

# UMT Research Outlook

## Jan-Feb 2022



A bi-monthly compilation of the research produced by the UMT community based on the data extracted from *Scopus* on February 28, 2022. A total of 204 publications are listed in this report according to the sequence of schools/institutes as appeared at UMT website. Publications without School/Institute affiliation are listed separately at the end for both Lahore and Sialkot campuses. Different colors are used for author, title, source, volume, & number of a publication record for the ease of readers. At the end there are 9 statistical tables of different criterions.

**Knowledge & Research  
Support Services, UMT**

# **UMT Research Outlook**

## **Jan-Feb 2022**

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**Sohail Aslam**

**Knowledge and Research Support Services**  
University of Management and Technology  
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## Dr Hasan Murad School of Management

1. **Azeem, M.U., School of Business and Economics, University of Management and Technology, Lahore, Pakistan.** *Religiousness, collectivism, and helping behavior: The invigorating role of abusive supervision [Religion, collectivisme et comportement d'aide: le rôle revigorant de la surveillance abusive].* *Revue Européenne de Psychologie Appliquée.* 72, 2.

Introduction: Voluntary helping behaviors are important for spurring organizational effectiveness. Objectives: This study investigates how employees' religiousness and collectivism might enhance their propensity to help their peers on a voluntary basis, as well as how this relationship might be invigorated by the presence of abusive supervision. Methods: Survey data were collected from employees and their supervisors in Pakistan-based organizations. The hypotheses were tested with hierarchical regression analysis. Results: Religiousness relates positively to helping behavior, and this relationship is stronger when employees experience abusive supervision, possibly because their religiousness motivates them to protect their colleagues against the hardships created by such a resource-draining leadership style. Although collectivism does not have a direct significant relationship with helping behavior overall, abusive supervision invigorates this relationship. Conclusion: For organizations seeking to increase voluntary work behaviors, the results show that religiousness and collectivism are two personal resources that can enhance an organizational culture that promotes collegiality and mutual support, particularly when employees believe that their supervisors are hostile to followers and abuse their leadership positions. © 2021 Elsevier Masson SAS. **Article.**

2. **Waheed, A., Dr. Hasan Murad School of Management (HSM), University of Management and Technology, Lahore, Pakistan.** *Understanding Ant Forest continuance: effects of user experience, personal attributes and motivational factors.* *Industrial Management and Data Systems.* 122, 2.

Purpose: Technology has emerged as a leading tool to address concerns regarding climate change in the recent era. As a result, the green mobile application "Ant Forest" was developed, and it has considerable potential to reduce negative environmental impacts by encouraging its users to become involved in eco-friendly activities. Ant Forest is a novel unexplored green mobile gaming phenomenon. To address this gap, this study explores the influence of user experience (cognitive experience and affective experience), personal attributes (affection and altruism) and motivational factors in game play (reward for activities and self-promotion) on the continuation intention toward Ant Forest. Design/methodology/approach: The authors assessed the data using partial least squares structural equation modeling (PLS-SEM) for understanding users' continuation intention toward Ant Forest. Findings: Through a survey of 337 Ant Forest users, the results reveal that cognitive and affective experiences substantially affect Ant Forest continuation intention. Personal attributes and motivational factors also stimulate users to continue using Ant Forest. Originality/value: The authors build and confirm a conceptual framework to understand users' continuation intention toward a novel unexplored Ant Forest phenomenon. © 2021, Emerald Publishing Limited. **Article.**

3. **Farid, S., Dr Hasan Murad School of Management, University of Management and Technology, Lahore, Pakistan.** *Time-frequency connectedness among clean-energy stocks and fossil fuel markets: Comparison between financial, oil and pandemic crisis.* *Energy.* 240.

Motivated by lack of empirical research on volatility linkages among clean-energy stock markets and fossil fuel markets during the recent Covid-19 pandemic, the study examines the volatility connectedness network among clean-energy stocks and fossil fuels such as crude WTI, natural gas, gas oil, and fuel oil. In addition, we also compare the influence of financial crises such as the Global Financial Crisis (GFC), oil crisis, and Covid-19 pandemic crisis is driving the volatility connectedness network of energy markets. We apply Diebold and Yilmaz (2012) [1] time-domain and Barunik and Krehlik (Barunk and Křehlík, 2018) [2] frequency-domain approach. The empirical results uncover weak volatility connections among clean-energy stocks and fossil fuel markets. Meanwhile, we find strong volatility interconnectedness between petroleum markets. Further, the results show that most of the volatility spillovers among energy markets persist in the short-run, whereas the findings display weak volatility transmission among the sample markets in the long run. Furthermore, the findings also unveil that contagion effects between the energy markets increase in the crisis periods, intensifying the volatility interlinkages among the sample energy markets. The findings have important significance for energy policymakers and investors. © 2021 Elsevier Ltd. **Article.**

4. **Shahzad, K., Dr Hasan Murad School of Management, University of Management and Technology, Pakistan.** *Knowledge-Intensive HRM Systems and Performance of Knowledge-Intensive Teams: Mediating Role of Team Knowledge Processes.* **Group and Organization Management.**

This study investigates whether and how knowledge-intensive HRM systems (KIHRM) impact the performance of knowledge-intensive teams (KITs). We integrate the ability-motivation-opportunity theory with the knowledge management literature to hypothesize that KIHRM affect KIT performance through team knowledge exploration and knowledge exploitation processes. A total of 543 responses (408 team members and 135 team leaders) from 135 KIT of 119 firms were collected in two waves with a time lag of 3 months. The findings indicate that KIHRM relate positively to KIT performance. Furthermore, team knowledge exploration and knowledge exploitation work in a sequence to mediate the relationship between KIHRM and KIT performance. © The Author(s) 2022. **Article.**

5. **Nosheen, S., Department of Banking and Finance, University of Management and Technology, Lahore, Pakistan; Naveed -ul-Haq, Office of Research Innovation and Commercialization (ORIC), University of Management and Technology, Lahore, Pakistan.** *Does more stringencies in government policies during pandemic impact stock returns? Fresh evidence from GREF countries, a new emerging green bloc.* **Resources Policy.** 76.

In this paper, we investigate the impact of the government economic policies in addition to the more stringent Covid-19 policies on stock index returns of GREF countries, that is, a new economic bloc of 5 countries (Pakistan, Iran, Turkey, Russia, and China) to foster for sustainable development of the region. Using the Panel, ARDL model and data for index returns and economic and Covid-19 control policies for the period March 1, 2020 to June 30, 2021, results show that Income support, workplace closure, stringency index, and cancellation of public events have a significant positive impact on the stock index returns over the long run. In contrast, school closure, restriction on public gatherings, and international travel control policies negatively impact stock returns. In comparison, Debt policies, Covid-19 testing policies, health index, and face-covering policies remain insignificant. In the short run, stringent index and face-covering policies remain positively significant. Results of the study suggest significant policy implications that can help reform economic and Covid-19 control policies and promote the region's economic growth over the long-run period. © 2022. **Article.**

6. **Saeed, M., Department of Banking and Finance, Dr Hasan Murad School of Management, University of Management & Technology, Lahore, 54700, Pakistan; Arshed, N., Economics, Department of Economics and Statistics, Dr Hasan Murad School of Management, University of Management and Technology, Lahore, 54700, Pakistan.** *The Adaptation of Internet of Things in the Indian Insurance Industry – Reviewing the Challenges and Potential Solutions.* **Electronics (Switzerland).** 11, 3.

The concept of insurance was found several centuries before Christ. Correspondingly, Chinese and Babylonian traders practiced moving or dispensing risks in the second and third millennia BC. Nowadays, insurance is the backbone of the economy. The recent introduction of big data, IoT, and other forms of InsurTech led to the fourth industrial revolution in insurance in the developed world. The industry is looking to improve the ergonomics of remote sensing technology to improve the acceptability of the clients. The adaptation of IoT in developing economies may provide a solution in increasing insurance penetration. This study explores the challenges and solutions in adopting IoT to increase insurance penetration in India. This study applied a systematic literature review (SLR) to extract the themes/variables related to challenges and solutions in adopting IoT in India's insurance sector. Several keywords were used to search the relevant literature from Google Scholar. Based on inclusion and exclusion criteria, the filtered studies were explored. This study listed several challenges and their solutions in the adaptation of IoT in the Indian insurance industry. Policymakers could adapt the suggestions provided to improve the service delivery insurance sector. The authors listed several challenges and solutions in the adaptation of IoT in the Indian insurance industry through a systematic literature review to facilitate the policymakers to make the right decisions. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

7. **Kanwal, A., Department of Economics (SBE), University of Management and Technology, Lahore, Pakistan; Butt, M.M., Department of Economics (SBE), University of Management and Technology,**

**Lahore, Pakistan.** *Naive Bayes combined with partial least squares for classification of high dimensional microarray data.* *Chemometrics and Intelligent Laboratory Systems.* 222.

Technological advances allow for the measurement of high dimensional data sets with small sample size. When dealing with such high-dimensional data, the consistency of estimations and classification accuracy is called into question. Partial least squares (PLS) scores have traditionally been coupled with linear discriminant analysis, which requires a multivariate normally distributed PLS score. For the classification of high-dimensional data sets, we introduce PLS-NB, a classification strategy that combines PLS with a variant of Naive Bayes (NB). PLS-NB with standard NB, PLS-NB-G with Gaussian(G) kernel NB, PLS-NB-N with non-parametric (N) kernel NB, and PLS-NB-L with Laplace (L) correction are compared to reference approaches PLS coupled with linear discriminate analyses (LDA) and sparse LDA, which are PLS-LDA and SPLS-LDA, respectively, over gene expression data. Cross-validation is used in conjunction with Monte Carlo simulation to avoid over-fitting. The suggested classifier PLS-NB has been validated and calibrated against reference classifiers. PLS-NB-N outperforms when it comes to classifying embryonal cancer with 89.1% accuracy on test data, and it outperforms when it comes to classifying prostate cancer with 92.3% accuracy on test data. The presented method appears to be a viable contender for high-dimensional data classification; its merits can be investigated further, and it can be used to a variety of classification problems. © 2022 Elsevier B.V. **Article.**

8. **Javaid, A., Department of Economics and Statistics, University of Management and Technology, Lahore, 54000, Pakistan.** *Role of Energy Mix in Determining Climate Change Vulnerability in G7 Countries.* *Sustainability (Switzerland).* 14, 4.

Anthropogenic activities are responsible for greenhouse gas emissions, causing extreme events like soil erosion, droughts, floods, forest fires and tornadoes. Fossil fuel consumption produces CO<sub>2</sub>, and trapping heat is the major reason for a rapid increase in global temperature, and electricity generation is responsible for 25% of greenhouse gas emissions. Fossil fuel consumption, CO<sub>2</sub> emissions and their adverse impact have become the focus of efforts to mitigate climate change vulnerability. This study explores empirical determinants of vulnerability to climate change such as ecosystem, food, health and infrastructure. The sustainable use of energy is necessary for development, and a source of response to climate change. The present study focuses on renewable energy consumption to determine climate vulnerability in G7 countries between 1995 and 2019. The panel ARDL approach showed that the renewable to non-renewable energy mix showed a quadratic effect on vulnerability, whereby a minimum threshold of renewable energy is required to witness a reduction in food, health and infrastructure vulnerability. Other results indicate that trade openness and development expenditures reduce health vulnerability. Development expenditures also decrease ecosystem vulnerability, while trade openness increases it. However, both of these variables increase infrastructure vulnerability. Avoiding severe food and water crises requires investment to tackle climate change, conserve energy and water resources, reform global trade and food markets, and adapting and adopting climate-resilient responses to change. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

9. **Hassan, M.S., Department of Economics and Statistics, Dr. Hassan Murad School of Management (HSM), University of Management and Technology, Lahore, Pakistan; Javaid, A., Department of Economics and Statistics, Dr. Hassan Murad School of Management (HSM), University of Management and Technology, Lahore, Pakistan.** *The impact of electric power consumption on economic growth: a case study of Portugal, France, and Finland.* *Environmental Science and Pollution Research.*

Energy plays a vital role in promoting sustainable economic development in complex societies. This study has analyzed the impact of electricity consumption on three European Union member countries' economic growth, i.e., Portugal, France, and Finland, caring structural breaks in cointegration analyses. The empirical results indicate a positive impact of electric power consumption on economic growth in the long and short run in Finland and Portugal and in the long run in France. The findings also highlight the positive and significant role of the labor force in boosting economic growth in the long and short run in France and Finland. However, it shrinks economic growth in the long run in Portugal. The study discloses the positive role of capital in the long run in the case of Portugal. Similar results are found in all three countries in the short run. Moreover, the study diagnoses a bidirectional causal relationship between economic growth and electric power consumption in Finland in the long and short run and in France in the long run. A growth-promoting or electricity-led growth hypothesis is found in Portugal. By simulating the mean values of electric power consumption, economic growth follows an increasing trend in all the countries. Hence, electric power consumption has appeared an

essential factor in elevating economic growth in all three selected countries. Based on these results, this study suggests that the provision of electricity supply ventures may be expanded in the selected EU member countries in order to enhance economic growth. The study also suggests that emphasis should be shifted from non-renewable energy sources to renewable energy sources to ensure the provision of clean energy to all the public under the umbrella of sustainable development goals of 2030. Hence, the present study contributes to achieving sustainable economic growth in the selected EU member countries. © 2022, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. [Article](#).

10. **Arshed, N., Department of Economics, University of Management and Technology, Lahore, Pakistan.** *Competitive intelligence process and strategic performance of banking sector in Pakistan. International Journal of Business Information Systems.* 39, 1.

Resource-based view (RBV) and knowledge-based view (KBV) of the firm are the key viewpoints of strategic planning for accomplishment of superior strategic benefits and sustainable competitive advantage via creating valuable competencies. Competitive intelligence (CI) process is a mechanism to achieve superior long-term strategic performance leading to sustainable competitive advantage under the umbrella of RBV and KBV. This study surveyed 200 banking officials from Lahore, Pakistan using the questionnaire which was pre-tested for validity both face and content. The instruments used in the questionnaire successfully converged to desired latent variables entitled as strategic performance, planning and focus, information gathering, analysis, communication, cultural awareness and process structure. The results showed that all the components of CI process significantly affect the strategic performance of the banks. Top management may consider the implementation of formal CI unit as this study concluded a positive significant impact of CI process on strategic performance of banks. In addition, banks top management can organise CI awareness programs which can improve participation of employees at all phases of CI process. © 2022 Inderscience Enterprises Ltd.. All rights reserved. [Article](#).

11. **Ali, A., Department of Economics and Statistics, University of Management and Technology, Lahore, Pakistan; Butt, M.M., Department of Economics and Statistics, University of Management and Technology, Lahore, Pakistan; Zubair, M., Department of Economics and Statistics, University of Management and Technology, Lahore, Pakistan.** *Generalized Chain Regression-cum-Chain Ratio Estimator for Population Mean under Stratified Extreme-cum-Median Ranked Set Sampling. Mathematical Problems in Engineering.* 2022.

Estimation of population mean of study variable Y suffers loss of precision in the presence of high variation in the data set. The use of auxiliary information incorporated in construction of an estimator under ranked set sampling scheme results in efficient estimation of population mean. In this paper, we propose an efficient generalized chain regression-cum-chain ratio type estimator to estimate finite population mean of study variable under stratified extreme-cum-median ranked set sampling utilizing information on two auxiliary variables. Mean square error (MSE) of the proposed generalized estimator is derived up to first order of approximation. The applications of the proposed estimator under symmetrical and asymmetrical probability distributions are discussed using simulation study and real-life data set for comparisons of efficiency. It is concluded that the proposed generalized estimator performs efficiently as compared to some existing estimators. It is also observed that the efficiency of the proposed estimator is directly proportional to the correlations between the study variable and its auxiliary variables. © 2022 Asad Ali et al. [Article](#).

12. **Javaid, A., Department of Economics and Statistics, University of Management and Technology, Lahore, 54770, Pakistan; Munir, M., Department of Economics and Statistics, University of Management and Technology, Lahore, 54770, Pakistan.** *Econometric Assessment of Institutional Quality in Mitigating Global Climate-Change Risk. Sustainability (Switzerland).* 14, 2.

Background: Environmental deterioration is the alarming situation that results from rapid urbanization and development. The rising temperature and climate volatility are accounted for by the massive carbon dioxide (CO<sub>2</sub>) emissions. The research on climate-change mitigation is trying to curtail the situations before they become irreversible and unmanageable. This study explores the role of institutions in mitigating climate change by moderating the impact of environmental quality on climate change risk. Methodology: Global data sets have been collected from world big data depositories like the World Economic Forum (WEF), the World Development Indicators (WDI), and the International

Country Risk Guide (ICRG). Countries that are listed in WEF were used as the sample of the study. An analysis was based on 114 countries that are based on the availability of data. For estimation, descriptive statistics, correlation analysis, change effects, and a Panel Feasible Generalized Least Squares (FGLS) model were used for estimating the results. Results: The global assessment indicates that CO<sub>2</sub> emissions increase the climate risk, but its impact can be reduced by increasing the quality of institutions. Additionally, an increase in renewable energy consumption and economic growth reduces the climate risk. Implications: It is an instrumental study that empirically investigated the role of institutions in reducing climate risk by moderating CO<sub>2</sub> emissions. The results of this study will help policymakers to formulate policies regarding environmental protection. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

13. **Hassan, M.S., Department of Economics, School of Business and Economics, University of Management and Technology Lahore, Pakistan; Arshed, N., Department of Economics, School of Business and Economics, University of Management and Technology Lahore, Pakistan; Saeed, M.I., Office of Research Innovation and Commercialization, University of Management and Technology Lahore, Pakistan.** *Inspecting non-linear behavior of aggregated and disaggregated renewable and non-renewable energy consumption on GDP per capita in Pakistan.* **Energy Strategy Reviews.** 39.

