OC symptoms. The participants were 362 Pakistani adults (*M* age = 26.82 years, *SD* = 4.75; males = 188, females = 174) and the findings were based on a demographic questionnaire, the perceived stress scale (Cohen et al., in Applied multiple correlation/regression analysis for the behavioral sciences, Taylor & Francis, London, 1983), and the Padua inventory of obsessive compulsion disorder symptoms (Burns et al., in Behav Res Ther, 34(2), 163–173, 1996). A series of stepwise regression analyses showed that socio-demographic characteristics (employment status, age, and education) significantly moderated the relationship between perceived stress and OC symptoms. The current findings have implications for clinicians and researchers in generating effective stress management programs and learning mechanism for managing OC symptoms, particularly in the context of socio-demographic characteristics.

Keywords: *obsessions and compulsions, perceived stress, socio-demographic characteristics, adults.*

3. Shujja, S., **Akram, A.,** Holzapfel, J., & Randall, A. K. (2020). Perceived ex-husband rejection and psychological distress among pakistani remarried women following divorce: Does emotional intelligence moderate? *Current Psychology*, 1-12. **(Ansa Akram (Psychology\SPP)** **Web of Science JCR Listed (IF: 2.051)**

Abstract: The current study assumed that perceived ex-partner rejection is likely to associate with increased symptoms of psychological distress among remarried women who had been previously divorced. Additionally, emotional intelligence may act as moderator between ex-partner rejection and psychological distress, and length of time between divorce and remarriage may play a role in the amount of psychological distress, a woman experiences. In this regard, 99 remarried women, who have been previously divorced, were recruited using purposive sampling technique. Separate hierarchical regressions revealed that perceived ex-spousal rejection significantly and positively predicted psychological distress, however, EI did not moderate between ex-partner rejection and psychological distress. Results further demonstrated no significant difference in level of psychological distress between group of women who remarried within 2 years of divorce, and those who remarried after 2 years of divorce. Implications for relationship researchers and mental health professionals are discussed.

Keywords: *maladjustment, rejection, retrospection, cultural variation.*

4. Qayyum, S., **Tariq, S.,** & Younas, F. (2020). Sick building syndrome and job performance in women factory workers. *Journal of Postgraduate Medical Institute (Peshawar-Pakistan), 34*(1). **(Shahnila Tariq (Psychology\SPP)**

SJR

Abstract: Objective: To investigate the relationship between sick building syndrome (SBS) and job performance of women factory workers. **Methodology:** This was a correlational study. A sample of 200 women working in different industrial sectors including pharmaceuticals, hosiery, polyester fiber, and stitching units was recruited with purposive sampling technique,. Indoor Air Quality (IAQ)1 was employed to assess sick building syndrome while Individual Work Performance Questionnaire (IWPQ)2 was used to assess job performance. **Results:** Results for correlation analyses revealed significant relationship between SBS and job performance while demographic variables including age, family system, working hours as negatively correlated with SBS and job performance. Moreover, SBS was found to be a significant negative predictor of job performance, while age was found to be a significant negative predictor of contextual and adaptive performance domains of job performance. **Conclusion:** It was concluded that SBS negatively affects the performance level of the factory workers.

Keywords: *factory workers, job performance, sick building syndrome.*

5. Liaqat, H., Malik, T. A., **Bilal, A.** (2020). Impact of Masculinity and Normative Male Alexithymia on Interpersonal Difficulties in Young Adult Males. *Mediterranean Journal of Clinical Psychology,* 8(2). https://doi.org/10.6092/2282-1619/mjcp-2488. **(Ahmed Bilal (Psychology\SPP)** SJR

Abstract: The study of psychology of men and masculinity received scientific attention recently focusing on gender differences and its impact in communicating and expressing emotions. It has been proposed that men, who had been discouraged as boys in expressing and talking about their emotions showed difficulty in identifying and expressing emotions throughout their lives which has been termed as normative male alexithymia (Levant, 2011). Emotions are related to many vital functions, and its awareness leads to healthy intrapersonal and interpersonal functioning. The present study aimed to explore the impact of masculinity and normative male alexithymia on interpersonal difficulties in young adult males. Assessment measures included a demographic form, sex role attitude scale, normative male alexithymia scale, and interpersonal difficulties scale. Sample of the study (N=232) included young adult males (Age = 18 to 24) who were approached through the universities of Lahore. Results suggested that with the increase in traditional masculinity, normative male alexithymia and interpersonal difficulties also increases. Further it was found that traditional masculinity predicted interpersonal difficulties and normative male alexithymia aggravate the relationship. Moreover, normative male alexithymia mediates the relationship between traditional masculinity and interpersonal difficulties. Findings of the study were explained and future implications were discussed.