This research assessed that how various sources of energy such as renewable, fossil fuel, electricity generation using oil, and hydroelectric sources can influence the level of output in Pakistan. For this purpose, the ARDL bounds test using annual time series data from 1980 to 2019 is used to determine the cointegration relationship between output per person and various sources of energy. The empirical results disclose that the linear terms of fossil fuel energy consumption and electricity production using oil sources significantly enhance economic growth while the squared terms of both significantly deteriorate economic growth both in the long and short-run in Pakistan. This confirms that fossil fuel has an inverted U-shaped influence on output per person in the long run as well as in the short-run period in Pakistan. Besides this, economic growth significantly falls due to a one percent increase in linear terms of renewable energy consumption and electricity production using hydroelectric sources in long run but economic growth significantly increases due to a one percent increase in the squared term of both terms. This provides evidence of the U-shaped consequence of renewable energy consumption on output level only for the long-run period. In short, the study concludes that the aggregate and disaggregate energy sources reveal similar results on the output. The study suggests that giving a boost to economic growth using fossil fuel is may be fruitful in the early phase of production but in the later phase of production it is not fruitful whereas the use of clean energy although is not beneficial in the early phase of production in expanding production activities in Pakistan but in the later phase of production it is fruitful for production but also for the environment. Therefore, the present study proposes that government may take serious efforts to shift its emphasis from nonrenewable to renewable energy sources to fulfill energy requirements for achieving sustainable economic growth in Pakistan. © 2021. **Article.**

14. **Abid, F., Department of Information System, Dr Hassan Murad School of Management, University of Management and Technology, Lahore, 54770, Pakistan.** *Elemental mercury (Hg<sup>0</sup>) removal from coal syngas using magnetic tea-biochar: Experimental and theoretical insights.* **Journal of Environmental Sciences (China).** 122.

Mercury is ranked 3rd as a global pollutant because of its long persistence in the environment. Approximately 65% of its anthropogenic emission (Hg<sup>0</sup>) to the atmosphere is from coal-thermal power plants. Thus, the Hg<sup>0</sup> emission control from coal-thermal power plants is inevitable. Therefore, multiple sorbent materials were synthesized using a one-step pyrolysis method to capture the Hg<sup>0</sup> from simulated coal syngas. Results showed, the Hg<sup>0</sup> removal performance of the sorbents increased by the citric acid/ultrasonic application. T5CUF0.3 demonstrated the highest Hg<sup>0</sup> capturing performance with an adsorption capacity of 106.81 µg/g within 60 min at 200 °C under complex simulated syngas mixture (20% CO, 20% H<sub>2</sub>, 10 ppmV HCl, 6% H<sub>2</sub>O, and 400 ppmV H<sub>2</sub>S). The Hg<sup>0</sup> removal mechanism was proposed, revealing that the chemisorption governs the Hg<sup>0</sup> removal process. Besides, the active Hg<sup>0</sup> removal performance is attributed to the high dispersion of valence Fe<sub>3</sub>O<sub>4</sub> and lattice oxygen (Î±) contents over the T5CUF0.3 surface. In addition, the temperature programmed desorption (TPD) and XPS analysis confirmed that H<sub>2</sub>S/HCl gases generate active sites over the sorbent surface, facilitating high Hg<sup>0</sup> adsorption from syngas. This work represented a facile and practical pathway for utilizing cheap and eco-friendly tea waste to control the Hg<sup>0</sup> emission. © 2021. **Article.**



15. Ghani, F., Department of Information Systems, University of Management and Technology, Lahore, Pakistan; Khan, H.W., Department of Information Systems, University of Management and Technology, Lahore, Pakistan; Narmeen, M., Department of Information Systems, University of Management and Technology, Lahore, Pakistan. *A Methodology for Glaucoma Disease Detection Using Deep Learning Techniques*. *International Journal of Computing and Digital Systems*. 11, 1.

The advancement of computer technology and the needs of image processing is spreading in a wide range of applications. There are many techniques in image processing and one of the major techniques is Image classification. In the literature, we have reviewed many methods of machine learning used on Glaucoma pictures by different researchers. There are different machine learning algorithms include C4.5, the Naive Bayes Classifier, and Random Forest. These algorithms of machine learning cannot more reliably diagnose glaucoma disease. We have developed an architecture focused on the methodology of Deep Learning (DL), which is a Convolution Neural Network (CNN) for the classification of Glaucoma diseases. We used two different deep learning neural networks such as the Inception-V3 and the Vgg-16 Model for Glaucoma classification and identification purposes. We have obtained 508 Glaucoma images belonging to 25 groups from the Joint Shantou International Eye Center (JSIEC), Shantou City, Guangdong Province, China, Joint Shantou Foreign Eye Centre. Since uploading the images, we've increased the provided data set and rendered the 1563 training and testing data collection pictures. The downloaded data set is not labelled, so we wanted a named picture data set for our research in deep learning. But we have labelled both photos with the class name of the disease after the augmentation. We've also used two deep neural network models Inception-V3 and Vgg-16, which are supervised learning methods for classification arrangements. Such structures require operating processes that need to learn to use previous knowledge, make judgments about it, and fix it if any errors arise. We have used the Dropout: 0.5, Library: cv2, NumPy, Enjoinment API: Keras, TensorFlow, Loss Function: Cross-Entropy, Learning Rate: Adam, Fully Connected: SoftMax Activation Function with 2 Layer, Average Pooling: 4 Layer, Convolution: Tanh Activation Function with 2 Layer. Taking into consideration the success findings collected, it is shown that the pre-trained Inception-V3 model has the best classification accuracy with 90.01 percentage than Vgg-16 model which has an accuracy of 83.46 percent respectively. © 2022 University of Bahrain. All rights reserved. [Article](#).

16. Asghar, A., Dr. Hasan Murad School of Management, University of Management and Technology, Lahore, 54000, Pakistan. *Exploring the role of organizational support, and critical success factors on renewable energy projects of Pakistan*. *Energy*. 243.

This study investigates the relationship between critical success factors (CSFs), organizational support, and renewable energy project success. The critical success factors with multiple dimensions (communication, team, technical, and environmental) were used in this paper. This study adopts the questionnaire survey approach, and collects data from the construction based renewable energy projects located in Punjab Province, Pakistan, which comprised 342 valid samples. Partial least-squares structural equation modelling (PLS-SEM) was used to analyze the theoretical framework. The results confirmed that three critical success factors i.e. team factors (TF), technical factors (Tech. F), and environmental factors (EF), have a positive and significant direct relationship with project success. However, communication factors (CF) have a direct but insignificant relationship with project success. Moreover, results also confirmed the positive mediating role of organizational support between critical success factors and project success. The empirical outcomes of this study show that these four critical success factors increase the success of renewable energy projects. The outcomes also show that organizational support as a mediating variable plays a dynamic role in enhancing the tangible success of renewable energy projects. This study contributes through empirical findings in the existing knowledge base for renewable energy projects. © 2021 Elsevier Ltd. [Article](#).

17. Abbas, R.Z., Department of Management, University of Management and Technology, Lahore, Pakistan; Arshed, N., Department of Economics and Statistics, University of Management and Technology, Lahore, Pakistan. *Money laundering and terror financing: issues and challenges in Pakistan*. *Journal of Money Laundering Control*. 25, 1.

Purpose: Pakistan is facing the momentous hazard of money laundering and a substantial risk of terror financing, which are seriously threatening its socioeconomic well-being. The purpose of this paper is to gauge the challenges posed by these threats in contrast with the existing potential and expertise of legal entities. It also examines legal and procedural measures enforced as a counter-strategy for terror financing and money laundering and the AMLA 2010 and National

Action Plan (NAP) for countering terrorism financing. Design/methodology/approach: This paper uses an analytical and comparative method using figures and comparative data on the success of the NAP and AMLA 2010 as national counterterrorism strategies. Terror financing and anti-money laundering regimes are confronted with grave legal and procedural odds, noncooperation and performance issues and conflicts of interest on the part of the enforcers/politicians. This paper highlights the issues that seriously jeopardize strategies to stop money laundering and terror financing, such as geography, informal financial transfers and exchange systems, un-regulated charities and real estate sectors, the modest performance of enforcement agencies and lukewarm political support for the NAP. Findings: The situation requires the improvement of weak legislation and poor coordination and the adaptation of technological advancements and novel counter-strategies, along with properly trained enforcement personnel. Originality/value: This paper will prove to be a valuable reference for exploring the shortcomings and insights. This will provide useful information for legal and financial practitioners, academicians, research scholars, policymakers and journalists. © 2021, Emerald Publishing Limited. **Article.**

18. Sami, F., Department of Quantitative Methods, University of Management and Technology, Lahore, Pakistan; Butt, M.M., Department of Quantitative Methods, University of Management and Technology, Lahore, Pakistan. *A modified one parameter Liu estimator for Conway-Maxwell Poisson response model.* **Journal of Statistical Computation and Simulation.**

The maximum likelihood estimator (MLE) is generally used to estimate the Conway Maxwell Poisson regression model (COMPRM). When the explanatory variables are highly correlated, then the MLE results are not valid. In this study, we proposed a modified one-parameter Liu estimator in the presence of multicollinearity among the regressors for the COMPRM. The theoretical properties of the proposed estimator are derived and compared it with the available biased estimators as well as the MLE based on the matrix mean squared error (MSE) and scalar MSE criteria. To investigate the efficiency of the proposed estimator, a Monte Carlo simulation analysis was performed under various controlled conditions. Finally, two real applications are considered in the superiority of the proposed estimator. The simulation and real applications results show that the proposed estimator outperforms the classical MLE and other biased estimators in terms of the minimum MSE and mean absolute error criterion. © 2022 Informa UK Limited, trading as Taylor & Francis Group. **Article.**

## School of Systems & Technology

19. Durrani, U.K., Artificial Intelligence Research Center (AIRC), College of Engineering and IT, Ajman University, Ajman, United Arab Emirates, School of Systems and Technology, University of Management & Technology, Pakistan. *Gamified flipped classroom versus traditional classroom learning: Which approach is more efficient in business education?* **International Journal of Management Education.** 20, 1.

Past studies have shown the efficacy of flipped classrooms and gamification learning approaches. However, we know little about the blend of these learning approaches. This study compares the effectiveness of gamified flipped classrooms (GFC) to traditional classroom (TC) learning approaches. We study two different undergraduate cohorts over six-week course delivery in management and IT in a university in UAE. We collected data through an online survey from 105 students (control and experimental) and performed interviews with two focus groups of students. We identified the GFC learning approach as more efficient in terms of complexity of the technique, task orientation, student engagement, satisfaction, knowledge, and learning motivation. We also found a slight difference between the two approaches in terms of student skill development. Surprisingly, the control group achieved better course learning outcomes through TC than the experimental group using GFC because of perceived content relevance. The study provides additional evidence on the relevance of employing mixed learning approaches in classrooms, not to rely on one approach of university lecturers and learning enhancement units solely. © 2021. **Article.**

20. Abid, A., School of System and Technology, University of Management and Technology, Lahore Pakistan. *Sentiment Analysis of Reviews in Natural Language: Roman Urdu as a Case Study.* **IEEE Access.**

Opinion Mining from user reviews is an emerging field. Sentiment Analysis of Natural Language text helps us in finding the opinion of the customers. These reviews can be in any language e.g. English, Chinese, Arabic, Japanese, Urdu, and Hindi. This research presents a model to classify the polarity of the review(s) in Roman Urdu text (reviews). For the

purpose, raw data was scraped from the reviews of 20 songs from Indo-Pak Music Industry. In this research a new dataset of 24000 reviews of Roman Urdu text is created. Nine Machine Learning algorithms; Naïve Bayes, Support Vector Machine, Logistic Regression, K-Nearest Neighbors, Artificial Neural Networks, Convolutional Neural Network, Recurrent Neural Networks, ID3 and Gradient Boost Tree, are attempted. Logistic Regression outperformed the rest, based on testing and cross validation accuracies that are 92.25% and 91.47% respectively. **Article.**

21. **Tanveer, M., School of Systems and Technology (SST), University of Management and Technology, Lahore, Pakistan. *A Novel 4D Hyperchaotic System Assisted Josephus Permutation for Secure Substitution-Box Generation.* Journal of Signal Processing Systems.**

Hyperchaotic systems found to exhibit better dynamics and behaviors compared to chaotic systems due to great possibility of simultaneous exponential expansion of their system's states in several directions. This feature makes hyperchaotic systems more suitable for the application of cryptographic algorithms design. This paper has multi-fold contributions which begin with the design of a novel four-dimensional dynamical system. The proposed system holds the characteristics of hyperchaotic nature, fractional KY dimension, dissipativeness, equilibrium point, complex phase attractors, etc. The new hyperchaotic system is utilized to assist the conventional Josephus permutation scheme to procure permutations with better randomness. Based on the dynamics of proposed hyperchaotic system and improved chaotic Josephus permutation scheme, a novel cryptographic substitution-box construction method is proposed. Hyperchaos-assisted Josephus permutation is applied to evolve the strength of S-box so that an optimized configuration is attained. The performance appraisal of proposed S-box is effected using standard parameters. The recital comparative analysis with number of existing S-boxes establishes the consistent performance and security of proposed S-box. © 2022, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature. **Article.**

22. **Abid, A., School of Systems and Technology, University of Management and Technology, Lahore, 54770, Pakistan; Farooq, M.S., School of Systems and Technology, University of Management and Technology, Lahore, 54770, Pakistan; Farooq, U., School of Systems and Technology, University of Management and Technology, Lahore, 54770, Pakistan; Obaid, I., School of Systems and Technology, University of Management and Technology, Lahore, 54770, Pakistan. *Taxi Dispatch Optimization in Smart Cities Using TOPSIS.* Security and Communication Networks. 2022.**

The modern smart cities demand an efficient taxi dispatch system to satisfy the expectations of the passengers while giving justified rides to the drivers. Many a time, the customers have to wait too long for a taxi and the taxi driver wastes a lot of his time and the fuel in finding customers. Furthermore, some customers cancel the ride for not finding suitable category of taxi. Though there exist some algorithms that aim to optimize the assignment of taxis to appropriate customers, yet most of these approaches focus on the positioning of the taxi drivers. This research aims to address the problem of taxi dispatching while keeping in view the preferences of the customer. To this end, this research models taxi dispatch system as a multicriteria decision-making problem where not only is the distance between the passenger and the taxi a parameter, but other user preferences are also incorporated in finalizing a taxi for a given passenger travel request. The proposed method has been compared with the traditional taxi dispatching system. The results reveal more satisfactory taxi dispatching based on the users' preferences. Furthermore, the precision of the proposed approach has been proven with lesser cancellation, improved driver rating, and reduction in complaints. © 2022 Adnan Abid et al. **Article.**

23. **Inayat, U., School of Systems and Technology, University of Management and Technology, Lahore, 54000, Pakistan; Iqbal, S., School of Systems and Technology, University of Management and Technology, Lahore, 54000, Pakistan. *Theoretical Investigation of Two-Dimensional Nonlinear Radiative Thermionics in Nano-MHD for Solar Insolation: A Semi-Empirical Approach.* CMES - Computer Modeling in Engineering and Sciences. 130, 2.**

In this contemporary study, theoretical investigation of nanofluidic model is thought-out. Two-dimensional nanomaterials based mixed flow is considered here. Convective solar radiative heat transport properties have been investigated over a nonlinearly stretched wall in the presence of magneto-hydrodynamic (MHD), by innovative application of semi analytical "optimal homotopy asymptotic method (OHAM)". OHAM does not require any

discretization, linearization and small parameter assumption. OHAM describes extremely precise 1st/2nd order solutions without the need of computing further higher order terms, therefore, fast convergence is observed. Nanofluidic governing model is transformed into system of ordinary differential equations (ODEs) by exploitation of similarity transformation. To study the significance of radiation parameter along with thermophoresis parameter, a semi analytical solver is applied to the transformed system. In this work, Brownian motion, influence of magnetic field, Lewis number, Prandtl number, Eckert number and Biot number have investigated on velocity, temperature and nanoparticle concentration profiles. The study provides sufficient number of graphical representations to demonstrate the inspiration of mentioned parameters. **Article.**

24. **Baig, T.I., School of Science and Technology, University of Management and Technology, Lahore, Pakistan; Khan, Y.D., School of Science and Technology, University of Management and Technology, Lahore, Pakistan.** *lipo-pseaac: Identification of lipoylation sites using statistical moments and general pseaac.* **Computers, Materials and Continua.** 71, 1.