Keywords: *masculinity, normative male alexithymia, interpersonal difficulties.*

School of Professional Advancement (SPA)

School of Professional Advancement

Research Articles

1. **Anwar, A.,** Kee, D. M. H., & Ahmed, A. (2020). Workplace cyberbullying and interpersonal deviance: understanding the mediating effect of silence and emotional exhaustion. *Cyberpsychology, behavior and social networking.* **(Aizza Anwar (SPA)** Web of Science JCR Listed (IF: 2.258)

Abstract: Workplace cyberbullying (WCB) is a new form of hostility in organizations in which information technology is used as a means to bully employees. The objective of this study is to determine the association between WCB and the interpersonal deviance (ID) of victims through parallel mediation through the ineffectual silence of employees and emotional exhaustion (EE). Conservation of resource (COR) theory and affective events theory were used as the study's guiding framework, and data were drawn from 351 white-collar employees who

were employed in a variety of industries—such as banking, telecommunications sector, education, health care, insurance, and consultancy—in Lahore, Pakistan. The results show that ineffectual silence negatively mediated the relationship between cyberbullying and deviance, decreasing the level of deviance of employees who used silence as a coping mechanism. EE, however, positively mediated the relationship between cyberbullying and deviance. This means that when employees felt emotionally overwhelmed they retaliated by engaging in deviant behaviors and acting as a bully toward colleagues. Drawing on the COR theory and the affective events theory, the findings show that WCB has an impact on ID. From a practical standpoint, the study reveals that WCB can lead to ID and it also may associate with large financial costs and workplace disruptions. Thus, organizations should establish a culture that prevent employees from engaging in WCB and adopt practices of prevention and intervention because it is not only harmful to the employees but also to the organization.

Keywords: *emotional exhaustion, interpersonal deviance, silence, workplace cyberbullying.*

2. **Anwar, A.,** Waqas, A., **Zain, H. M.,** & Kee, D. M. H. (2020). Impact of Music and Colour on Customers' Emotional States: An Experimental Study of Online Store. *Asian Journal of Business Research, 10*(1), 104. doi: DOI: 10.14707/ajbr.200077. **(Aizza Anwar, Hafiz Muhammad Zain (SPA) SJR**

   Abstract: Retailers try their best to make their online store environment more entertaining and attractive to capture customers' attention. Therefore, it is interesting and beneficial to explore how the store environment impacts the customer emotions in store and how these emotions change customer's buying behaviour. The main focus of this study is to measure the impact of atmosphere cues, such as colour and music on respondent's emotional response and their shopping behaviour in an online store. Respondents were exposed to different combinations of music and colour, and both cues had significant impacts on the respondent's emotional response and behavioural intention. The questionnaire responses of 230 valid respondents from Pakistan revealed that cool colours and fast tempo music showed greater levels of pleasure and arousal as compared to slow tempo music with warm colours. Arousal and pleasure were also found to be significant parameters for predicting behaviour intention. Respondent's in fast tempo music with cool colour environment showed more approach behaviour in comparison to slow tempo music with warm colours. An efficient online store environment is proposed, incorporating suitable music and colour attributes that will result in more time spent in-store, repurchasing, and revisiting. The outcomes of the study assist online retailers in Pakistan to make the shopping environment attractive and enjoyable.

   Keywords: *atmospheric cues, online store, online buying behaviour, emotional response, behavioural intention. arrangements, affordable housing, Punjab, Pakistan, low-income groups, policy framework.*

3. **Munir, F.,** Abiodullah, M., **& Aslam, F.** (2020). Employees' Perception of School Leaders' Efficacy and its Impact on their Adaptive Performance. *Sukkur IBA Journal of Management and Business, 7*(1), 55-74. **(Farhat Munir (SPA) Faiza Aslam, (ORIC) HEC Z CAT**

   Abstract: The fast-paced changes in the education sector at secondary school'slevel demand a highlevel of adaptability. Several factors have been explored through research that affects employees' adaptability. The purpose of this study was to explore the relationship between employees' perception of leaders' efficacy and its impact on their adaptive performance. 266 academic and administrative employees were randomly selected, as a sample for the purpose of this study, from 50 private secondary schools located in Lahore, Pakistan. Pearson correlation and multiple linear regression analysis (were used to analyze/evaluate the data) were run for data analysis and a significant positive relationship was found between the employees' perception of leaders' efficacy and their adaptive performance.

   Keywords: *employees' perception, leader action self-efficacy, leader mean self-efficacy, leader self-regulation efficacy, adaptive performance.*

4. Khan, M. N. A., Mirza, A. M., & **Saleem, I.** (2020). Software Risk Analysis with the use of Classification Techniques: A Review. *Engineering, Technology & Applied Science Research, 10*(3), 5678-5682. **(Imran Saleem (SPA) Not HEC Recognized**

Abstract: Risk analysis and management is a critical aspect of the software development process. Various risks are associated with every phase of the software development lifecycle. The early identification of risks in each phase of software development coupled with mitigating plans can help to reduce the cost of the product and increase software quality. This study aims to explore various tools and techniques used in the literature of analyzing and managing risks. Most risk analysis techniques have been applied in the requirement analysis phase, so there is a scarcity of tools supporting automated risk analysis. Accommodating various types of risk factors to predict the software risks reduces the accuracy of the classifier.

Keywords: *risk analysis, software risk, classification techniques.*

Conference Paper

1. **Mahmood, M. T., Aslam, F.** (2020). *Motives of Revaluation of Property Plant and Equipment: A Qualitative Study of Public Companies in Pakistan.* Paper presented at the 6th International Conference on Doing Responsible and Sustainable Business: Challenges under Belt & Road Initiative (ICIBM-2020) University of Central Punjab, Lahore (UCP), Pakistan 6-7 Feb 2020.**(Mohyuddin Tahir Mahmood (SPA) Faiza Aslam (ORIC)**

Abstract: The purpose of this research paper is to analyze the management's motives behind the revaluation of Property, Plant and Equipment (PPE) by public companies in Pakistan. Purposive sampling technique is used for selection of respondents who are information rich in the relevant area. Semi structured interviews were conducted to collect data from the respondents. Analyses based on interviews transcriptions, field notes and tag clouds suggest that management has certain motives regarding revaluation of PPE. Among those, financing from the banks, improvement in debt to equity ratio and performance of the organization, positive signals to the potential investors, and reduction in political cost are the main motives of the management behind revaluation of PPE. By focusing on these motives, companies may formulate policies to revalue their PPE and then decide the frequency of revaluation. This research can also assist the future researchers in unfolding motives in the financial sector.

Keywords: *revaluation, ppe, ias, motives, public companies, debt to equity ratio.*

Institute of Aviation Study (IAS)

Institute of Aviation Study

Conference Proceedings

1. **Batul, B., Jamil, Z.,** & Sohail, A. (2020, 14-18 Jan. 2020). *Effect of Similarity Distortion on the Scaled Model of a Pressure Vessel- A Case Study of Propellant Tank.* Paper presented at the 2020 17th International Bhurban Conference on Applied Sciences and Technology (IBCAST). **(Beenish Batul, Zukhraf Jamil (IAS) SJR**

Abstract: This paper investigates the effect of similarity distortions on the structural similitude performed on the full scale prototype propellant tank in order to develop its scaled model. Propellant tanks act as pressure vessels and find their use in various aerostructures ranging from launch vehicles to missiles. They require extensive and costly testing to qualify which can be reduced by performing tests on the scale down model and using its results to accurately predict the prototype performance. Structural similitude using dimensional analysis is the widely used method of developing scaled models of pressure vessels in order to reduce the cost of manufacturing and testing. One of the problems encountered in dimensional analysis is the lack of complete similarity due to variations in the material properties, geometrical parameters and other factors between the prototype and the scaled model. These variations, called similarity distortions, result in partial similarity model that can affect the overall testing results. In this paper, the similarity distortions due to the change in material, wall thickness and

head ratio of the propellant tank are studied. The objective to analyze these distortions is to achieve reliable test results and at the same time identify the structural parameters whose complete similarity cannot be violated. For comparison and overall analysis, a linear pattern of scale factors for different levels of distortions is presented for the development of scaled models. Results show that partial similarity in the scale factor of head ratio does not give satisfactory results. However, partial similarity in the material properties and wall thickness of the scaled pressure vessel can be overcome and the method to achieve this is presented. **Keywords:** *propellant tank, pressure vessels, dimensional analysis, partial similarity.*

School of Commerce and Accountancy (SCA)

School of Commerce and Accountancy

Research Articles

1. Sadia, Z., Humayun, A., Shafiq ur, R., Shan, E., **Amer, S.,** Farhat, Y., & Shehnila, A. (2020). Effect of excess Fluoride consumption on Urine-Serum Fluorides, Dental state and Thyroid Hormones among children in "Talab Sarai" Punjab Pakistan. *Open Chemistry, 18*(1), 119-128. doi: https://doi.org/10.1515/chem-2020-0012. **(Amer Shakeel (School of Commerce and Accountancy/SCA) Web of Science JCR Listed (IF: 1.216)**

   Abstract: 190 children aged 7-18 years from an endemic fluorotic village "Talab Sarai (n = 130) and a non-fluorotic, control, village "Ottawa" (n = 60) were selected for comparison. Children were examined for fluoride (F-) concentration in drinking water, urine, and serum as well as Dental fluorosis (DF) and thyroid hormone levels. The mean concentration of water fluoride (WF) in the sample group was 6.23 mg/L, urine fluoride (UF) 3.38 mg/L, and serum fluoride (SF) 0.21 mg/L, while DF was 93.07%. Significant elevations (P = 0.000) in the concentration of all these four variables were observed in sample group children as compared to control. Mean Free Tetra-iodothyronine (FT4), Free Tri-iodothyronine (FT3) and Thyroid Stimulating Hormone (TSH) concentrations in the sample group were 16.64pmol/L, 5.57 pmol /L and 4.41 mlU/L, respectively. No marked difference in FT4 (P = 0.1) was noted, while significant elevations in FT3 and TSH (P = 0.000) were found in the sample relative to the control group. 80% of the children displayed clear thyroid hormonal derangements, with 36.92% having high TSH and 43.07% with FT3 and FT4 disorders. A moderate to strong correlation among WF, UF, SF and DF (r = 0.94, 0.60, 0.60, 0.72) and a very strong correlation between WF and TSH (r = 0.9) were observed. Our results suggest that excess F- level that is four times greater than the "safe limit" is not only increasing fluoride concentration in body fluids but is also affecting thyroid hormones in 4 out of 5 children which could lead to abnormal physical and mental growth in later developmental stages.