Lysine Lipoylation is a protective and conserved Post Translational Modification (PTM) in proteomics research like prokaryotes and eukaryotes. It is connected with many biological processes and closely linked with many metabolic diseases. To develop a perfect and accurate classification model for identifying lipoylation sites at the protein level, the computational methods and several other factors play a key role in this purpose. Usually, most of the techniques and different traditional experimental models have a very high cost. They are time-consuming; so, it is required to construct a predictor model to extract lysine lipoylation sites. This study proposes a model that could predict lysine lipoylation sites with the help of a classification method known as Artificial Neural Network (ANN). The ANN algorithm deals with the noise problem and imbalance classification in lipoylation sites dataset samples. As the result shows in ten-fold cross-validation, a brilliant performance is achieved through the predictor model with an accuracy of 99.88%, and also achieved 0.9976 as the highest value of MCC. So, the predictor model is a very useful and helpful tool for lipoylation sites prediction. Some of the residues around lysine lipoylation sites play a vital part in prediction, as demonstrated during feature analysis. The wonderful results reported through the evaluation and prediction of this model can provide an informative and relative explanation for lipoylation and its molecular mechanisms. © 2022 Tech Science Press. All rights reserved. **Article.**

25. **Ramzan, M., Department of Computer Science and Information Technology, University of Sargodha, Sargodha, 40100, Pakistan, School of Systems and Technology, University of Management and Technology, Lahore, 54782, Pakistan.** *Automatic heart disease detection by classification of ventricular arrhythmias on ecg using machine learning.* **Computers, Materials and Continua.** 71, 1.

This paper focuses on detecting diseased signals and arrhythmias classification into two classes: Ventricular tachycardia and premature ventricular contraction. The sole purpose of the signal detection is used to determine if a signal has been collected from a healthy or sick person. The proposed research approach presents a mathematical model for the signal detector based on calculating the instantaneous frequency (IF). Once a signal taken from a patient is detected, then the classifier takes that signal as input and classifies the target disease by predicting the class label. While applying the classifier, templates are designed separately for ventricular tachycardia and premature ventricular contraction. Similarities of a given signal with both the templates are computed in the spectral domain. The empirical analysis reveals precisions for the detector and the applied classifier are 100% and 77.27%, respectively. Moreover, instantaneous frequency analysis provides a benchmark that IF of a normal signal ranges from 0.8 to 1.1 Hz whereas IF range for ventricular tachycardia and premature ventricular contraction is 0.08-0.6 Hz. This indicates a serious loss of high-frequency contents in the spectrum, implying that the heart's overall activity is slowed down. This study may help medical practitioners in detecting the heart disease type based on signal analysis. © 2022 Tech Science Press. All rights reserved. **Article.**

26. **Iqbal, S., School of Systems and Technology, University of Management and Technology, Lahore, 54000, Pakistan.** *A multi-simplex imperialist competitive paradigm for solving nonlinear physical systems.* **Intelligent Automation and Soft Computing.** 32, 1.

This paper proposes a novel gradient free multi-simplex topology fabric aided imperialist competitive algorithm (ICA) for solving nonlinear systems of algebraic equations by transforming them to equivalent global optimization problems. The

high dependence of traditional gradient based solvers of such systems on initial guesses and the Jacobians resulting in false convergence is the main motivation behind the present work. The present work provides a mechanism for enhancing exploitation powers of imperialist search phase of the algorithm and hence improves the convergence speed. The variants emerging from the proposed approach are applied to diverse nonlinear systems arising in different scientific areas and the results so obtained are analyzed in details. Based on the analysis of empirical results on complex benchmark models, it is observed that the proposed enhancement of ICA has not only boosted the problem solving power of the imperialist system when applied multidimensional nonlinear physical systems but also emerged as an efficient gradient/initial guess free alternative solver with high accuracy for nonlinear systems. © 2022, Tech Science Press. All rights reserved. [Article](#).

27. **Farooq, M.S., Department of Computer Science, University of Management and Technology, Lahore, 54000, Pakistan.; Kalim, Z., Department of Software Engineering, University of Management and Technology, Lahore, 54000, Pakistan.; Abid, A., Department of Computer Science, University of Management and Technology, Lahore, 54000, Pakistan.** [A Blockchain-based Framework for Distributed Agile Software Development. IEEE Access.](#)

Distributed Agile Software Development (DASD) is one of the most important approach for the modern software industry that allows geographically independent development of software. In the past, different tools and frameworks were proposed to solve communication and collaboration issues in DASD but they lacked transparency, trust, traceability, and security. These shortcomings resulted in project failure or overdue, customer dissatisfaction, project deal cancellations, and payment clashes between the customers and development teams. This paper addresses and overcomes the major issues of transparency, trust, security, traceability, coordination, and communication in DASD by embedding blockchain technology. We have proposed a blockchain embedded framework named as AgilePlus which executes the smart contracts on a private ethereum blockchain for acceptance testing, secure payment, verification of developer's payment requirements, and automatic payment distribution into the digital wallets of development teams for ensuring trust between geographically distributed customers and developers. The execution of these smart contracts automatically assign penalties to the customers for late or non-payments and also to the developers for overdue tasks. Moreover, we have also solved the blockchain's scalability challenge in AgilePlus by utilizing Interplanetary File System (IPFS) as off-chain storage. Lastly, experimental results prove that the proposed framework enhances transparency, communication, coordination, traceability, security and solves trust issues of both customers and developers in DASD. [Article](#).

28. **Naseer, S., Department of Computer Science, University of Management and Technology, Lahore, 54770, Pakistan; Ali, R.F., Department of Computer Science, University of Management and Technology, Lahore, 54770, Pakistan.** [Computational identification of 4-carboxyglutamate sites to supplement physiological studies using deep learning. Scientific Reports. 12, 1.](#)

In biological systems, Glutamic acid is a crucial amino acid which is used in protein biosynthesis. Carboxylation of glutamic acid is a significant post-translational modification which plays important role in blood coagulation by activating prothrombin to thrombin. Contrariwise, 4-carboxy-glutamate is also found to be involved in diseases including plaque atherosclerosis, osteoporosis, mineralized heart valves, bone resorption and serves as biomarker for onset of these diseases. Owing to the pathophysiological significance of 4-carboxyglutamate, its identification is important to better understand pathophysiological systems. The wet lab identification of prospective 4-carboxyglutamate sites is costly, laborious and time consuming due to inherent difficulties of in-vivo, ex-vivo and in vitro experiments. To supplement these experiments, we proposed, implemented, and evaluated a different approach to develop 4-carboxyglutamate site predictors using pseudo amino acid compositions (PseAAC) and deep neural networks (DNNs). Our approach does not require any feature extraction and employs deep neural networks to learn feature representation of peptide sequences and performing classification thereof. Proposed approach is validated using standard performance evaluation metrics. Among different deep neural networks, convolutional neural network-based predictor achieved best scores on independent dataset with accuracy of 94.7%, AuC score of 0.91 and F1-score of 0.874 which shows the promise of proposed approach. The iCarboxE-Deep server is deployed at <https://share.streamlit.io/sherazn/carboxyglutamate/app.py>. © 2022, The Author(s). [Article](#).

29. Shaheen, M., Department of Computer Science, SST, University of Management and Technology, Lahore, 54000, Pakistan; Farooq, M.S., Department of Computer Science, SST, University of Management and Technology, Lahore, 54000, Pakistan. *Applications of Federated Learning; Taxonomy, Challenges, and Research Trends. Electronics (Switzerland)*. 11, 4.

The federated learning technique (FL) supports the collaborative training of machine learning and deep learning models for edge network optimization. Although a complex edge network with heterogeneous devices having different constraints can affect its performance, this leads to a problem in this area. Therefore, some research can be seen to design new frameworks and approaches to improve federated learning processes. The purpose of this study is to provide an overview of the FL technique and its applicability in different domains. The key focus of the paper is to produce a systematic literature review of recent research studies that clearly describes the adoption of FL in edge networks. The search procedure was performed from April 2020 to May 2021 with a total initial number of papers being 7546 published in the duration of 2016 to 2020. The systematic literature synthesizes and compares the algorithms, models, and frameworks of federated learning. Additionally, we have presented the scope of FL applications in different industries and domains. It has been revealed after careful investigation of studies that 25% of the studies used FL in IoT and edge-based applications and 30% of studies implement the FL concept in the health industry, 10% for NLP, 10% for autonomous vehicles, 10% for mobile services, 10% for recommender systems, and 5% for FinTech. A taxonomy is also proposed on implementing FL for edge networks in different domains. Moreover, another novelty of this paper is that datasets used for the implementation of FL are discussed in detail to provide the researchers an overview of the distributed datasets, which can be used for employing FL techniques. Lastly, this study discusses the current challenges of implementing the FL technique. We have found that the areas of medical AI, IoT, edge systems, and the autonomous industry can adapt the FL in many of its sub-domains; however, the challenges these domains can encounter are statistical heterogeneity, system heterogeneity, data imbalance, resource allocation, and privacy. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

30. Naeem, A., Department of Computer Science, University of Management and Technology, Lahore, 54000, Pakistan; Anees, T., Department of Software Engineering, University of Management and Technology, Lahore, 54000, Pakistan. *A Comprehensive Analysis of Recent Deep and Federated-Learning-Based Methodologies for Brain Tumor Diagnosis. Journal of Personalized Medicine*. 12, 2.

Brain tumors are a deadly disease with a high mortality rate. Early diagnosis of brain tumors improves treatment, which results in a better survival rate for patients. Artificial intelligence (AI) has recently emerged as an assistive technology for the early diagnosis of tumors, and AI is the primary focus of researchers in the diagnosis of brain tumors. This study provides an overview of recent research on the diagnosis of brain tumors using federated and deep learning methods. The primary objective is to explore the performance of deep and federated learning methods and evaluate their accuracy in the diagnosis process. A systematic literature review is provided, discussing the open issues and challenges, which are likely to guide future researchers working in the field of brain tumor diagnosis. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Review.**

31. Khaskheli, F., Department of Computer Sciences, School of Systems and Technology, University of Management and Technology, Lahore, Pakistan; Hassan, M.T., Department of Software Engineering, School of Systems and Technology, University of Management and Technology, Lahore, Pakistan; Naseer, S., Department of Computer Sciences, School of Systems and Technology, University of Management and Technology, Lahore, Pakistan. *Employing automatic content recognition for teaching methodology analysis in classroom videos. PLoS ONE*. 17, 2-Feb.

A teacher plays a pivotal role in grooming a society and paves way for its social and economic developments. Teaching is a dynamic role and demands continuous adaptation. A teacher adopts teaching techniques suitable for a certain discipline and a situation. A thorough, detailed, and impartial observation of a teacher is a desideratum for adaptation of an effective teaching methodology and it is a laborious exercise. An automatic strategy for analyzing a teacher's teaching methodology in a classroom environment is suggested in this work. The proposed strategy recognizes a teacher's actions in videos while he is delivering lectures. In this study, 3D CNN and Conv2DLSTM with time-distributed layers are used for experimentation. A range of actions are recognized for a complete classroom session during experimentation and the reported results are considered effective for analysis of a teacher's teaching

technique. © 2022 Rafique et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. **Article.**

32. Farooq, M.S., Department of Computer Science, School of System and Technology, University of Management and Technology, Lahore, 54000, Pakistan; Rehman, A.U., Department of Computer Science, School of System and Technology, University of Management and Technology, Lahore, 54000, Pakistan; Khan, M.Z., Department of Computer Science, School of System and Technology, University of Management and Technology, Lahore, 54000, Pakistan. *Formal Modeling and Improvement in the Random Path Routing Network Scheme Using Colored Petri Nets. Applied Sciences (Switzerland). 12, 3.*

Wireless sensor networks (WSNs) have been applied in networking devices, and a new problem has emerged called source location privacy (SLP) in critical security systems. In wireless sensor networks, hiding the location of the source node from the hackers is known as SLP. The WSNs have limited battery capacity and low computational ability. Many state-of-the-art protocols have been proposed to address the SLP problems and other problems such as limited battery capacity and low computational power. One of the popular protocols is random path routing (RPR), and in random path routing, the system keeps sending the message randomly along all the possible paths from a source node to a sink node irrespective of the path's distance. The problem arises when the system keeps sending a message via the longest route, resulting because of high battery usage and computational costs. This research paper presents a novel networking model referred to as calculated random path routing (CRPR). CRPR first calculates the top three shortest paths, and then randomly sends a token to any of the top three shortest calculated paths, ensuring the optimal tradeoff between computational cost and SLP. The proposed methodology includes the formal modeling of the CRPR in Colored Petri Nets. We have validated and verified the CRPR, and the results depict the optimal tradeoff. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Review.**

33. Arif, M., School of Computer Science and Engineering, Nanjing University of Science and Technology, Nanjing, 210094, China, School of Systems and Technology, Department of Informatics and System, University of Management and Technology, Lahore, 54770, Pakistan; Ahmed, S., Center of Data Mining and Biomedical Informatics, Faculty of Medical Technology, Mahidol University, Bangkok, 10700, Thailand, School of Systems and Technology, Department of Computer Science, University of Management and Technology, Lahore, 54770, Pakistan; Kabir, M., School of Systems and Technology, Department of Computer Science, University of Management and Technology, Lahore, 54770, Pakistan; Khan, Y.D., School of Systems and Technology, Department of Computer Science, University of Management and Technology, Lahore, 54770, Pakistan. *StackACPred: Prediction of anticancer peptides by integrating optimized multiple feature descriptors with stacked ensemble approach. Chemometrics and Intelligent Laboratory Systems. 220.*

Anticancer peptides (ACPs) have been emerged as a potential safe therapeutic agent for treating cancer. Identifying novel ACPs is crucial for understanding deep insight their functional mechanisms and vaccine production. Conventional wet-lab technological methods for finding ACPs are overpriced, slow, and resource-intensive. Thus, fast and accurate ACPs prediction through computational approach is highly desired because of massive peptide sequences accumulated in the post-genomic era. Recently, several intelligent statistical approaches have been designed for discriminating ACPs from non-ACPs. Although remarkable achievements have been accomplished, available methods still have inadequate feature descriptors and learning algorithms, thereby restricting the predictive performance. To address this, we develop a novel predictor called Stack-ACPred for the correct identification of ACPs. More specifically, the proposed method possesses three nominal feature encoding strategies i.e., evolutionary-profile and physicochemical information as segmented position-specific scoring matrix (SegPSSM), pseudo (PsePSSM), and extended pseudo amino acid composition (PseAAC). The extracted features are serially fused and further optimized through a powerful support vector machine recursive feature elimination and correlation bias reduction (SVM-RFE + CBR) algorithm. The optimal selected attributes are provided to build the stacking-base ensemble model for targeting effective ACPs. The proposed StackACPred attained 84.45% and 86.21% accuracy based on ACP740 and ACP240 datasets with 5-fold cross-validation test, which was 2.97% and 0.79% higher than other existing studies, respectively. The empirical outcomes of our

developed automated tool demonstrate the excellent discriminative power for annotating large scale ACPs in particular and other peptides in general. © 2021 Elsevier B.V. [Article](#).

34. Hussain, W., Department of Computer Science, School of Systems and Technology, University of Management and Technology, Lahore, Pakistan. *AEPI: insights into the potential of deep representations for human identification through outer ear images*. [Multimedia Tools and Applications](#).

For forensic human identification, one of the most important methods is by opting for protocols of biometrics. The outer human ear, also known as auricle or pinna, has unique characteristics, which are not even the same in identical twins. Thus, considering the uniqueness, reliability, and easy collectability of this trait, herein, a novel method is proposed for human identification namely Automated Ear Pinna Identification (AEPI). The proposed method opts for potentials of deep learning, by creating a unique blend of deep representation from a residual network and a spatial encoding block to identify human ear pinna imagery. The evaluation of the proposed method is also performed by comparing both, same and different ear pinna image pairs. Based on the evaluation, it is observed that the proposed method is 87.207% accurate for classification among classes of the dataset, 97.2% for gender-based classification and 99.0% accurate for identifying humans based on ear pinna images. These scores depict the strong potential and contribution of the proposed method in the field of ear biometrics and it is concluded that AEPI can aid the identification of humans based on ear pinna images in an accurate, effective and efficient manner. AEPI is freely available at (<http://zeetu.org/AEPI.html>). © 2022, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature. [Article](#).

35. Naseer, S., Department of Computer Science, University of Management and Technology, Lahore, Pakistan; Ali, R.F., Department of Computer Science, University of Management and Technology, Lahore, Pakistan. *iAceS-Deep: Sequence-Based Identification of Acetyl Serine Sites in Proteins Using PseAAC and Deep Neural Representations*. [IEEE Access](#). 10.

In the biological systems, Acetylation is a crucial post-translational modification, prevalent in various physiological functions and pathological conditions like carcinoma and malignancies. To better understand serine acetylation, the first step is the efficient identification of the same. Although multiple large-scale in-vivo, ex-vivo, and in-vitro methods have been applied to detect serine acetylation biomarkers, these experimental methods are time-consuming and labor-intensive. This research aims to develop an in-silico solution to supplement wetlab experiments for efficient detection of serine acetylation sites by combining Chou's Pseudo Amino Acid Composition (PseAAC) with deep neural networks (DNNs). By employing well-known DNNs for feature learning and classification of peptide sequences, our approach obsoletes the need to separately perform costly and cumbersome feature learning process. Based on performance evaluation using standard evaluation metrics, CNN and FCN based models, for AcetylSerine site identification, surpassed previously reported predictors which shows the efficacy of proposed approach. © 2013 IEEE. [Article](#).