   Keywords: *Water fluoride, Urine and Serum fluorides, Dental fluorosis, FT4, FT3 TSH.*

2. **Shakeel, A., Rasheed, B.,** Ahmed, M., & Bakhsh, A. (2020). Effectiveness of the Role of Internal Audit Function: A Perception of External Auditors of Pakistan. *Paradigms, SI*(1), 75-80. doi: 10.24312/20000112. **(Amer Shakeel, Burhan Rasheed (School of Commerce and Accountancy/SCA) HEC Y CAT**

   Abstract: Internal Audit Function (IAF) is considered as an important element of corporate governance. It can contribute to good corporate governance only if it operates effectively. There are many stakeholders of IAF like Board of Directors (BoD), the firm's management, external auditors etc. All these stakeholders have their different needs and also have different perception regarding IAF. In this study, we tried to explore the perception of external auditors regarding the role and effectiveness of the IAF. For this purpose, we interviewed with eight external auditors of different audit firms. As per the findings of this study, the role of IAF includes checking the compliance and evaluation of internal controls, risk management and fraud risk management. This paper further concluded that the current role of IAF can be more effective by making IAF independent and by the induction of the personnel with right qualification, skills and relevant experience. External auditors can also get benefits from effective IAF.

Keywords: *Internal audit function, corporate governance, external auditors, board of directors.*

School of Media and Communication Studies (SMCS)

School of Media and Communication Studies

Research Articles

1. Shafiq, Z., **Hussain, T.,** & Ali, H. A. (2020). English-role of religion in indian cinema. *The Scholar-Islamic Academic Research Journal, 6*(1), 231-251. doi: 10.29370/siarj/issue10ar16. **(Tanveer Hussain (SMCS) HEC X CAT**

   Abstract: Relationship between cinema and religion is as old as the history of cinema. Since the beginning of commercial feature films in the sub-continent (now Pakistan, India and Bangladesh), religion was used as a tool of acceptance and popularity of this new medium. Until now the use of religion is common in the cinema industries of India and Pakistan. This paper is part of a major project that attempts to explore the use of religion in the sub-continent region. The current paper only focuses on its one dimension which is to study the role of religion in Indian cinema and the ways it has used religion as one of its major narrative tools. Due to the excessive use of religious and mythological elements in films, this paper offers an analysis of selected horror films. The study established that Hinduism gains a superior position from Islam and Christianity in Indian horror. However, all the films show respect to these religions. Moreover, when the religious force confronts the secular, the 'monster' in these films punishes the secular and leaves the believers.

   Keywords: *religion, islam, hinduism, secularism, cinema.*

2. Adnan, M., **Hussain, T.,** & Nawaz, M. B. (2020). Television and Marital Family Discourses in Pakistan: Islamic Values and Urdu Drama Narratives. *Pakistan Journal of Islamic Research, 21*(1), 103-112. **(Tanveer Hussain (SMCS) HEC X CAT**

   Abstract: The advancement of television in the globe has been amazing. Television has become a constant feature in the family circle over the past few years and television drama has become an important source for education, entertainment and information for billions of individuals around the globe. Television drama in Pakistan has the potential to educate and affect the people. So the question arises that the Pakistani television dramas are promoting the Islamic culture or not. The main purpose of selecting Pakistani dramas for this research is to find out that how these dramas present the marital family issues. This study focuses on Islamic values, marital family and narratives of Pakistani dramas. It is highly needed to investigate that what sort of contents are being disseminated in the name of entertainment. In contemporary society, where divorce rate is increasing day by day, it is the need of the time to have great in-depth look of Urdu televise drama. The study concluded that the stories of almost all the Urdu dramas presented by the different channels show some confusion and rift in family relationships that lead to the marital family deterioration. Most of the schemes of these dramas are directly contrary to the spirit of Islamic teachings and beliefs. Generally, illicit relations or extramarital relations are shown in such a way that they can detract its viewers and generation is ruined in this way. All these thoughts are anti to Islamic teachings and values.

   Keywords: *television, Urdu drama, Islamic values, marital family, Pakistan.*

3. Safdar, G., **Javed, M. N.,** & Amin, S. (2020). Use of Internet for Education Learning among Female University Students of Punjab, Pakistan. *Universal Journal of Educational Research, 8*(8), 3371-3380. doi: 10.13189/ujer.2020.080809. **(Muhammad Naeem Javed (SMCS) SJR**

   Abstract: Current era is called era of internet technology. Internet provides platform where various channels are just one click far away. The core aspire of this research study was to explore internet use for educational learning targeting public universities female students belonging to Punjab Pakistan. The study recorded student's internet usage pattern, level of usage, preferred viewing sites, favorite visiting sites, and most usage time and core

reasons of using internet. It also analyzed demographic information of respondents such as hostelries or home, class and urban or rural areas. The study crossed checked the opinion regarding internet usage as well as demographic characteristics. The data was collected using survey methodology. A total sample size of N=1157 respondents were taken from six selected public sectors universities with highest student statistical rate using multi-level sample technique. The collected data was analyzed using SPSS and study focused how female university students think about internet as a medium of educational learning at undergraduate, graduate and post-graduate level. The study concluded that internet usage is more common and is the source of inspiration among female for educational learning and enhanced learning trends and searching educational content. Using internet causes dual learning i.e. educational and technological for female and due to multimedia content, internet is a more effective source of learning for female than text books.

Keywords: *internet, educational learning, female university students, Punjab Province.*

4. **Hussain, T., Javed, M. N.,** & Shahwar, D. (2020). The Reflection of River Warfare in Pakistani and Indian Press: Dispute, Management and Strategies. *Global Regional Review, V* ((II)), 1-10. **(Tanveer Hussain, Muhammad Naeem Javed (SMCS) HEC Y CAT**

   Abstract: This study provides an overview of Pak-India River warfare over the sharing of water and management failure which led to serious water crises and disaster especially in Pakistan. Water resources are diminishing day by day water is become a scarce commodity in the world with every passing day. It is rapidly emerging a source of tension and dispute between two nations (Pakistan and India), which is a destabilizing factor of international peace and regional harmony. The content analysis used as research methodology while data collected from editorials and articles published in "The News" and "The Telegraph". This research covers the period between 2018 and 2019. The results showed that "The News" gives more coverage and large space related to the Pak-India River Warfare as compared to "The Telegraph". Furthermore, "The News" has a clear stance for the solution of Pak-India River Warfare rather than Indian newspaper "The Telegraph".

   Keywords: *Pak-India river warfare, role of newspapers, management.*

5. **Hussain, T., Awan, N. K., & Javed, M. N.** (2020). Psychological Effects of Social Media Resulting in Isolation Among Students of Lahore: A Cross-Sectional Study. *International Review of Social Sciences (IRSS), 8*(9), 118-134. **(Tanveer Hussain, Noman Khalid Awan, Muhammad Naeem Javed (SMCS) HEC Y CAT**

   Abstract: The present research focuses on the effect of media platforms on more separation of students. Learners to scientific advancement start to be using social media channels e.g Facebook messenger google video Snapchat and many others that have seen many methods of impacting one's lifestyles. Using such social networks they are violently isolated short tempered ill. The study focuses on the effects of student isolation. The research examines the effects of isolation in students, how isolation changed their lives their behaviors towards people and how the use of social media effected their health in general. To achieve these objectives we conducted quantitative method like questionnaires and surveyor by manipulating preexisting statistical data using computational techniques. In the research 52.2 percent accepted the psychological effects of isolation, Result shows that 57.6 percent people said that they are effected by the use of social media, research says that 27.4 percent says that they will spend their time with friends which shows that people have vast effects of social media excessive use and they want some other activities of healthy activities to get rid of the social media to avoid any further health and mental and other kind of socializing problems.

   Keywords: *effects, psychology, social, media, Lahore.*

6. **Javed, M. N., Basit, A., & Hussain, T.** (2020). Climate Change in the Mainstream Pakistani Press: Coverage and Framing Trends. *Global Political Review,* V(I), 192-204. doi:10.31703/gpr.2020(V-I).22. **(Muhammad Naeem Javed, Abdul Basit, Tanveer Hussain (SMCS) HEC Y CAT**

Abstract: Climate change is a global phenomenon; its outcome affects societies around the world. Due to the systemic effects of climate change, Pakistan frequently suffers from natural disasters. The present study explored the press coverage and framing trends about three climate issues (1) Climate change and global warming (2) climate change and water scarcity (3) agriculture and food security. The study was based on content analysis. In this research, editorials of four newspapers; The Nation, The News, Nawa-i-Waqt and Jang were examined during 2011 to 2018. It was census study and all editorials were examined during the period of 8 years. The results showed that all four newspapers highly covered issues of water scarcity in Pakistan and however, gave less coverage to the issue of agriculture and food security. Thus, overall editorial coverages increase with every passing year and mainstream Pakistani press framing trends were remain very positive and suggestive.
Keywords: *climate change, mainstream press, newspaper coverage, framing trends.*

7. Zahra, M., **Hussain, T.** & Shahwar, D. (2020). Role of Technology in Developing Oral Fluency among Intermediate Students. *Global Regional Review,* V(I), 442 – 459. http://dx.doi.org/10.31703/grr.2020(V-I).48. **(Tanveer Hussain (SMCS)** **HEC Y CAT**
   Abstract: Use of technology develops learner oral fluency, as well as their other learning skills. The recent research is on the role of modern technology in developing oral fluency of English among the students of intermediate level. The objective of the paper is to answer the question, what role technology plays in developing the oral fluency of learners? This study has been built on the hypothesis that technology has a positive influence on oral fluency, as by using technology learners enhance their oral fluency. In order to check our hypothesis this study used the quantitative data through questionnaire from 200 students (both male and female) aged between 17-19 years, at intermediate level from Government Emerson College Multan and Government Degree College Multan. The framework employed in this study is the input hypothesis by Stephen Krashen (1977). The hypothesis that technology plays positive role in developing oral fluency among students is proved in conclusion.
   Keywords: *modern technology, oral fluency, use of technology in second language learning.*

8. Chaudhary, M. U., **Hussain, T.** & Ghani, A. (2020). Role of FM Radio on Pakistani Youth: Socio-Political Perspective. *Global Political Review*,V(I),172-181, doi:http://dx.doi.org/10.31703/gpr.2020(V-I).20. **(Tanveer Hussain (SMCS)** **HEC Y CAT**
   Abstract: This research paper is being presented to know and evaluate the socio-political influence of FM radio on Pakistan youth. At the time of partition and inception of Pakistan, Radio Pakistan was the only electronic medium available in the country. Radio has been the most powerful and useful informative/ educative tool for the reason that it has excellent outreach as compared to all other electronic mediums; with passing years it has been turning into a neglected medium due to the policies of sitting governments who have used radio medium for propagation of their agendas and made this useful source of information, an extol tool which only focused actions of government, instead of disseminating education, highlighting different social, cultural and political issues and awareness campaigns for the masses. Concrete and stunning efforts are still required to get maximize yield and benefit from the radio medium in Pakistan.
   Keywords: *FM radio, youth, social, political.*