36. Farooq, M.S., University of Management and Technology, Department of Computer Science, Lahore, 54000, Pakistan; Sohail, O.O., University of Management and Technology, Department of Computer Science, Lahore, 54000, Pakistan; Abid, A., University of Management and Technology, Department of Computer Science, Lahore, 54000, Pakistan. *A Survey on the Role of IoT in Agriculture for the Implementation of Smart Livestock Environment*. [IEEE Access](#). 10.

The Internet of Things (IoT) is an emerging paradigm that is transforming real-world things (objects) into smarter devices. IoT is applicable to a variety of application domains including healthcare, smart grid, and agriculture. This domain has started revolutionizing the agriculture industry by providing smart solutions for precision farming, greenhouse management, and livestock monitoring. This article aims to present a comprehensive survey on the role of IoT in the Livestock field by categorizing and synthesizing existing research work in this area. To this end, a detailed discussion has been provided on IoT network infrastructure, topologies and platforms employed for livestock management. In addition, a list of communication protocols and connections of IoT-based livestock systems with relevant technologies have also been explored. Furthermore, numerous IoT-based livestock monitoring, controlling, and tracking applications have been discussed. Apart from this, it also analyses distinct security issues in IoT-based livestock field and developed a collaborative security model to detect and minimize the security risk. Lastly, pertinent open research challenges in the



domain of IoT-based livestock management have been presented with future research directions. **Article.**

37. Khan, Y.D., Department of Computer Science, School of Systems and Technology, University of Management and Technology, Lahore, Pakistan. *A comprehensive tool for accurate identification of methyl-Glutamine sites*. *Journal of Molecular Graphics and Modelling*. 110.

Methylation is a biochemical process involved in nearly all of the human body functions. Glutamine is considered an indispensable amino acid that is susceptible to methylation via post-translational modification (PTM). Modern research has proved that methylation plays a momentous role in the progression of most types of cancers. Therefore, there is a need for an effective method to predict glutamine sites vulnerable to methylation accurately and inexpensively. The motive of this study is the formulation of an accurate method that could predict such sites with high accuracy. Various computationally intelligent classifiers were employed for their formulation and evaluation. Rigorous validations prove that deep learning performs best as compared to other classifiers. The accuracy (ACC) and the area under the receiver operating curve (AUC) obtained by 10-fold cross-validation was 0.962 and 0.981, while with the jackknife testing, it was 0.968 and 0.980, respectively. From these results, it is concluded that the proposed methodology works sufficiently well for the prediction of methyl-glutamine sites. The webserver's code, developed for the prediction of methyl-glutamine sites, is freely available at <https://github.com/s20181080001/WebServer.git>. The code can easily be set up by any intermediate-level Python user. © 2021 Elsevier Inc. **Article.**

38. Wajid, B., Department of Electrical Engineering, University of Engineering and Technology, Lahore, Pakistan, Muhammad Ibn Musa Al-Khwarizmi Research and Development Division, Sabz-Qalam, Lahore, Pakistan, Department of Computer Science, University of Management & Technology (UMT), Lahore, Pakistan; Nisar, H., Office of Research Innovation and Commercialization, UMT, Lahore, Pakistan. *Music of metagenomics—a review of its applications, analysis pipeline, and associated tools*. *Functional and Integrative Genomics*. 22, 1.

This humble effort highlights the intricate details of metagenomics in a simple, poetic, and rhythmic way. The paper enforces the significance of the research area, provides details about major analytical methods, examines the taxonomy and assembly of genomes, emphasizes some tools, and concludes by celebrating the richness of the ecosystem populated by the “œmetagenome.” . © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Review.**

39. Malik, H., Department of Computer Science, University of Management and Technology, Lahore, 54000, Pakistan; Anees, T., Department of Software Engineering, University of Management and Technology, Lahore, 54000, Pakistan. *BDCNet: multi-classification convolutional neural network model for classification of COVID-19, pneumonia, and lung cancer from chest radiographs*. *Multimedia Systems*.

Globally, coronavirus disease (COVID-19) has badly affected the medical system and economy. Sometimes, the deadly COVID-19 has the same symptoms as other chest diseases such as pneumonia and lungs cancer and can mislead the doctors in diagnosing coronavirus. Frontline doctors and researchers are working assiduously in finding the rapid and automatic process for the detection of COVID-19 at the initial stage, to save human lives. However, the clinical diagnosis of COVID-19 is highly subjective and variable. The objective of this study is to implement a multi-classification algorithm based on deep learning (DL) model for identifying the COVID-19, pneumonia, and lung cancer diseases from chest radiographs. In the present study, we have proposed a model with the combination of Vgg-19 and convolutional neural networks (CNN) named BDCNet and applied it on different publically available benchmark databases to diagnose the COVID-19 and other chest tract diseases. To the best of our knowledge, this is the first study to diagnose the three chest diseases in a single deep learning model. We also computed and compared the classification accuracy of our proposed model with four well-known pre-trained models such as ResNet-50, Vgg-16, Vgg-19, and inception v3. Our proposed model achieved an AUC of 0.9833 (with an accuracy of 99.10%, a recall of 98.31%, a precision of 99.9%, and an f1-score of 99.09%) in classifying the different chest diseases. Moreover, CNN-based pre-trained models VGG-16, VGG-19, ResNet-50, and Inception-v3 achieved an accuracy of classifying multi-diseases are 97.35%, 97.14%, 97.15%, and 95.10%, respectively. The results revealed that our proposed model produced a remarkable performance as compared to its competitor approaches, thus providing significant assistance to diagnostic radiographers and health experts. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

40. Zahid, A.H., Department of Informatics and Systems, University of Management and Technology, Lahore, 54700, Pakistan. *An image encryption algorithm based on new generalized fusion fractal structure. Information Sciences.* 592.

The design and utilization of suitable fractal structures is one of the prominent areas of security for the protection of digital data. This paper proposes a generalized fusion fractal structure by combining two one-dimensional fractals as seed functions from a larger spectrum of fractal functions. A fusion fractal termed as PLFF is formulated by combining traditional Phoenix and Lambda fractals. Improved randomized phase space, self-similar structure on various magnification scales, and fractional dimension are found in the resultant PLFF fractal. The capacity of PLFF to create a pseudo-random number (PRN) sequence in both integer and binary format is validated by its increased complexity and enhanced chaotic range. The generated PRN sequences feature a significant degree of uncorrelation and randomness. A novel image encryption algorithm based on the new PLFF fractal function is proposed which utilizes a generated PRN sequence as secret key. Standard security evaluations such as histogram variance, NPCR and UACI tests for plain-image sensitivity, key sensitivity, information entropy, pixel correlation, and noise and data loss, etc. are used to analyze the performance of the proposed encryption algorithm. The simulation results revealed performance indicators such as entropies  $> 7.997$ , NPCR  $> 96.6$ , UACI  $> 33.5$ , high throughput of  $\approx 6$  MBps, and highly uncorrelated neighboring pixels in encrypted images. The findings are also compared with some current image encryption schemes, demonstrating that the proposed digital image encryption algorithm performs well. © 2022 Elsevier Inc. **Article.**

41. Shahzad, S.K., Department of Informatics and Systems, University of Management and Technology, Lahore, 54000, Pakistan. *Deep neural networks for gun detection in public surveillance. Intelligent Automation and Soft Computing.* 32, 2.

The conventional surveillance and control system of Closed-Circuit Television (CCTV) cameras require human resource supervision. Almost all the criminal activities take place using weapons mostly handheld gun, revolver, or pistol. Automatic gun detection is a vital requirement now-a-days. The use of real-time object detection system for the improvement of surveillance is a promising application of Convolutional Neural Networks (CNN). We are concerned about the real-time detection of weapons for the surveillance cameras, so we focused on the implementation and comparison of faster approaches such as Region (R-CNN) and Region Fully Convolutional Networks (R-FCN) with feature extractor Visual Geometry Group (VGG) and ResNet respectively. Training and testing are done on database that consists of local environment images. These images are taken with different type and high-resolution cameras that minimize the idealism. Some metrics also defined to reduce the false positives which are specific to the solution of problem. This research also contributes to the constitution of a hybrid CNN model of both faster-based R-CNN and R-FCN. Both hybrid and existing models experimented to reduce false positive in weapon detection. Result represented in graph with calculation during and after training with confusion matrix and hybrid model results better than other models. © 2022, Tech Science Press. All rights reserved. **Article.**

42. Shahzad, S.K., Department of Informatics and Systems, University of Management and Technology, Lahore, 54000, Pakistan; Mushtaq, M.T., Department of Informatics and Systems, University of Management and Technology, Lahore, 54000, Pakistan. *Patients using machine learning algorithms. Intelligent Automation and Soft Computing.* 31, 1.

Coronavirus disease (COVID-19), also known as Severe acute respiratory syndrome (SARS-COV2) and it has imposed deep concern on public health globally. Based on its fast-spreading breakout among the people exposed to the wet animal market in Wuhan city of China, the city was indicated as its origin. The symptoms, reactions, and the rate of recovery shown in the coronavirus cases worldwide have been varied. The number of patients is still rising exponentially, and some countries are now battling the third wave. Since the most effective treatment of this disease has not been discovered so far, early detection of potential COVID-19 patients can help isolate them socially to decrease the spread and flat-ten the curve. In this study, we explore state-of-the-art research on coronavirus disease to determine the impact of this illness among various age groups. More-over, we analyze the performance of the Decision tree (DT), K-nearest neighbors (KNN), Naïve bayes (NB), Support vector machine (SVM), and Logistic regression (LR) to determine COVID-19 in the patients based on their symptoms. A dataset obtained from a public repository was collected and pre-processed, before applying the selected Machine learning (ML) algorithms on them. The results demonstrate that all the ML

algorithms incorporated perform well in determining COVID-19 in potential patients. NB and DT classifiers show the best performance with an accuracy of 93.70%, whereas other algorithms, such as SVM, KNN, and LR, demonstrate an accuracy of 93.60%, 93.50%, and 92.80% respectively. Hence, we determine that ML models have a significant role in detecting COVID-19 in patients based on their symptoms. © 2022, Tech Science Press. All rights reserved. **Article.**

43. Hussain, W., Department of Computer Science, School of Systems and Technology, University of Management and Technology, Lahore, 54770, Pakistan. *sAMP-PFPDeep: Improving accuracy of short antimicrobial peptides prediction using three different sequence encodings and deep neural networks*. *Briefings in bioinformatics*. 23, 1.

Short antimicrobial peptides (sAMPs) belong to a significant repertoire of antimicrobial agents and are known to possess enhanced antimicrobial activity, higher stability and less toxicity to human cells, as well as less complex than other large biological drugs. As these molecules are significantly important, herein, a prediction method for sAMPs (with a sequence length of 30 residues) is proposed for accurate and efficient prediction of sAMPs instead of laborious and costly experimental approaches. Benchmark dataset was collected from a recently reported study and sequences were converted into three channel images comprising information related to the position, frequency and sum of 12 physiochemical features as the first, second and third channels, respectively. Two image-based deep neural networks (DNNs), i.e. RESNET-50 and VGG-16 were trained and evaluated using various metrics while a comparative analysis with previous techniques was also performed. Validation of sAMP-PFPDeep was also performed by using molecular docking based analysis. The results showed that VGG-16 provided more accurate results, i.e. 98.30% training accuracy and 87.37% testing accuracy for predicting sAMPs as compared to those of RESNET-50 having 96.14% training accuracy and 83.87% testing accuracy. However, the comparative analysis revealed that both these models outperformed previously reported state-of-the-art methods. Based on the results, it is concluded that sAMP-PFPDeep can help identify antimicrobial peptides with promising accuracy and efficiency. It can help biologists and scientists to identify antimicrobial peptides, by further aiding the computer-aided drug design and discovery, as well as virtual screening protocols against various pathologies. sAMP-PFPDeep is available at (<https://github.com/WaqarHusain/sAMP-PFPDeep>). © The Author(s) 2021. Published by Oxford University Press. All rights reserved. For permissions, please e-mail: [journals.permissions@oup.com](mailto:journals.permissions@oup.com). **Article.**

44. M.J., Department of Software Engineering, University of Management and Technology, Lahore, Pakistan. *Microscopic retinal blood vessels detection and segmentation using support vector machine and K-nearest neighbors*. *Microscopy Research and Technique*.

The retina is the deepest layer of texture covering the rear of the eye, recorded by fundus images. Vessel detection and segmentation are useful in disease diagnosis. The retina's blood vessels could help diagnose maladies such as glaucoma, diabetic retinopathy, and blood pressure. A mix of supervised and unsupervised strategies exists for the detection and segmentation of blood vessels images. The tree structure of retinal blood vessels, their random area, and different thickness have caused vessel detection difficulties at machine learning calculations. Since the green band of retinal images conveys more information about the vessels, they are utilized for microscopic vessels detection. The current research proposes an administered calculation for segmentation of retinal vessels, where two upgrading stages depending on filtering and comparative histogram were applied after pre-processing and image quality improvement. At that point, statistical features of vessel tracking, maximum curvature and curvelet coefficient are extracted for each pixel. The extracted features are classified by support vector machine and the k-nearest neighbors. The morphological operators then enhance the classified image at the final stage to segment with higher accuracy. The dice coefficient is utilized for the evaluation of the proposed method. The proposed approach is concluded to be better than different strategies with a normal of 92%. © 2022 Wiley Periodicals LLC. **Article.**

45. Naseer, A., Department of Software Engineering, School of Systems and Technology, University of Management and Technology, Lahore, 54782, Pakistan; Ashraf, F., Department of Computer Science, School of Systems and Technology, University of Management and Technology, Lahore, 54782, Pakistan. *Sentence Boundary Extraction from Scientific Literature of Electric Double Layer Capacitor Domain: Tools and Techniques*. *Applied Sciences (Switzerland)*. 12, 3.

Given the growth of scientific literature on the web, particularly material science, acquiring data precisely from the

literature has become more significant. Material information systems, or chemical information systems, play an essential role in discovering data, materials, or synthesis processes using the existing scientific literature. Processing and understanding the natural language of scientific literature is the backbone of these systems, which depend heavily on appropriate textual content. Appropriate textual content means a complete, meaningful sentence from a large chunk of textual content. The process of detecting the beginning and end of a sentence and extracting them as correct sentences is called sentence boundary extraction. The accurate extraction of sentence boundaries from PDF documents is essential for readability and natural language processing. Therefore, this study provides a comparative analysis of different tools for extracting PDF documents into text, which are available as Python libraries or packages and are widely used by the research community. The main objective is to find the most suitable technique among the available techniques that can correctly extract sentences from PDF files as text. The performance of the used techniques Pypdf2, Pdfminer.six, Pypdf, Pdftotext, Tika, and Grobid is presented in terms of precision, recall, f-1 score, run time, and memory consumption. NLTK, Spacy, and Gensim Natural Language Processing (NLP) tools are used to identify sentence boundaries. Of all the techniques studied, the Grobid PDF extraction package using the NLP tool Spacy achieved the highest f-1 score of 93% and consumed the least amount of memory at 46.13 MegaBytes. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

**46. Awan, M.J., Department of Software Engineering, University of Management and Technology, Lahore, 54770, Pakistan. *Harris Hawks Sparse Auto-Encoder Networks for Automatic Speech Recognition System. Applied Sciences (Switzerland). 12, 3.***

Automatic speech recognition (ASR) is an effective technique that can convert human speech into text format or computer actions. ASR systems are widely used in smart appliances, smart homes, and biometric systems. Signal processing and machine learning techniques are incorporated to recognize speech. However, traditional systems have low performance due to a noisy environment. In addition to this, accents and local differences negatively affect the ASR system's performance while analyzing speech signals. A precise speech recognition system was developed to improve the system performance to overcome these issues. This paper uses speech information from jim-schwoebel voice datasets processed by Mel-frequency cepstral coefficients (MFCCs). The MFCC algorithm extracts the valuable features that are used to recognize speech. Here, a sparse auto-encoder (SAE) neural network is used to classify the model, and the hidden Markov model (HMM) is used to decide on the speech recognition. The network performance is optimized by applying the Harris Hawks optimization (HHO) algorithm to fine-tune the network parameter. The fine-tuned network can effectively recognize speech in a noisy environment. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

## School of Social Sciences & Humanities

**47. Khan, Z.A., School of Social Sciences and Humanities, University of Management and Technology, Lahore, Pakistan. *Dynamic linkages of financial inclusion, modernization, and environmental sustainability in South Asia: a panel data analysis. Environmental Science and Pollution Research. 29, 11.***

This study explores the dynamic linkages of financial inclusion, modernization, and environmental sustainability in South Asia during the period 1998–2019. Two distinct composite indexes for financial inclusion and modernization are developed by using principal component analysis (PCA) based on normalized indicators. To examine the dynamic linkages, we adopted panel regression models that are not only robust but also heteroskedasticity consistent. We find that financial inclusion, modernization, per capita GDP, and FDI appear to lead to higher CO<sub>2</sub> emissions in the South Asian region. Meanwhile, increased economic integration and trade openness appear to have negative dynamics for carbon emissions. These empirical findings are unbiased and robust to different reasonable modifications to panel data model specifications. This study comes up with the conclusion that presently there is no policy coherence and coordination between growing financial inclusion, modernization, and carbon mitigation strategies in South Asia. Thus, the prospect of financial inclusion and modernization should be cohesive into comprehensive climate change mitigation strategies at regional, national, and global levels, specifically to mitigate the adverse dynamics of higher carbon emissions associated with modern development. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

48. Asghar, M.Z., Department of Education, University of Helsinki, Helsinki, 00014, Finland, School of Doctorate, Education & ICT (e-Learning), Universitat Oberta de Catalunya, Barcelona, 08018, Spain, Department of Education, University of Management and Technology, Lahore, 54700, Pakistan. *The Impacts of Emotional Intelligence on Students' Study Habits in Blended Learning Environments: The Mediating Role of Cognitive Engagement during COVID-19*. *Behavioral Sciences*. 12, 1.