9. **Waheed, S.,** Saleem, N., Riaz, A., & Bukhari, S. F. (2020). Islam and myths about family planing: The impact of greenstar media advertisement campaign on the mindset of the rural dwellers of Pakistan. *Journal of Islamic Thought and Civilization* 10 (1), 332-347. https://doi.org/10.32350/jitc.101.18. **(Saima Waheed (SMCS)** **SJR**
   Abstract: Religious guidance in Islam is derived primarily from the Holy Qur'ān and *Sunnah*. For cases not discussed in the Holy Qur'ān, Muslims refer to *ijtihad* and *ijma,* that is, they strive to find solutions for the existing problems by reinterpreting Islamic decrees while utilizing the ultimate superintendent sources (Holy Qur'ān and *Sunnah*) and seek consensus. The study aims to investigate the effects of Greenstar media advertisement

campaign on the mindset of the rural dwellers of Pakistan through selective exposure technique. Greenstar marketing tends to educate the rural populace about population control and guides them about different birth control methods, such as contraceptive pills. The researchers carried out a survey with a sample of 200 respondents, out of which 100 were male and 100 were female. Data was collected by providing two questionnaires to take sample from different age groups developed on a five point Likert scale. The results of the study highlighted that regardless of exposure to Greenstar media advertisement, rural men still showed a rigid attitude towards using these products (*p* value = 0.000). On the other hand, rural women considered local midwives more knowledgeable and expert about the matter at hand (*p* value = 0.002) and were reluctant towards using Greenstar products that were advertised on the mainstream media due to the pressure of their husbands (*p* value = 0.000).

Keywords: *Greenstar products, Islam, media advertisement campaign, mindset, myths, family planning, Pakistani villagers.*

10. Naeem, T., **Khan, M. H.,** & Khaliq, F. A. (2020). Cultural Imperialism through Hollywood Cinematic Media on Pakistani Youth. *International Journal of Media and Information Literacy,* 5 (1), 90-102. doi: 10.13187/ijmil.2020.1.90. **(Mohsin Hassan Khan (SMCS) SJR**

    Abstract: Cinematic media is a very powerful tool, used by developed countries in the modern world, with a deliberate purpose to transmit their cultural legacy by projecting a variety of attractive features to influence the minds of youth. This study aims to scrutinize the impact of Hollywood cinematic media on Pakistani youth. The theoretical framework applied in this study is based on the Theory of Cultural Imperialism, propounded by Her Herbert Schiller in 1973. The theory postulates that the Western media has a strong effect on the Third World countries by imposing on them Western cultural standards and hence are destroying their own cultures. The study is quantitative based on a mixed survey, which consists of close-ended questions along with the opinions of the respondents. SPSS is used to compute the obtained data. The findings demonstrate that the Hollywood movies leave a significant impact on Pakistani youth, since they are prominently engrossed to the lifestyle of American culture. The study suggests that it is responsibility of Pakistani people and media authorities to pay serious heed to control such movies, which prove to be serious threat to their own cultural values.

    Keywords: *cinematic media, cultural imperialism, Pakistani youth.*

11. Noureen, A., **Hussain, T.** & Warrich, Haseeb Ur Rehman. (2020). Hollywood Interpretative Overview on Communism: An Analysis of Pre, During & Post-Cold War Era. *Global Mass Communication Review, V(I), 1-14. doi:10.31703/gmcr.2020(V-I).01*. **(Tanveer Hussain (SMCS) HEC Y CAT**

    Abstract: The US's communist or socialist fright began in the late 1800s, the moment when blue-collar workers stood up in opposition to get their fundamental integrity, remuneration betterment etc., and the attainment of such integrities from intercontinental supremacies, and to have remained in opposition to such economical way of mechanism. The fears of communism and their followers of anti-harmony to US community were seen among the structural class systems of ethnic interconnectedness. The elementary struggle is related to the portrayal of Communism and their followers in Hollywood productions. It relates to exacerbating negatively frame about their ideological depictions, communist countries and the individuals interlinked with it.

    Keywords: *Hollywood, ideology, propaganda, communism, social constructivism.*

12. **Hussain, T.,** Rafique, S., & **Basit, A.** (2020). Online Learning at University Level amid COVID-19 Outbreak: A Survey of UMT Students. *Global Educational Studies Review*, V(III), 1-16. https://doi.org/10.31703/gesr.2020(V-III).01. **(Tanveer Hussain, Abdul Basit (SMCS) HEC Y CAT**

    Abstract: This research inquires impact of COVID-19 outbreak on education. It measured the effectiveness and productivity of online learning during pandemic. Online mode of education. Knowing the role of information and

communication technologies in assisting and facilitating online learning was also one of the main objectives. Online Survey was conducted for data collection. Sample was selected from University of Management and Technology using simple random sampling. According to the results, respondents agreed that COVID-19 has affected education at university level badly. Respondent agreed that sudden switch to online learning due to COVID-19 has created unrest among students. Respondents also strongly agreed that online leaning is less effective and classroom leaning is more effective. In current research, it has been observed that respondents strongly disagreed and 19.50% disagreed that ICTs have facilitated them during their online leaning amid COVID-19.