Emotional intelligence is a main area in educational psychology and a key factor in the academic life of students. It deals with deviant behavior through self-awareness and self-motivation, regulates emotional and social skills, and converts emotional energy into positive energy. This study examined direct and indirect relationships between emotional intelligence and study habits in blended learning environments. Blended learning is conceptualized as a hybrid learning approach that combines online learning opportunities and the traditional classroom approach. Furthermore, the study explored the mediating role of cognitive engagement in the relationship between emotional intelligence and study habits. We used 26 items in a paper-based questionnaire in a quantitative study to collect data on emotional intelligence, cognitive engagement and study habits from health sciences students (N = 338) enrolled in blended learning courses in universities in the Hunan province of China. Emotional intelligence included self-awareness, self-motivation, and the regulation of emotion; social skills were also examined. A partial least squares structural-equation modeling approach was applied through SmartPLS software to explore the relationships. The results indicate that self-awareness and self-motivation have direct, significant, and positive connections with study habits. Similarly, the results indicate that all four dimensions of emotional intelligence (self-awareness, self-motivation, emotion regulation and social skills) had indirect, significant, and positive relationships with study habits using cognitive engagement as a mediator variable. It was concluded that students face higher-than-usual challenges in building study habits in blended learning environments during the COVID-19 pandemic, and that emotional intelligence helps them to develop their study habits to greater effect. Similarly, it was concluded that cognitive engagement strengthens the connection between emotional intelligence and study habits. Therefore, it is recommended that universities take specific measures to enhance students' emotional intelligence and cognitive engagement, which will ultimately improve their study habits. Moreover, valuable and practical implications for teachers, practitioners, and university management were also discussed in the study. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

49. Asghar, M.Z., Department of Education, University of Helsinki, Helsinki, 00014, Finland, School of Doctorate, Education & ICT (e-Learning), Universitat Oberta de Catalunya, Barcelona, 08018, Spain, Department of Education, University of Management and Technology, Lahore, 54700, Pakistan; Arif, S., Department of Education, University of Management and Technology, Lahore, 54700, Pakistan. *Social Media Tools for the Development of Pre-Service Health Sciences Researchers during COVID-19 in Pakistan*. *International Journal of Environmental Research and Public Health*. 19, 1.

The development of health sciences researchers has immense significance during a pandemic to control, manage, and prevent future outbreaks of the disease. This study focused on the use of social media tools (SMT) among pre-service health sciences researchers to complement their research competencies (RCT) and research completion levels (RC) during COVID-19. This study used the Vitae research development framework (RDF) to measure research competencies as a mediator between the use of social media tools and research completion levels among post-graduate health sciences students. A cross-section survey research approach was adopted to collect data from the post-graduate students (n = 410) enrolled in health sciences departments at universities in Pakistan. The SmartPLS 3.3.8 software was used to analyze data through Partial least square structural equation modeling (PLS-SEM). The results revealed that different social media tools such as communication, information management, and multimedia have a direct influence on the research competencies of the pre-service researchers and have an indirect effect on the research completion levels. Health sciences institutions may devise social-media-based instructional strategies to develop post-graduate students' research competencies, such as personal effectiveness, research governance, and research engagement, to help them compile their research and complete their degree program in time during an emergency. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

50. **Salahuddin, A., Department of Gender Studies, University of Management Technology, Lahore, Pakistan.** *Breaking second glass ceiling: lived experiences of women entrepreneurs in Pakistan.* **Quality and Quantity.** 56, 1.

The glass ceiling is a well-recognized phenomenon in the corporate sector thwarting aspirant women to gain senior management positions. It is an indiscernible barrier and a strong ceiling blocking women moving up in the management hierarchy. This paper, however, explores the existence of the second glass ceiling for women entrepreneurs who escaped the corporate world to start their businesses but are trapped by another glass ceiling. This research mainly explores the existence of a second glass ceiling for women entrepreneurs and the ways they used to get through it. This study is conducted for an in-depth understanding and uses the phenomenological approach. Semi-structured in-depth interviews were conducted with women entrepreneurs of Lahore. This paper apart from explaining the second glass ceiling also finds solutions to break it. © 2021, The Author(s), under exclusive licence to Springer Nature B.V. part of Springer Nature. **Article.**

51. **Mehmood, U., Department of Political Science, University of Management and Technology, Lahore, Pakistan.** *Examining the role of financial inclusion towards CO<sub>2</sub> emissions: presenting the role of renewable energy and globalization in the context of EKC.* **Environmental Science and Pollution Research.** 29, 11.

To achieve sustainable development, the role of financial inclusion has been discussed in limited studies. Therefore, this work aims to investigate the impacts of financial inclusion, renewable energy, globalization, and economic growth on carbon dioxide emissions in the context of environmental Kuznets curve. The annual data of 1990–2017 is analyzed by employing second-generation methods. Westerlund test confirm the long-run association among the panel data. Cross-sectional auto-regressive distributive lag approach has been applied because this method considers the cross-sectional dependence among the panel data to provide robust results. The findings show that financial inclusion is increasing carbon dioxide emissions. This means that financial inclusion requires to integrate it with greener environmental policies. Renewable energy is helpful in mitigating the carbon dioxide emissions but globalization and economic growth are increasing carbon dioxide emissions. On the base of the findings, it is recommended that Pakistan, India, Bangladesh, and Sri Lanka need to revise their international trade policies to reduce carbon dioxide emissions. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

52. **Mehmood, U., Department of Political Science, University of Management and Technology, Lahore, 54770, Pakistan.** *Evaluating the Influences of Natural Resources and Ageing People on CO<sub>2</sub> Emissions in G-11 Nations: Application of CS-ARDL Approach.* **International Journal of Environmental Research and Public Health.** 19, 3.

Globalization as well as the ratio of ageing people in the group of 11 (G-11) countries has seen a rapid increase in recent years. Therefore, this study aims to provide effective policy recommendations for sustainable development goals 13, 8, and 7, for the G-11 countries. This work estimates the impact of natural resources and the ageing population on the emission of carbon dioxide (CO<sub>2</sub>) in G-11 countries using panel data from 1990–2020. For empirical results, second-generation methods were applied. The Westerlund co-integration test that assesses co-integration confirms the firm association among the parameters, and the values of coefficient of the cross-sectional autoregressive distributed lag (CS-ARDL) approach show that a 1% increase in the ageing population will lower the emissions of CO<sub>2</sub> by 13.41% among G-11 countries. Moreover, the findings show that there exists an environmental Kuznets curve (EKC) among natural resources, globalization, economic growth, ageing people, and the emission of CO<sub>2</sub>. Based on the findings, this work presents some important policy implications for achieving sustainable growth in the G-11 countries. These countries need to lower the amount of energy obtained from fossil fuels to improve air quality. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

53. **Mehmood, U., Remote Sensing, GIS and Climatic Research Lab (National Center of GIS and Space Applications), Center for Remote Sensing, University of the Punjab, Lahore, Pakistan, Department of Political Science, University of management and technology, Lahore, Pakistan.** *Nexus between Greenhouse Gas Emissions, Energy Use and Economic Growth: Empirical Evidence from South Asian*

**Countries. Polish Journal of Environmental Studies. 31, 1.**

This article explores the nexus between three measures of greenhouse gases (CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>) with economic growth (GDP) and energy use for six South Asian countries (Pakistan, India, Nepal, Bangladesh, Sri-Lanka and Bhutan) by using panel ARDL approach from 1990 to 2017. The paper evaluates the three panel models of nitrous oxide (N<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) and studies the relationships with energy use and GDP in the context of (Environmental Kuznets curve) EKC. This study shows non-linear relation of CO<sub>2</sub> with GDP as well as of N<sub>2</sub>O with GDP hence proves the presence of EKC in long run. The analysis of the study shows the positive significant impact of CO<sub>2</sub> on GDP and energy use in long. In case of short run, the relationship of CO<sub>2</sub> with energy use is significant at 10% level. In case of methane model for long run, there is negative relationship between CH<sub>4</sub> and energy use however, there is positive significant impact between CH<sub>4</sub> and GDP. However, there has been negative relationship of N<sub>2</sub>O with energy use and positive insignificant relationship with GDP. © 2022, HARD Publishing Company. All rights reserved. **Article.**

**54. Mehmood, U., Department of Political Science, University of Management and Technology, Lahore, Pakistan. Environmental degradation and financial development: do institutional quality and human capital make a difference in G11 nations? Environmental Science and Pollution Research.**

Developing nations are rushing towards economic developments; however, this development is increasing the ecological footprints. In this regard, it has become important to identify the factors of environmental degradation. For sound economic growth, countries are enhancing their human resources with sound financial institutions. Therefore, this work examines the effects of human capital (HC), financial development (FD), and institutional quality (IQ) on ecological footprints (EF) in the group of 11 countries. This work also checks the interactional effect of FD, human capital, and IQ on ecological footprints. This work employs the annual data of 1984–2017 and utilizes the cross-sectional autoregressive distributed lag approach for panel data analysis (CS-ARDL). The findings show that FD is degrading the environmental quality by 0.04%. Furthermore, IQ and HC are improving environmental quality by 0.07% and 0.01%. The findings also reveal that FD is lowering ecological footprints through the channel of HC and IQ. Based on the findings, these countries need to extend human capital with an efficient institutional network for environmental sustainability. These countries need to allocate funds to the health and education sector to develop human capital. Moreover, human resource management tools should be strengthened to cope with the challenges of environmental problems. © 2022, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

**55. Mehmood, U., Remote Sensing, GIS and Climatic Research Lab (National center of GIS and Space Applications), Department of Space Science, University of the Punjab, Lahore, Pakistan, Department of Political Science, University of management and technology, Lahore, Pakistan. Exploring the existence of environmental Phillips curve in South Asian countries. Environmental Science and Pollution Research.**

Considering the economic activities that trigger alarming situations for the global atmosphere and ecology, this work probes the associations of unemployment (UNE), GDP, population growth (POP), renewable (REN), non-renewable energy use (ENE), and ecological footprints (EF) for South Asian countries. The annual data of 1991–2019 is analyzed for empirical results. This is the first study that employs panel as well as country-specific estimations for South Asian countries by utilizing the Pool mean group (PMG) and autoregressive distributed lag (ARDL) methods, respectively. The study also validates the environmental Phillips curve (EPC) for selected counties. The empirical evidence in all models confirms the positive effects of GDP, ENE, and POP on environmental dilapidation whereas REN and UNE reduce environmental deprivation. The findings confirm the presence of the EPC in South Asian countries. This work presents some important policy instruments for south Asian countries to reduce environmental pollution. In the efforts to improve air quality, these countries have increased unemployment. These nations have to raise the share of renewable energy to the total energy consumption. This will sustain their economies with an increasing employment ratio. At the same time, there is a need to revise the urban policies because the increasing population is also a contributing factor towards environmental degradation. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

56. **Mehmood, U., Remote Sensing, GIS and Climatic Research Lab (National Center of GIS and Space Applications), Centre for Remote Sensing, University of the Punjab, Lahore, Pakistan, Department of Political Science, University of Management and Technology, Lahore, Pakistan.** *Long-term spatiotemporal trends in aerosol optical depth and its relationship with enhanced vegetation index and meteorological parameters over South Asia.* **Environmental Science and Pollution Research.**

Satellite-based aerosol optical depth (AOD) is columnar light extinction by aerosol absorption and scattering and has become the most important variable for the assessment of the spatiotemporal distribution of aerosols at a regional and global level. In this paper, we have used AOD observations of multiangle imaging spectroradiometer (MISR) from September 2002 to May 2017, moderate resolution imaging spectroradiometer (MODIS) from September 2002 to December 2020, and sea-viewing wide field-of-view sensor (SeaWiFS) from September 2002 to December 2010 over South Asia. We have observed the association of AOD with enhanced vegetation index (EVI) and meteorological variables (temperature (TEMP), wind speed (WS), and relative humidity (RH)) acquired from Giovanni during the period September 2002–December 2020. The satellite observations of Terra-, MISR-, and SeaWiFS-AOD were also compared with Aqua-AOD. The findings show that AOD in eastern Pakistan is higher than in the western Pakistan due to increase in population density and biomass burning. Mean annual peak AOD ( $\approx 0.7$ ) has been observed over the IGB region because of the significant increase in economical, industrial, and agricultural activities while AOD of  $\approx 0.6$  is observed over Bangladesh. The lowest mean annual AOD of  $\approx 0.3$  is observed over northeastern Afghanistan, western Nepal, and Bhutan whereas the AOD of 0.3 is seen over Sri Lanka. The highest seasonal mean AOD of 0.8 has been seen over Bihar, India, and AOD of  $\sim 0.7$  is observed over Bangladesh while the lowest AOD is observed over Afghanistan, Sri Lanka, Nepal, and Bhutan during the winter season. However, the mean AOD over eastern Pakistan is maximum in both monsoon and post-monsoon season but relatively low in pre-monsoon and winter. The highest positive seasonal AOD anomalies were observed over South Asia in winter season followed by post-monsoon, pre-monsoon, and least being monsoon. The higher mean AOD anomaly value is found to be 0.2 over eastern Pakistan and western India. In northeastern Pakistan and central India, AOD and RH are positively correlated ( $r \approx 0.54$ ) while negatively correlated over Afghanistan, southwestern region of Pakistan, eastern India, Nepal, Bhutan, and Bangladesh. AOD is negatively correlated ( $r \approx -0.3$ ) with EVI over eastern Pakistan and western India. The highest correlation coefficient ( $r$ ) obtained among Terra and Aqua is 0.97, MISR and Aqua is 0.93, and SeaWiFS and Aqua is 0.58 over South Asia. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

57. **Sajjad, F.W., Department of Political Science and International Relations, University of Management and Technology, Lahore, Pakistan.** *Rethinking education to counter violent extremism: a critical review of policy and practice.* **Ethics and Education.** 17, 1.

This paper explores the alarming phenomenon of violent extremism in university campuses. It probes why education fails to prevent violent extremism in this case? Drawing on Robert Cox's distinction of problem solving and critical theories, the paper examines policy discourses that aim to prevent violent extremism through education. It is observed that dominant policy discourses take up problem solving approaches to prevent/counter violent extremism and fail to take into account the broader structural violence that feeds extremist ideologies. The counter violent extremism policies largely view education as a means to control thinking rather than develop it. Such policies hinder the development of critical consciousness in students that can provide effective defence against extremism. Hence, there is a need to rethink education to counter extremism. Subsequently, the paper shifts its focus to Pakistan, where education has remained a central concern of counter extremism policies since 9/11. Based on 13 expert interviews, I explore higher education practices in Pakistan from practitioners' perspective. The practitioners point out multiple problems of educational status quo that need to be addressed to counter extremism on campus effectively. © 2022 Informa UK Limited, trading as Taylor & Francis Group. **Article.**



## School of Professional Advancement

58. Anwar, A., School of Management, Universiti Sains Malaysia, Gelugor, Malaysia, School of Professional Advancement, University of Management and Technology, Lahore, Pakistan. *Impact of COVID-19 social media news on employee behavior: the mediating role of psychological well-being and depression. Asian Education and Development Studies. 11, 1.*

Purpose: The study's objective is to examine the impact of coronavirus disease 2019 (COVID-19) social media news (SMN) on work boredom (WB) and task performance (TP). The study proposes that psychological well-being (PWB) and depression mediate the relationship between COVID-19 SMN, WB and TP. Design/methodology/approach: The data for this research was collected from white-collar employees of two Asian countries, Pakistan (study 1, n = 167) and Malaysia (study 2, n = 118), was collected using an online survey during strict movement control order (MCO), work from home, at the beginning of the year 2020. Findings: In both studies, the PWB of employees mediated the relationship between COVID-19 SMN and their WB. On the other hand, depression only mediated the relationship between COVID-19 SMN and WB in Pakistan. PWB only mediated the relationship between COVID-19 SMN and TP in study 2. Depression only mediated the relationship between COVID-19 SMN and TP in study 1. Research limitations/implications: A couple of limitations worth noting are that the study adopted a cross-sectional approach. Thus, the sample size is not large in both countries. Because of the outbreak, limited employees agree to be part of an online survey. The scope of the study also restricts the authors to collect data during MCO, when employees were forced to work from home. In Pakistan, MCO began on 20th March and ended on 30th April, while in Malaysia, MCO started on 18th March and ended on 12th May. This also limits the study's claim of generalizability. Practical implications: The practical implication of the study is to guide practitioners of both Pakistan and Malaysia in developing strategies that help them understand that employees having PWB look for growth and challenging opportunities even during pandemic situations; employers can leverage it to deal with external threats like COVID-19 because improving the PWB can improve TP and reduce WB. The interesting results highlighted the fact that high TP not necessarily means everything is fine with employees, when the uncertainty level is high, employees may be performing well due to fear and depression instead of work motivation. Thus, employers should be more vigilant during a pandemic situation. This study also helps policymakers understand that the overall economic situation affects the individual employee's state of mind and work behavior. Originality/value: The paper contributes to scarce literature on COVID-19 and SMN and illustrates employees' work behavior when forced to work from home during the MCO. © 2021, Emerald Publishing Limited. [Article](#).

## School of Engineering

59. Rizwan, S.A., Dean School of Engineering, Univ. of Management and Technology, Lahore, 54700, Pakistan. *Sustainable Development and Performance Assessment of Clay-Based Geopolymer Bricks Incorporating Fly Ash and Sugarcane Bagasse Ash. Journal of Materials in Civil Engineering. 34, 4.*

Emission of carbon dioxide (CO<sub>2</sub>) either from the firing of clay bricks or from cement production, contributes considerably toward global warming. Conversely, the production of bricks is inevitable since a large number of bricks are needed to fulfill the housing sector demand. In this study, silty clay-based geopolymer bricks were produced incorporating fly ash and sugarcane bagasse ash. This was accomplished in two stages: the laboratory phase that comprised of production of cylindrical specimens, and the industrial phase whereby full-size bricks were produced based on the results obtained in the laboratory phase. The silty clay-based geopolymer bricks were developed with lesser energy input, i.e., forming pressure of 7 MPa with curing at ambient temperature. The whole set of mechanical and durability properties of the newly developed geopolymer brick yielded satisfactory results conforming to the standard codes. Scanning electron microscopy (SEM) and X-ray diffraction (XRD) results revealed the coexistence of sodium aluminosilicate gel (N-A-S-H) and calcium aluminosilicate hydrate (C-A-S-H), which led to a dense microstructure resulting in increased mechanical strength and ensuring enhanced durability of the brick structure. The environmental impact assessment confirmed the ecofriendly utilization of sugarcane bagasse ash in combination with fly ash in clay-based geopolymer bricks. The newly developed geopolymer can have a broad range of applications, including wall panel making, jet grouting, deep mixing, mortar for masonry constructions, canal lining, and grouting material used in backfill grouting during shield tunneling. © 2022 American Society of Civil Engineers. [Article](#).

60. Ali, N., Department of Civil Engineering, School of Engineering, University of Management and Technology, Lahore, 54770, Pakistan. *Use of Natural and Synthetic Fiber-Reinforced Composites for*

***Punching Shear of Flat Slabs: A Comparative Study.* *Polymers.* 14, 4.**

Over the last two decades, considerable attention has been devoted to the strengthening of sub-standard flat-slab constructions. With the evolution of composite materials and an increasing emphasis on the economical and sustainable use of natural fibers, many researchers have utilized them in the strengthening of flat slabs mitigating punching failures. This study aims at investigating and comparing the behavior of flat slabs strengthened with post-installed composite and natural reinforcements. An experimental program was devised consisting of eight flat-slab specimens. One specimen was tested in as-built condition to provide a reference. The remaining specimens were strengthened with Carbon Fiber-Reinforced Polymer (CFRP), Aramid Fiber-Reinforced Polymer (AFRP), and sisal rods. The pattern of post-installed rods was varied as single line, double line, and star shapes around the column. The results indicated that the single-line pattern could only enhance the maximum sustained load by up to 6% compared to that of the reference specimen. On the contrary, double line and star shape configurations resulted in a substantial increase in the maximum sustained load. An analytical assessment of ACI 318-19 provisions resulted in an over-estimation of the shear strengths of CFRP- and AFRP-strengthened slabs. Furthermore, the same provisions led to lower yields than experimental shear strengths for sisal-strengthened slabs. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

**61. Ali, N., Department of Civil Engineering, School of Engineering, University of Management and Technology, Lahore, 54770, Pakistan. *Analysis of Driver's Socioeconomic Characteristics Relating to Speeding Behavior and Crash Involvement: A Case Study in Lahore.* *Infrastructures.* 7, 2.**

Speeding is one of the risky behaviors which results in accident involvement causing fatalities and severe injuries. This paper aimed to identify the significant socio-economic characteristics of drivers concerning their speeding behavior and crash involvement. A questionnaire was designed consisting of driver's demographic features, involvement in an accident, penalty on speed violations, and statements on speeding behavior in terms of exceeding the speed limits by 10 km/h or more on roads with different speed limits of 60, 80, 100, and 120 km/h per standard operating speeds on various road types in Pakistan. This survey was conducted in Lahore city and a total of 551 usable samples were obtained. A latent variable of driver's speeding behavior was introduced; factor loadings were estimated, and an observed variable of driver's crash experience was defined as the driver's crash involvement. Ordered regression analysis using the probit function was conducted on speeding behavior and crash involvement. The ordinal analysis revealed that the driver's age, gender, marital status, employment, vehicle engine size, type of vehicle they drive, and driving frequency per day are good predictors of speeding behavior. Similarly, male driver's age, vehicle engine size, and type of vehicle they drive were significant predictors of their likelihood to be involved in an accident. The young, single, and male drivers and drivers of cars with an engine capacity above 1.5 L were more likely to speed and be involved in crashes. These findings provide a clear understanding of a specific group of drivers who have a higher probability of speeding and crash involvement. There is a need to focus on specific demographic factors in the formulation of traffic safety policies and managing speedy driver's behaviors. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

**62. Rashid, M.U., Department of Civil Engineering, University of Management and Technology, Lahore, Pakistan. *Optimization of hydropower and related benefits through Cascade Reservoirs for sustainable economic growth.* *Renewable Energy.* 185.**

Reservoirs are major indicators of sustainable socio-economic development, agriculture and energy. This study focused on genetic algorithm based optimization of rule curves for maximizing the hydropower and associated benefits through cascade reservoirs. Optimization has been carried out using RESOOSE model for maximizing hydro-power, irrigation and evacuation of sediment from multipurpose Diamer Basha and Terbela Reservoirs on Indus River in Pakistan. The best methods and values of Genetic Algorithm computed through sensitivity analysis were tournament selection method with 2 teams, population size 288, single point crossover method with crossover probability 0.8 and adapt feasible mutation method. The policy equations on storage, outflows and hydropower for the cascade reservoirs in series were formulated. The maximum annual overall benefits were 3380 Million US\$ for multi-objective optimization of joint operation of Terbela and Diamer Basha Reservoirs, where hydropower was major contributor among all the associated benefits with highest annual benefits of 2724.7 Million US\$. The results demonstrate that hydropower has been optimized along with maximization of the associated benefits. The optimized rule curves of the cascade reservoirs developed in the study have enhanced the overall benefits for achieving SDGs of zero hunger, affordable clean energy, economic growth and water availability. © 2021. [Article](#).

63. **Raja, M.N.A., Civil Engineering Department, School of Engineering, University of Management and Technology, Lahore, Pakistan.** *Load-settlement response of a footing over buried conduit in a sloping terrain: a numerical experiment-based artificial intelligent approach.* **Soft Computing.**

Settlement estimation of a footing located over a buried conduit in a sloping terrain is a challenging task for practicing civil/geotechnical engineers. In the recent past, the advent of machine learning technology has made many traditional approaches antiquated. This paper investigates the viability, development, implementation, and comprehensive comparison of five artificial intelligence-based machine learning models, namely multilayer perceptron, Gaussian processes regression, lazy K-Star, decision table, and random forest (RF) to estimate the settlement of footing located over a buried conduit within a soil slope. The pertaining dataset of 3600 observations was obtained by conducting large-scale numerical simulations via the finite element modeling framework. After executing the feature selection technique that is correlation-based subset selection, the applied load, total unit weight of soil, constrained modulus of soil, slope angle ratio, hoop stiffness of conduit, bending stiffness of conduit, burial depth of conduit, and crest distance of footing were utilized as the influence parameters for estimating and forecasting the settlement. The predictive strength and accuracy of all models mentioned supra were evaluated using several well-established statistical indices such as Pearson's correlation coefficient ( $r$ ), root mean square error (RMSE), Nash's Sutcliffe efficiency (NSE), scatter index (SI), and relative percentage difference (RPD). The results showed that among all the models employed in this study, the multilayer perceptron model has shown better results with  $r$ , RMSE, NSE, SI, and RPD values of (0.977, 0.298, 0.937, 0.31, and 4.31) and (0.974, 0.323, 0.928, 0.44, and 3.75) for training and testing dataset, respectively. The sensitivity analysis revealed that all the selected parameters play an important role in determining the output value. However, the applied load, constrained modulus, unit weight, slope angle ratio, and hoop stiffness have the highest strength with the relative importance of 18.4%, 16.3%, and 15.3%, 13.8%, 11.4%, respectively. Finally, the model was translated into a functional relationship for easy implementation and can prove useful for practitioners and researchers in predicting the settlement of a footing located over a buried conduit in a sloping terrain. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

64. **Ali, N., Department of Civil Engineering, School of Engineering, University of Management and Technology, Lahore, 54770, Pakistan.** *Structural Behavior of Large-Scale Hollow Section RC Beams and Strength Enhancement Using Carbon Fiber Reinforced Polymer (CFRP) Composites.* **Polymers. 14, 1.**

An experimental program was conducted to ascertain the efficiency of Carbon Fiber Reinforced Polymer (CFRP) in enhancing the flexural response of hollow section reinforced concrete (RC) beams. Nine beams were tested under four-point bending in three groups. Beams were categorized to reflect the presence or configuration of the CFRP sheet. Each group consisted of three beams: one with a solid section, one with a square 50 mm x mm opening, and 1 with 100 mm x mm opening. Beams in 1st group were tested in as-built conditions. Beams in the 2nd group were strengthened with a single CFRP sheet bonded to their bottom sides. Configuration of CFRP sheet was altered to U-shape applied to the tension side of 3rd group beams. The inclusion of openings, regardless of their size, did not result in degradation of ultimate load and corresponding deflections. However, cracking loads were found to decline as the opening size increased. Regardless of the opening size and CFRP configuration, ultimate loads of beams increased with the application of CFRP. However, this improvement was limited to the debonding and rupture of CFRP in group 2 and 3 beams, respectively. A comparison in the behavior of group 2 and 3 beams revealed that the application of the U-shape CFRP sheet yielded better flexural performance in comparison with the flat-CFRP sheet bonded to the bottom of beams. In the end, in order to further evaluate the economic and performance benefits of these beams, the cost-benefit analysis was also performed. The analysis showed that the feasibility of the hollow section RC beams is more than the solid section RC beams. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

65. **Ali, N., Department of Civil Engineering, University of Management and Technology, Lahore, 54770, Pakistan.** *Extracting Travelers' Preferences toward Electric Vehicles Using the Theory of Planned Behavior in Lahore, Pakistan.* **Sustainability (Switzerland). 14, 3.**

The high use of gasoline and diesel vehicles results in environmental pollution and loss of natural resources. The use of electric vehicles can be socially beneficial and reduce air pollution. In this research study, the main aims are to identify the potential of Electric Vehicles (EVs) in Pakistan using a Stated Preferences (SP) survey. An SP questionnaire was

designed using the theoretical framework of the Theory of Planned Behavior (TPB). This questionnaire consisted of travelers' personal and travel characteristics and various statements designed to address the variables of TPB such as Attitudes Towards the Electric Vehicles, Subjective Norms (SN), Perceived Behavioral Control (PBC), and Behavioral Intentions (BI). The behavior items were designed in the context of travelers' willingness to buy and use EVs. Confirmatory Factor Analyses (CFAs) were conducted to validate the designed hypotheses related to the variables of TPB. The cross-analysis revealed that there are variations in responses across different occupations, trip distances, travel modes, and vehicle ownership. The developed structural models showed that the Attitudes and PBC have a positive influence on BI and PBC, which also have a direct impact on travelers' willingness to use EV. The SN, PBC, and Attitudes are significant predictors of behavioral intentions in the willingness to buy EV and PBC is not a direct predictor of travelers' willingness to buy an EV. The BI acts as a mediator to explain the indirect effects of Attitudes, SN, and PBC on willingness to purchase and use an EV. In the end, a framework is also proposed for the behavior-related interventions to promote the EVs considering the socio-economic context of Pakistan. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

66. Butt, F.A., Department of Electrical Engineering, School of Engineering, University of Management and Technology, Lahore, Pakistan; Chattha, J.N., Department of Electrical Engineering, School of Engineering, University of Management and Technology, Lahore, Pakistan; Ahmad, J., Department of Electrical Engineering, School of Engineering, University of Management and Technology, Lahore, Pakistan; Rizwan, M., Department of Electrical Engineering, School of Engineering, University of Management and Technology, Lahore, Pakistan. *On the Integration of Enabling Wireless Technologies and Sensor Fusion for Next-Generation Connected and Autonomous Vehicles*. *IEEE Access*. 10.

The automotive industry is transitioning towards intelligent, connected, and autonomous vehicles to avoid traffic congestion, conflicts, and collisions with increased driver safety. Connected and autonomous vehicles (CAV) must be aware of their surroundings and act as per their environment. Communication infrastructure can be vital in transmitting necessary information to peers and receiving critical information for timely decisions. This article provides a comprehensive review of the topic, covering the aspects of enabling wireless technologies and sensor fusion. The article reviews data acquisition using various sensing devices such as RADAR (Radio Detection and Ranging), LiDAR (Light Detection and Ranging), cameras, and multi-modal sensor fusion of the acquired data after signal processing. Thereafter, it reviews the communication and networking infrastructure for intra-and inter-vehicle communication and related technologies. For each of these themes, research challenges and future directions have been identified. **Article.**

67. Tariq, H., Department of Electrical Engineering, School of Engineering, University of Management and Technology (UMT), Lahore, 54770, Pakistan; Javed, A., Department of Electrical Engineering, School of Engineering, University of Management and Technology (UMT), Lahore, 54770, Pakistan; Zafar, E., Department of Electrical Engineering, School of Engineering, University of Management and Technology (UMT), Lahore, 54770, Pakistan. *Performance analysis of deep-neural-network-based automatic diagnosis of diabetic retinopathy*. *Sensors*. 22, 1.

Diabetic retinopathy (DR) is a human eye disease that affects people who are suffering from diabetes. It causes damage to their eyes, including vision loss. It is treatable; however, it takes a long time to diagnose and may require many eye exams. Early detection of DR may prevent or delay the vision loss. Therefore, a robust, automatic and computer-based diagnosis of DR is essential. Currently, deep neural networks are being utilized in numerous medical areas to diagnose various diseases. Consequently, deep transfer learning is utilized in this article. We employ five convolutional-neural-network-based designs (AlexNet, GoogleNet, Inception V4, Inception ResNet V2 and ResNeXt-50). A collection of DR pictures is created. Subsequently, the created collections are labeled with an appropriate treatment approach. This automates the diagnosis and assists patients through subsequent therapies. Furthermore, in order to identify the severity of DR retina pictures, we use our own dataset to train deep convolutional neural networks (CNNs). Experimental results reveal that the pre-trained model Se-ResNeXt-50 obtains the best classification accuracy of 97.53% for our dataset out of all pre-trained models. Moreover, we perform five different experiments on each CNN architecture. As a result, a minimum accuracy of 84.01% is achieved for a five-degree classification. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

68. **Mughal, M.P., Industrial Engineering Department, University of Management and Technology, Lahore, Pakistan.** *Machinability investigations through novel controlled flushing characteristics in wire electric discharge machining of M42 high-speed steel.* **International Journal of Advanced Manufacturing Technology.**

The industry anticipates technological advancements for productivity improvement, and this can be accomplished by improving the machining performance in the areas where machinability challenges exist. The machinability and productivity of wire electric discharge machining (WEDM), which is a popular non-conventional cutting process, can be improved while having comparable surface integrity. Previously the non-conventional machining literature is focused on the machinability investigations of various industrial materials and process optimization. However, no extensive research on the study of flushing parameters optimization to improve machinability in non-conventional machining is known. In this research, WEDM of M42 HSS using controlled flushing is performed resulting in improved machinability in terms of material removal rate (MRR), surface roughness (Ra), and kerf width (KW). The findings indicate that the nozzle diameter (76.85%) has a substantial influence on total machining performance. Nozzle diameter, nozzle-workpiece distance, servo voltage, and flushing pressure all had a substantial influence on MRR, with percentage contributions of 34.50%, 26.02%, 22.94%, and 14.21%, respectively. Furthermore, multi-response optimization is also performed and depicts the possibility of achieving optimized values of MRR, Ra, and KW simultaneously. The flush-controlled machining improved work quality in terms of accurate production, increased productivity by lowering process time, and improved surface integrity of the machined piece thus can be a possible process advancement in the aerospace and automotive industries. © 2022, The Author(s), under exclusive licence to Springer-Verlag London Ltd., part of Springer Nature.

**Article.**

69. **Shahzad, M.M., School of Mechanics, Civil Engineering and Architecture, Northwestern Polytechnical University, Xi'an, China, School of Engineering, Civil Engineering Department, University of Management and Technology, Lahore, Pakistan.** *Comparative response assessment of different steel plate shear walls (SPSWs) under near-field ground motion.* **Journal of Constructional Steel Research.** 190.