Keywords: *COVID-19, online leaning, ICTs.*

School of Architecture and Planning

Department of Architecture

Research Articles

1. **Ramla Toor, Saima Gulzar, & Faiqa Khilat.** (2020). Condition Assessment. *Journal of Art, Architecture and Built Environment (JAABE)*, *3*(1). Retrieved from https://journals.umt.edu.pk/index.php/JAABE/article/view/553 .**(Ramla Toor, Saima Gulzar, Faiqa Khilat (Architecture/SAP) UMT JOURNAL**

   Abstract: not available.

   Keywords: *not available.*

2. **Hamna Ahmed, Ayesha Mehmood Malik, Saad Mujahid, & Rabia Khan.** (2020). Study of Utilizing Residual Spaces under Flyovers in Lahore, Pakistan. *Journal of Art, Architecture and Built Environment (JAABE)*, *3*(1). Retrieved from https://journals.umt.edu.pk/index.php/JAABE/article/view/552 .**(Hamna Ahmed, Ayesha Mehmood Malik, Saad Mujahid, Rabia Khan (Architecture/SAP) UMT JOURNAL**

   Abstract: not available.

   Keywords: *not available.*

3. **Shirwani, R., Gulzar, S.,** Asim, M., **Umair, M., & Al-Rashid, M. A.** (2020). Control of vehicular emission using innovative energy solutions comprising of hydrogen for transportation sector in Pakistan: A case study of Lahore City. *International Journal of Hydrogen Energy, 45*(32), 16287-16297. doi: https://doi.org/10.1016/j.ijhydene.2019.02.173. **(Rummana Shirwani, Saima Gulzar, Muhammad Umair, Muhammad Ahmad Al-Rashid (Architecture/SAP) Web of Science JCR Listed (IF: 4.939)**

   Abstract: Energy, either from non-renewable or renewable sources, is of paramount importance as the progress of a country is gauged on economic development. However, with the use of non-renewable energy resources, the environmental degradation is exacerbating with every passing day in developing countries including Pakistan. On the contrary, the developed countries are resorting to sustainable and renewable energy resources to achieve sustainable development goals. The primary consumer of the non-renewable energy sources is transportation sector in Pakistan, with the total consumption amounting to almost two-third of the total utilization. Keeping in view the existing energy expenditures and its share in environmental pollution by transportation sector, Lahore Metropolitan area has been selected for this research paper. This research analyzed the environmental data collected from multiple road junctions of Lahore City. In light of the existing data, the research exhibited improvements in overall environmental quality by comparing the existing and proposed energy solutions comprising of Hydrogen in transportation sector. The comparison carried out by utilizing International and

National Environmental quality standards. Additionally, research also addresses the energy savings with the transition from non-renewable energy sources to renewable and innovative energy solutions.

Keywords: *energy, environment, Pakistan, hydrogen energy.*

Center for Teaching and Learning (CTL)

Research Articles

1. **Asif, S.,** Afzal, I., & Bashir, R. (2020). An Analysis of Medium of Instruction Policies in the Education System of Pakistan with Specific Reference to English Medium Education. *Sir Syed Journal of Education & Social Research, 3*(2), 370-382. **(Sadia Asif (CTL) HEC Y CAT**

Abstract: A critical examination of the trends, issues, and challenges in policy and practice of English language education in Pakistan is the main concern of this paper. This is done first by describing the practice of teaching English in varied instructional situations. Second, the paper historically reviews the language education policies since Pakistan's independence in 1947. Third, the consequences of using English as the medium of instruction are discussed. A longitudinal large scale study is done to highlight the fact that English as medium of instruction at primary school level can distort the teaching and learning activities for students and teachers in rural areas of Pakistan and student drop-out rate can even get higher in those areas. The data was collected from the interviews of twenty teachers working in government and semi government schools at primary level. Based on the information obtained from the target participants, teaching at the same level but in different schools, the author argues that mother tongue education at the primary level is the most appropriate method to enhance the educational performance of students and a positive approach to bilingual education must be taken to resolve the challenges associated with the medium of instruction policies in the education system of Pakistan. Moreover, the data also shows that adopting English as a medium of instruction in Public schools may lead to low motivation level among students and it can hinder the development of English as a second language among learners. Furthermore, a difference in home language and school language may also hamper development and concepts formation in students at school level. Therefore, it is recommended that before implementing any language as medium of instruction at school level, one must review the history of Pakistani education system and must keep in mind the linguistic differences of the society and unavailability of resources is also a major hindrance in implementation of any language policy. The results of this study confirm that the pedagogical effectiveness could only be achieved through the mother tongue and provides clear evidence for the usage of native languages as a medium of education in schools.

Keywords: *medium of instruction, urdu medium schools, bilingual education, language policies, private schools.*

Summary of UMT Research Outlook 2020

Table I

School/Department wise listing of Publications

School\Departments	Articles	Proceeding Papers	Conference Papers	Books/Book Chapter	Total
School of Sciences (SSC)					
Department of Mathematics	124	1			125
Department of Life Science	44	2			46
Department of Chemistry	23				23
Department of Physics	12				12
Total	**203**	**3**			**206**
School of System & Technology (SST)					
Department of Computer Science	41	2			43
Department of Software Engineering	1	1			2
Departments of Informatics & Systems	10	4			14
Total	**52**	**7**			**59**
School of Engineering (SEN)					
Department of Mechanical Engineering	2				2
Department of Electrical Engineering	6	2			8
Department of Industrial Engineering	5				5
Department of Civil Engineering	6				6
Total	**19**	**2**			**21**
School of Business and Economics (SBE)					
Department of Management	13				13
Department of Operations & Supply Chain	4				4
Department of Information Systems	2				2
Department of Marketing	10	1			11