Steel plate shear walls (SPSWs) are widely used due to their high energy absorption and exceptional lateral resistance. However, the behavior of different infill panels varies, and their response under near-field seismic excitations is uncertain. To better understand how different infill panels contribute to seismic structural responses, this paper presents findings from research conducted on different types of SPSWs. The study of different types of SPSWs with infill panel aspect ratios of 1:1 and 2:1 under cyclic loading was the first part of this parametric investigation, and the second part was the study of the structural response of 3D frames with an aspect ratio of 3:4:2 and a 1:1 infill panel under near-field ground motions. The results of energy dissipation, acceleration, and drift were compared. This study's goal was to better understand how various infill panels react to near-field ground motions and cyclic loading. With a 2:1 aspect ratio, unstiffened SPSWs reduced plastic dissipation by 78% while increasing lateral stiffness by 10%. With minimal peak transient and residual interstory drifts and effectively damped floor acceleration, unstiffened SPSW demonstrated the best viscous effect and dissipated 69.42% of the total system. © 2022 Elsevier Ltd. **Article.**

70. **Munir, N., Department of Mechanical Engineering, Sungkyunkwan University, Suwon, 16419, South Korea, Department of Industrial Engineering, University of Management and Technology, Lahore, Pakistan.** *Non-contact detection of railhead defects and their classification by using convolutional neural network.* **Optik.** 253.

Railhead defects must be detected and classified intelligently in order for railway transportation systems to operate safely. Rail defect identification and categorization can be automated by using machine learning models to process rail image data (acquired using cameras). However, such an automated method has significant drawbacks: it cannot detect subsurface defects, picture data requires a high-end GPU with a long computational time, and machine learning model training can be influenced by image quality, which is dependent on light intensity and shooting altitude. Rayleigh waves are a potential candidate for rail inspection because they can detect both surface and subsurface defects and travel long distances on curved surfaces (like a rail) at high speed. This article looks into the possibility of combining fully non-contact laser ultrasonic technology (LUT) and a deep learning approach for intelligent detection and classification of railhead surface and subsurface defects. The fully non-contact LUT was used to actuate and capture laser-generated Rayleigh wave signals on railhead specimens in order to create a database of A-scan signals from healthy, surface,

subsurface, and edge defect railheads. The classification capabilities of a support vector machine (SVM), a fully connected deep neural network (DNN), and a convolutional neural network (CNN) were examined after they were applied to the preprocessed signals without extracting any statistical/signal processing-based characteristics. The comparative analysis demonstrates that CNN is robust in classifying railhead defects. As a result, when combined with CNN, the laser ultrasonic technology may ensure automatic deflection and classification of railhead surface and subsurface flaws. © 2022 Elsevier GmbH. **Article.**

## School of Governance & Society

71. **Azhar, A., School of Governance and Society, University of Management and Technology, Lahore, Pakistan. *Structure, governance and challenges of networks in the public sector: the case of the power network in Pakistan. International Journal of Public Sector Management.* 35, 1.**

Purpose: With governance networks as the critical emerging feature of public administration, this article examines the structure, governance and challenges of networks in the public sector. Using complexity theory, this article explains that control-based relations do not hold much relevance to govern the complex systems of networks. Design/methodology/approach: Case study research design is employed taking the power network in Pakistan as the unit of analysis. Data were collected through eleven semi-structured interviews, companies' websites, government policy reports and other companies' reports. The structure of the power network was examined through the technique of social network analysis using UCINET. Thematic analysis of interviews was conducted with the help of NVivo 13 to identify the mode of governance and challenges. Findings: The study found that five central public sector actors have a high degree centrality and betweenness centrality. Thematic analysis further revealed that these actors are controlling most of the decisions in the network in a hierarchical mode of governance. Other actors face multiple challenges including lack of autonomy, overlapping authorities, conflicting rules and complex decision processes. Research limitations/implications: The findings imply that instead of top-down and control-based relations, networks require self-governance mechanisms where actors independently participate and interact with other actors to generate common solutions to problems. Practical implications: The authorities should use network management strategies, participatory approaches and consensus-building methods to reach decisions. Originality/value: The study explores the network structure and network governance challenges in the context of a developing country that is barely addressed in the public management literature. © 2021, Emerald Publishing Limited. **Article.**

72. **Hussain, A., School of Management, Jiangsu University, Zhenjiang, 212013, China, School of Governance and Society, University of Management and Technology, Lahore, 54770, Pakistan. *Determinants of gender disparity in nutritional intake among children in Pakistan: Evidence from PDHS. Children.* 9, 1.**

The purpose of this study is to analyze early age malnutrition on a gender basis in Pakistan. Pakistan Demographic and Health Survey (PDHS) 2012–13 data related to households' characteristics that affect the nutrition of children less than 5 years of age are used for the estimation of results. Gender disparity (measured by girl malnourished in household/boy malnourished in a household) is constructed for the measurement of gender disparity in early age child nutrition. After synthesizing the PDHS data set, 2119 observations are used for regression results of gender disparity. Regression results are analyzed at the level of 5% confidence interval otherwise insignificant. Regression results for gender disparity show that households in good socioeconomic status, a greater number of household members, a mother's higher level of education, mother employment, and the male head of the household, causes a decrease in gender disparity in nutrition intake of children. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

73. **Hussain, A., School of Management, Jiangsu University, Zhenjiang, 212013, China, School of Governance and Society, University of Management and Technology, Lahore, 54872, Pakistan. *Revisiting environmental kuznets curve in relation to economic development and energy carbon emission efficiency: Evidence from Suzhou, China. Energies.* 15, 1.**

This study empirically examines the effect of economic development on carbon emissions and revisits the environmental Kuznets curve in Suzhou, China. The study made use of the Gross Domestic Product Per Capita (GDPPC) of Suzhou, China as an indicator of economic development as it depicts the entire developmental ecosystem that indicates the level of production activities and total energy consumption. Bearing this in mind, the authors postulate that economic development directly increases carbon emissions through industrial and domestic consumptions. For this purpose, linear

and non-linear approaches to cointegration are applied. The study finds the existence of an inverted U-shape relationship between economic development and carbon emission in the long run. Trade openness and industrial share are positively contributing to increasing carbon emissions. Energy use shows a positive sign but an insignificant association with carbon emissions. The study concludes that carbon emissions in Suzhou should be further decreased followed by policy recommendations. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

## School of Health Sciences

74. **Tanweer, A., School of Health Sciences, University of Management and Technology, Lahore, Pakistan.** *Malnutrition among Hospitalized Adult Patients Evidence from a Cross-sectional Study in Lahore, Pakistan.* **Topics in Clinical Nutrition.** 37, 1.

Hospital malnutrition, although well established, has remained underrecognized in health care settings. This study aimed at determining the prevalence and factors associated with hospital malnutrition in Lahore, Pakistan. A sample of 937 hospitalized patients was screened for malnutrition using a Subjective Global Assessment (SGA). More than half (59.4%) of the sample was found to be undernourished, of which 26.4% was severely malnourished (SGA-C). Age more than 60 years (odds ratio [OR] = 0.574,  $P < .05$ ), comorbidities (OR = 1.388,  $P = .014$ ), and specific disease conditions (cancer and renal diseases) (OR = 3.291; OR = 3.042,  $P < .05$ , respectively) increased the risk of undernourishment (SGA-B&C). High prevalence of disease-associated malnutrition among hospitalized patients urgently calls for preadmission screening. Copyright © 2022 Wolters Kluwer Health, Inc. All rights reserved. [Article](#).

75. **Syed, S.K., Department of Basic Medical Sciences, School of Health Sciences, University of Management and Technology, Lahore, Pakistan.** *TGF- $\beta$ 1 signaling can worsen NAFLD with liver fibrosis backdrop.* **Experimental and Molecular Pathology.** 124.

Non-Alcoholic Fatty Liver Disease (NAFLD) is characterized by the accumulation of fats in the liver. Relatively benign NAFLD often progresses to fibrosis, cirrhosis, and liver malignancies. Although NAFLD precedes fibrosis, continuous lipid overload keeps fueling fibrosis and the process of disease progression remains unhindered. It is well known that TGF- $\beta$ 1 plays its part in liver fibrosis, yet its effects on liver lipid overload remain unknown. As TGF- $\beta$ 1 signaling has been increasingly attempted to manage liver fibrosis, its actions on the primary suspect (NAFLD) are easily ignored. The complex interaction of inflammatory stress and lipid accumulation aided by mediators such as pro-inflammatory interleukins and TGF- $\beta$ 1 forms the basis of NAFLD progression. Anticipatorily, the inhibition of TGF- $\beta$ 1 signaling during anti-fibrotic treatment should reverse the NAFLD though the data remain scattered on this subject to date. TGF- $\beta$ 1 signaling pathway is an important drug target in liver fibrosis and abundant literature is available on it, but its direct effects on NAFLD are rarely studied. This review aims to cover the pathogenesis of NAFLD focusing on the role of the TGF- $\beta$ 1 in the disease progression, especially in the backdrop of liver fibrosis. © 2021 Elsevier Inc. [Review](#).

76. **Syed, S.K., Department of Basic Medical Sciences, School of Health Sciences, University of Management and Technology, Lahore, 54000, Pakistan.** *Pharmacological Justification for the Medicinal Use of *Plumeria rubra* Linn. in Cardiovascular Disorders.* **Molecules.** 27, 1.

*Plumeria rubra* (L.) is a traditional folkloric medicinal herb used to treat cardiovascular disorders. The present investigation was methodically planned to investigate the pharmacological foundations for the therapeutic effectiveness of *P. rubra* in cardiovascular illnesses and its underlying mechanisms. Ex vivo vaso-relaxant effects of crude leaf extract of *P. rubra* were observed in rabbit aorta ring preparations. Hypotensive effects were measured using pressure and force transducers connected to the Power Lab data acquisition system. Furthermore, *P. rubra* displayed cardioprotective properties in rabbits when they were exposed to adrenaline-induced myocardial infarction. In comparison to the intoxicated group, the myocardial infarction model showed decreased troponin levels, CK-MB, LDH, ALT, ALP, AST, and CRP, as well as necrosis, apoptosis, oedema, and inflammatory cell enrollment. *P. rubra* has revealed good antioxidant properties and prolonged the noradrenaline intoxicated platelet adhesion. Its anticoagulant, vasorelaxant, and cardioprotective effects in both in vivo and ex vivo investigations are enabled by blocking L-type calcium channels, lowering adrenaline, induced oxidative stress, and tissue tear, justifying its therapeutic utility in cardiovascular disorders. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

77. Tanweer, A., Department of Nutrition Sciences, School of Health Sciences, University of Management and Technology, Lahore, Pakistan. *Correlation Between Previous Caesarean Section and Adverse Maternal Outcomes Accordingly With Robson Classification: Systematic Review and Meta-Analysis. Frontiers in Medicine. 8.*

Background: The increasing rates of Caesarean section (CS) beyond the WHO standards (10–15%) pose a significant global health concern. Objective: Systematic review and meta-analysis to identify an association between CS history and maternal adverse outcomes for the subsequent pregnancy and delivery among women classified in Robson classification (RC). Search Strategy: PubMed/Medline, EbscoHost, ProQuest, Embase, Web of Science, BIOSIS, MEDLINE, and Russian Science Citation Index databases were searched from 2008 to 2018. Selection Criteria: Based on Robson classification, studies reporting one or more of the 14 adverse maternal outcomes were considered eligible for this review. Data Collection: Study design data, interventions used, CS history, and adverse maternal outcomes were extracted. Main Results: From 4,084 studies, 28 (n = 1,524,695 women) met the inclusion criteria. RC group 5 showed the highest proportion among deliveries followed by RC10, RC7, and RC8 (67.71, 32.27, 0.02, and 0.001%). Among adverse maternal outcomes, hysterectomy had the highest association after preterm delivery OR = 3.39 (95% CI 1.56–7.36), followed by Severe Maternal Outcomes OR = 2.95 (95% CI 1.00–8.67). We identified over one and a half million pregnant women, of whom the majority were found to belong to RC group 5. Conclusions: Previous CS was observed to be associated with adverse maternal outcomes for the subsequent pregnancies. CS rates need to be monitored given the prospective risks which may occur for maternal and child health in subsequent births. Copyright © 2022 Jamshed, Chien, Tanweer, Asdary, Hardhantyo, Greenfield, Chien, Weng, Jian and Iqbal. **Review.**

## School of Science

78. Nadeem, S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Khushi, H.H., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Javed, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan Akhter, T., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Rauf, A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Raza, H., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Well-defined heterointerface over the doped sulfur atoms in NiS@S-rGO nanocomposite improving spatial charge separation with excellent visible-light photocatalytic performance. Journal of Molecular Structure. 1252.*

This work comprises the synthesis of efficient photocatalytic material of NiS@sulfur doped rGO nanocomposite. GO was constructed by a revised Hummer's method from graphite powder. GO was reduced by the solvothermal method by using hydrazine as a reducing agent. NiS nanoparticles were synthesized by a hydrothermal method. NiS nanoparticles and sulfur doped rGO are tightly bridged to form a well-defined heterointerface through the doped sulfur atoms. The prepared nanocomposite and nanoparticles were characterized for structural properties by using various techniques such as FTIR, UV-vis, SEM, EPR, EDX, photocurrent responses and XRD. The prepared materials were used for the degradation of methylene blue (MB) under sunlight and 98% degradation was observed for NiS@S-rGO nanocomposite in 90 min. Antibacterial performance of NiS@S-rGO against Gram-positive and Gram-negative bacteria under sunlight was explored. These promising results may further be employed for the cleaning of polluted water from various industries. © 2021 Elsevier B.V. **Article.**

79. Javed, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, Pakistan; Hassan, S.S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, Pakistan; Nadeem, S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, Pakistan; Mohyuddin, A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, Pakistan. *Binary Co@ZF/S@GCN S-scheme heterojunction enriching spatial charge carrier separation for efficient removal of organic pollutants under sunlight irradiation. Colloids and Surfaces A: Physicochemical and Engineering Aspects. 636.*

The hydrothermal approach was used to create a binary Co@ZF/S@GCN step-scheme (S-scheme) photocatalyst system. Cutting-edge devices such as TEM, XRD, XPS, FTIR, BET, UV-vis, transient photo-response, ESR signals, and EIS were



used to analyze the hybrid photocatalyst. Combining 5% Co-doped zinc ferrite (Co@ZF) nanoparticles (NPs) with varying amounts (10–80 wt%) of S-g-C<sub>3</sub>N<sub>4</sub> (S@GCN) yielded a series of binary nanocomposites (NCs). For photocatalytic dye removal, novel binary NCs built between Co@ZF and S@GCN create an enormous number of catalytic active positions. The results demonstrated that loading 5% Co@ZF NPs on S@GCN, which functions as a well-defined heterointerface for adequate charge transit and separation over the S-scheme Co@ZF/S@GCN NCs, resulted in a well-defined heterointerface. The loading of 5% Co@ZF NPs supports enhancing the BET surface area of the binary system for the photocatalytic response, boosting the sunlight harvesting capability and thereby improving the photocatalytic activity of the system. The binary hybrid photocatalyst system with optimal loading of 50% Co@ZF NPs showed the highest photo-removal efficiency (99%), which is about 2.5 times higher than those of their counterparts. Moreover, the trapping experiments revealed that  $\cdot\text{OH}$  and  $\text{h}^+$  were the main active species in the process of MB aqueous photo-degradation. © 2021 Elsevier B.V. [Article](#).

80. Qamar, M.A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Javed, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Shahid, S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Sher, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Fabrication of g-C<sub>3</sub>N<sub>4</sub>/transition metal (Fe, Co, Ni, Mn and Cr)-doped ZnO ternary composites: Excellent visible light active photocatalysts for the degradation of organic pollutants from wastewater.* [Materials Research Bulletin](#). 147.

This study investigated the comparative photocatalytic efficiency of metal (Fe, Co, Ni, Mn and Cr)-doped ZnO/g-C<sub>3</sub>N<sub>4</sub> nanocomposites against MB dye. The materials were synthesised via the chemical co-precipitation method and characterised by critical analytical techniques. TEM results revealed the distinctive heterojunctions developed between g-C<sub>3</sub>N<sub>4</sub> and metal-doped ZnO. Optical and photoelectrochemical analysis of the synthesised g-C<sub>3</sub>N<sub>4</sub>/metal-doped ZnO exhibited a redshift in light absorption and decay in electron-hole pairs recombination rate, respectively. The increase in the photocatalytic activity of the synthesised nanocomposites might be attributed to the development of exemplary interfaces between ZnO, g-C<sub>3</sub>N<sub>4</sub> and metal dopants. In particular, g-C<sub>3</sub>N<sub>4</sub>/Mn-doped ZnO nanocomposites (MnGZ NCs) exhibited maximum photocatalytic degradation of MB (100%) after 60 min of sunlight irradiations. The MnGZ NCs showed good photocatalytic stability even after 12 consecutive cycles. The photoluminescence and reactive species scavenger test results suggest a potential MB degradation mechanism over the MnGZ NCs. © 2021. [Article](#).

81. Farooq, M., Department of Chemistry, University of Management and Technology, Lahore, 54000, Pakistan. *Enhancement of visible light-driven hydrogen production over zinc cadmium sulfide nanoparticles anchored on BiVO<sub>4</sub> nanorods.* [International Journal of Hydrogen Energy](#). 47, 13.