Department of Economics	18			3	21
Department of Quantitative Methods	4				4
Department of Finance	15	1		1	17
Total	**66**	**2**		**4**	**72**
School of Social Sciences & Humanities (SSSH)					
Department of Political Science & International Relations	8		1		9
Department of Sociology	3				3
Department of Education	4				4
Department of Gender Studies	1				1
Department of Islamic Thought & Civilization	1				1
Total	**17**		**1**		**18**
School of Health Science (SHS)					
SHS	4			1	5
Total	**4**			**1**	**5**
School of Food and Agricultural Sciences(SFAS)					
SFAS	14				14
Total	**14**				**14**
School of Textile & Design (STD)					
STD	4				4
Total	**4**				**4**
Institute of Liberal Arts (ILA)					
Department of Linguistics & Communications	14				14
Department of English & Literary Studies	2				2
Total	**16**				**16**
School of Professional Psychology (SPP)					

Department of Clinical Psychology (ICP)	17				17
Department of Applied Psychology	5				5
Total	**22**				**22**
School of Professional Advancement (SPA)					
SPA	4		1		5
Total	**4**		**1**		**5**
Institute of Aviation Studies (IAS)					
Department of Aviation Studies		1			1
Total		**1**			**1**
School of Commerce and Accountancy (SCA)					
SCA	2				2
Total	**2**				**2**
School of Media and Communication Studies (SMCS)					
SMCS	12				12
Total	**12**				**12**
School of Architecture and Planning					
Department of Architecture	3				3
Total	**3**				**3**
Center for Teaching and Learning (CTL)					
CTL	1				1
Total	**1**				**1**
Grand Total	**439**	**15**	**2**	**5**	**461**

Table II

School/Department wise listing of Journals Articles

School\Departments	JCR	SJR	HEC X-Cat.	HEC Y-Cat.	HEC Z-Cat.	NR	UMT	Master Journal List	Total
School of Sciences (SSC)									
Department of Mathematics	86	24	5	3		4		2	124
Department of Life Science	35	6						1	44
Department of Chemistry	22	1							23
Department of Physics	12								12
Total	**157**	**31**	**5**	**3**		**4**		**3**	**203**
School of System & Technology (SST)									
Department of Computer Science	31	10							41
Department of Software Engineering	1								1
Departments of Informatics & Systems	9	1							10
Total	**41**	**11**							**52**
School of Engineering (SEN)									
Department of Mechanical Engineering	2								2
Department of Electrical Engineering	5	1							6
Department of Industrial Engineering	3	2							5
Department of Civil Engineering	4	2							6
Total	**14**	**5**							**19**
School of Business and Economics (SBE)									
Department of Management	8	3					1	1	13
Department of Operations & Supply Chain	2	2							4
Department of Information Systems	1	1							2

School\Departments	JCR	SJR	HEC X-Cat.	HEC Y-Cat.	HEC Z-Cat.	NR	UMT	Master Journal List	Total
Department of Marketing	6	3		1					10
Department of Economics	6	4	2	3		1	1	1	18
Department of Quantitative Methods	4								4
Department of Finance	6	8		1					15
Total	**33**	**21**	**2**	**5**	**0**	**1**	**2**	**2**	**66**
School of Social Sciences & Humanities (SSSH)									
Department of Political Science & International Relations	1		2	1	3	1			8
Department of Sociology		3							3
Department of Education	1	1		1			1		4
Department of Gender Studies		1							1
Department of Islamic Thought & Civilization		1							1
Total	**2**	**6**	**2**	**2**	**3**	**1**	**1**		**17**
School of Health Science (SHS)									
SHS	3	1							4
Total	**3**	**1**							**4**
School of Food and Agricultural Sciences(SFAS)									
SFAS	14								14
Total	**14**								**14**
School of Textile & Design (STD)									
STD	2	2							4
Total	**2**	**2**							**4**
Institute of Liberal Arts (ILA)									
Linguistics & Communications		5	6	2			1		14

School\Departments	JCR	SJR	HEC X-Cat.	HEC Y-Cat.	HEC Z-Cat.	NR	UMT	Master Journal List	Total
Department of English and Literary Studies	2								2
Total	**2**	**5**	**6**	**2**			**1**		**16**
School of Professional Psychology (SPP)									
Department of Clinical Psychology (ICP)	11	4		1			1		17
Department of Applied Psychology	2	3							5
Total	**13**	**7**		**1**			**1**		**22**
School of Professional Advancement (SPA)									
SPA	1	1			1	1			4
Total	**1**	**1**			**1**	**1**			**4**
School of Commerce and Accountancy (SCA)									
SCA	1			1					2
Total	**1**			**1**					**2**
School of Media and Communication Studies (SMCS)									
SMCS		3	2	7					12
Total		**3**	**2**	**7**					**12**
School of Architecture and Planning (SAP)									
Department of Architecture	1						2		3
Total	**1**						**2**		**3**
Center for Teaching and Learning (CTL)									
CTL				1					**1**
Total				**1**					**1**
Grand Total	**284**	**93**	**17**	**22**	**4**	**7**	**7**	**5**	**439**

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