Photocatalytic water splitting to produce H<sub>2</sub> is a promising technology for clean energy generation. However, the use of expensive noble metals, toxicity, low charge separation efficiency and wide band gap of semiconductors hampering the widespread commercialization. Herein, we showed the potential of combining BiVO<sub>4</sub> nanorods with ZnCdS forming a hetero-structure which extend the spectral responsive range, separate the charge carriers effectively and enhances photocatalytic activity compared to single-component materials. The two components of hetero-structure forms an interface contact which also mitigate the problems of lower conduction band position of BiVO<sub>4</sub> and fast recombination of charge carriers of ZnCdS. The BiVO<sub>4</sub>/ZnCdS hetero-structure was studied through surface morphology, crystallization properties, elemental analysis and optical properties. Under visible light irradiation, the BiVO<sub>4</sub>/ZnCdS heterostructure produced 152.5 μmol h<sup>-1</sup> hydrogen from water splitting, which was much higher than that of the individual components and stability of the hydrogen production was observed in three consecutive cycles. The as-obtained heterostructure showed improved visible light harvesting ability, prolong life of charges carriers and charge separation efficiency and Z-scheme mechanism features which results in enhanced photocatalytic activity for water splitting. © 2022 Hydrogen Energy Publications LLC. [Article](#).

82. Javed, M., Department of Chemistry, School of Science, University of Management & Technology, Lahore, 54770, Pakistan. *Synergetic intimate interface contacts of 2D/1D S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS heterojunction with spatial charge separation for boosting photodegradation of MB and inactivation*

*of pathogens under visible light irradiation. Journal of Alloys and Compounds. 892.*

The constricted visible light harvesting and undesirable rapid recombination of photogenerated e<sup>-</sup> and h<sup>+</sup> set enormously hinder the activity of the photocatalysts. In this work, we design and develop two-dimensional/one-dimensional (2D/1D) S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS heterojunction with intimate heterointerface contact by self-assembly technique. The fast electron transportation of 2D S-g-C<sub>3</sub>N<sub>4</sub> nanosheets (NSs) and the well-matched energy levels of bare S-g-C<sub>3</sub>N<sub>4</sub> and 5% Co-NiS nanorods (NRs) cooperative support the transportation and separation of photo-carriers at the heterointerface of S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS. The as-fabricated samples were evaluated EDX, SEM, UV-vis, XRD, TEM, FTIR, XPS, BET, PL and transient photocurrent. Moreover, this well-defined construction boosts sunlight harvesting and exhibits a large surface area. Benefiting from the intimate coupling and structural features, the 20% S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS heterojunction attains a noteworthy photocatalytic methylene blue (MB) degradation rate of 100%, considerably improved than that of bare NiS (34%), 5% Co-NiS (57%) and pristine S-g-C<sub>3</sub>N<sub>4</sub> (31%). Concurrently, the photocorrosion of bare S-g-C<sub>3</sub>N<sub>4</sub> was suppressed by simultaneous integrating with NiS and engineering with cobalt, which was demonstrated through a chemical stability test with 6 consecutive experimental tests. Such outstanding enrichment in photocatalytic activity and chemical stability was primarily attributed to boosting spatial charge separation and synergistic effects of the 20% 2D/1D S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS nanocomposites (NCs). Antibacterial performance of 20% 2D/1D S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiSNCs against 4 infectious species was evaluated in visible light radiance. Our results emphasize the great importance of the efficacious heterointerface blend of 2D/1D S-g-C<sub>3</sub>N<sub>4</sub>/Co-NiS NCs as a promising photocatalyst scheme for enhanced photocatalytic degradation of dye and disinfection of pathogens. © 2021 Elsevier B.V. **Article.**

83. Mansoor, S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Shahid, S., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Javed, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Fatima, A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Green synthesis of a MnO-GO-Ag nanocomposite using leaf extract of Fagonia arabica and its antioxidant and anti-inflammatory performance. Nano-Structures and Nano-Objects. 29.*

This research work includes the green synthesis of silver and graphene oxide doped manganese oxide nanocomposites (NCs) using Fagonia arabica, which is commonly found in Asian countries and widely grown in deserts. Fagonia arabica is a medicinal herb used for the treatment of a variety of diseases. Fagonia arabica shows efficient anti-inflammatory, antimicrobial activity and antioxidant properties. Manganese oxide (MnO) NPs were synthesized by a green synthesis method using leaf extract of Fagonia arabica. The synthesized manganese oxide nanoparticles (NPs) were then used to form manganese oxide composites coupled with graphene oxide (GO) and silver (Ag). The main composite synthesized in this research work is MnO-GO-Ag NCs. All the synthesized NPs and composites were then characterized by SEM, XRD, EDX and ultra-violet-visible spectroscopy. The anti-inflammatory activity of the manganese oxide NPs and their MnO-GO and MnO-GO-Ag composites were checked by UV-visible spectroscopy and the obtained results were compared with the standard Diclofenac Sodium. The antioxidant activity of MnO-GO-Ag shows a higher scavenging potential than the standard ascorbic acid. SEM analysis was performed to check the size and morphology of the obtained product. The XRD analysis confirmed the purity and crystallinity of synthesized MnO-GO-Ag NCs. EDX spectra showed the peaks for C, O, Ag and Mn, indicating the presence of these elements in our desired composite. For anti-inflammatory activity, the MnO-GO-Ag NCs showed percentage inhibitions of 34.15 and 81.71%, having an IC<sub>50</sub> values of 0.15 and 0.23, at 0.1 and 0.5 mg/mL concentrations, respectively. MnO-GO-Ag showed percentage scavenging efficiencies of 59.84 and 74.48% at concentrations of 0.3 and 0.5 mg/mL, respectively, while the standard (ascorbic acid) showed scavenging potentials of 44.22 and 58.42% at similar concentrations. The MnO-GO-Ag NCs showed lower IC<sub>50</sub> values, thus exhibit the high efficiency of the NCs for anti-inflammatory and antioxidant activities. © 2021 Elsevier B.V. **Article.**

84. Kosar, N., Department of Chemistry, University of Management and Technology (UMT), C11, Johar Town Lahore, Pakistan. *Remarkable nonlinear optical response of Mn@C<sub>20</sub> (M = Na & K and n = 6); a DFT outcome. Materials Science in Semiconductor Processing. 138.*

Electronic, optical and nonlinear (NLO) optical properties of Na and K (single and multiple) doped C<sub>20</sub> fullerene are investigated via density functional theory (DFT) methods. It is observed that the exohedral interaction of single and multi-doped (Na & K) with the C<sub>20</sub> surface is highly exothermic, whereas endohedral interaction is highly endothermic

(energetically non-favorable). Among all single and multi-doped complexes of C<sub>20</sub>, K<sub>6</sub>@C<sub>20</sub> shows the highest thermodynamic stability having interaction energy of  $\sim 131.76$  kcal mol<sup>-1</sup>. The HOMO-LUMO energy gaps are effectively reduced, and this reduction is more prominent in multi-doped complexes compared to single atom doped complexes. TDOS plots of all doped complexes confirmed the involvement of metal atoms with C<sub>20</sub> in newly generated HOMO orbitals. First hyperpolarizability analysis revealed the NLO response of newly designed single and multi-doped complexes. It is observed that the doping of multiple atoms of metals (Na & K) significantly increased the first hyperpolarizability ( $\beta^{(2)}$ ), directly related with the NLO response. Among all considered Na and K complexes of C<sub>20</sub> fullerene, K<sub>5</sub>@C<sub>20</sub> has the highest hyperpolarizability value i.e.  $1.88 \times 10^5$  a.u. © 2021 Elsevier Ltd. [Article](#).

85. Arif, M., School of Chemistry, University of the Punjab New Campus, Lahore, 54590, Pakistan, Department of Chemistry, University of Management and Technology, School of Science, Lahore, 54770, Pakistan. *Polymer microgels for the stabilization of gold nanoparticles and their application in the catalytic reduction of nitroarenes in aqueous media*. *RSC Advances*. 12, 9.

Polymer microgels containing a polystyrene core and poly(N-isopropylmethacrylamide) shell were synthesized in aqueous media following a free radical precipitation polymerization. Au nanoparticles were fabricated into the shell region of the core-shell microgels denoted as P(STY@NIPM) by the in situ reduction of chloroauric acid with sodium borohydride. Various characterization techniques such as transmission electron microscopy (TEM), ultraviolet-visible spectroscopy (UV-visible) and Fourier transform infrared spectroscopy (FTIR) were used for the characterization of Au-P(STY@NIPM). The catalytic potential of Au-P(STY@NIPM) toward the reductive reaction of 4-nitrophenol (4NP) under various reaction conditions was evaluated. The Arrhenius and Eyring parameters for the catalytic reduction of 4NP were determined to explore the process of catalysis. A variety of nitroarenes were converted successfully into their corresponding aminoarenes with good to excellent yields in the presence of the Au-P(STY@NIPM) system using NaBH<sub>4</sub> as a reductant. The Au-P(STY@NIPM) system was found to be an efficient and recyclable catalyst with no significant loss in its catalytic efficiency. © The Royal Society of Chemistry. [Article](#).

86. Rauf, A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Hydrogen production potential from agricultural biomass in Punjab province of Pakistan*. *International Journal of Hydrogen Energy*. 47, 5.

Depleting resources and popping environmental concerns instigate the development of sustainable and clean energy solutions. Amongst others, Hydrogen (H<sub>2</sub>) is an imperious alternative due to the lowest emissions, higher calorific value, and usability. It has great relevance in Pakistan due to sequester Agricultural biomass potential that can be used as feedstock for H<sub>2</sub> production. So, this study estimates the H<sub>2</sub> production potential from agricultural biomass (rice, sugarcane, cotton, wheat, and maize) of Punjab, Pakistan. In doing so, simulations are performed using Aspen Plus under various conditions to derive an optimal value of H<sub>2</sub> output. The results indicate significant heterogeneity across districts and crop residues types. Therefore, the Geographic Information System (GIS) is used to draw the spatial distribution of optimal H<sub>2</sub> production across crops and districts. The simulated results reveal that Punjab province has the potential to produce 2619.90  $\times 10^3$  Metric tons (MT)/year H<sub>2</sub>, and the highest potential derives from sugarcane trash (1012.77  $\times 10^3$  MT/year), followed by maize straw (433.67  $\times 10^3$  MT/year). The estimated H<sub>2</sub> potential (2.62 million MT/year) can be used in industries, transportation, and urea production as a sustainable alternative in Pakistan. © 2021 Hydrogen Energy Publications LLC. [Article](#).

87. Javed, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Qamar, M.A., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan; Fayyaz, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Synthesis of Cu-ZnO/Polyacrylic Acid Hydrogel as Visible-Light-Driven Photocatalyst for Organic Pollutant Degradation*. *Chemistry Select*. 7, 1.

The present study illustrates the production of Cu-doped ZnO nanocomposite with polyacrylic acid (PAA) microgel for the degradation of a coloured pollutant under sunlight. From 1 to 20 % Cu was doped into ZnO nanostructure (1–20 % Cu doped-ZnO NPs) by the co-precipitation method and applied for photocatalytic dye degradation. The 15CuZnO NPs exhibited the best dye degradation under sunlight. The 15CuZnO NPs were incorporated with PAA microgel through

inverse phase polymerization under N<sub>2</sub> gas atmosphere to yield the objective nanocomposite (PAA/CuZnO NC). The yielded composite showed an extreme rise in photocatalytic efficiency and completely mineralized MB in 60 minutes. The prepared composite showed better degradation of methylene blue than Cu-doped ZnO nanoparticles under UV-vis light radiation. The stability of PAA/CuZnO NC for photodegradation of dye was verified by a recycling experiment of the composite. © 2022 Wiley-VCH GmbH. **Article.**

**88. Rauf, A., Department of Chemistry, School of Science, University of Management and Technology, CII, Johar Town, Lahore, 54770, Pakistan. *Arc discharge process for in-situ growth of thermally stable single-phase Cr<sub>3</sub>C<sub>2</sub>@C NCs for photocatalytic applications.* *Journal of Materials Research.***

Cr<sub>3</sub>C<sub>2</sub> has drawn great interest due to its excellent physical, chemical, and mechanical properties. Herein, Cr<sub>3</sub>C<sub>2</sub>@C nanocapsules (NCs) were contrived by the arc discharge plasma method by the direct evaporation of Cr metal ingots under a mixed static pressure of Ar/CH<sub>4</sub> gases. Synchronized thermogravimetric and differential thermal analysis (TGA/DTA) studies revealed that at 300 °C, Cr<sub>3</sub>C<sub>2</sub>@C NCs underwent a phase evaluation process (Cr<sub>3</sub>C<sub>2</sub>@Cr<sub>2</sub>O<sub>3</sub>), and at ~ 650 °C transformed to Cr<sub>2</sub>O<sub>3</sub>. The growth process of Cr<sub>3</sub>C<sub>2</sub>@C NCs in an arc discharge passed through the nucleation of Cr<sub>3</sub>C<sub>2</sub> seeds and then anisotropic growth of the seeds into hexagonal platelet-like morphologies under a controlled carbon content. By, tuning microstructures of pristine Cr<sub>3</sub>C<sub>2</sub> to Cr<sub>3</sub>C<sub>2</sub>@C NCs gives broad increment in surface area and pore size. It implies more space on Cr<sub>3</sub>C<sub>2</sub>@C surface for adsorption and photodegradation of organic pollutants due to NCs defective and mesoporous nature. Graphical abstract: [Figure not available: see fulltext.] © 2022, The Author(s), under exclusive licence to The Materials Research Society. **Article.**

**89. Arif, M., Department of Chemistry, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Multi-functional organic-inorganic hydrogel microspheres as efficient catalytic system for reduction of toxic dyes in aqueous medium.* *Zeitschrift fur Physikalische Chemie.* **236, 1.****

Poly(N-isopropylacrylamide-acrylamide-methacrylic acid) [p(NAM)] colloidal particles were synthesized and stabilized in aqueous medium. Ag nanoparticles were fabricated inside the p(NAM) system by in-situ reduction of Ag<sup>+</sup> ions with NaBH<sub>4</sub> to obtain Ag-p(NAM) organic-inorganic hybrid with fascinating catalytic properties. Various characterization techniques including XRD, FTIR, DLS, TEM and UV-visible spectroscopy were used to confirm the fabrication of p(NAM) and Ag-p(NAM) in aqueous medium. Loading of silver nanoparticles into the p(NAM) does not affect responsive properties of the colloidal system. Ag-p(NAM) system was used as catalyst for reduction of toxic dyes including methyl orange (MO) and Congo red (CR) from aqueous medium. Ag-p(NAM) catalyzed reduction of dyes was carried out under different reaction conditions to explore the catalytic process of degradation. The Ag-p(NAM) catalytic system is recyclable and reusable with almost same catalytic activity up to four cycles. **Article.**

**90. Afzal, M.S., Department of Life Sciences, School of Science, University of Management and Technology (UMT), Lahore, 54782, Pakistan. *A Retrospective Cohort Study on Human Cystic Echinococcosis in Khyber Pakhtunkhwa Province (Pakistan) Based on 16 Years of Hospital Discharge Records.* *Pathogens.* **11, 2.****

Human cystic echinococcosis (CE) is a worldwide-distributed parasitic zoonotic disease, which represents a threat for both human and animals. The current study aimed at estimating the prevalence of human CE in Khyber Pakhtunkhwa (KPK) province of Pakistan. Clinical records from four major hospitals in this region were reviewed for CE human cases during the period of 2006–2021. Out of 251 (0.00071%) CE patients identified during the considered period, 142 (56.6%) were females, and 109 (43.4%) were males. The highest number of CE cases was recorded in the 21–30 (27.9%) age group, followed by 31–40 (23.1%) and 41–50 (16.3%). Most of the CE patients in KPK province were members of the Afghani ethnic group (17.1%); secondarily, they were Pakistani (6.4%), while for 76.5% ethnicity data were not available. The liver (41%) and the lungs (4.8%) were the most infected organs identified among CE patients in KPK province. The present study identified CE as a significant public health problem in KPK province, and the current findings demonstrated a constant endemicity of CE during the last 15 years. Further field studies on the active search of CE carriers by means of ultrasound population-based surveys are needed to fill knowledge gaps on clinical and molecular epidemiology of human CE in Pakistan. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

91. Department of Life Sciences, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. *Molecular study on the role of vacuolar transporters in glycyrrhetic acid production in engineered Saccharomyces cerevisiae*. *Biochimica et Biophysica Acta – Biomembranes*. 1864, 6.

Glycyrrhetic acid (GA) is one of the major bioactive components of the leguminous plant, Glycyrrhiza spp. (Chinese licorice). Owing to GA's complicated chemical structure, its production by chemical synthesis is challenging and requires other efficient strategies such as microbial synthesis. Earlier investigations employed numerous approaches to improve GA yield by refining the synthetic pathway and improving the metabolic flux. Nevertheless, the metabolic role of transporters in GA biosynthesis in microbial cell factories has not been studied so far. In this study, we investigated the role of yeast ATP binding cassette (ABC) vacuolar transporters in GA production. Molecular docking of GA and its precursors,  $\beta$ -Amyrin and 11-oxo- $\beta$ -amyrin, was performed with five vacuolar ABC transporters (Bpt1p, Vmr1p, Ybt1p, Ycf1p and Nft1p). Based on docking scores, two top scoring transporters were selected (Bpt1p and Vmr1p) to investigate transporters' functions on GA production via overexpression and knockout experiments in one GA-producing yeast strain (GA166). Results revealed that GA and its precursors exhibited the highest predicted binding affinity towards BPT1 ( $\Delta G = \hat{\sim}10.9, \hat{\sim}10.6, \hat{\sim}10.9$  kcal/mol for GA,  $\beta$ -amyrin and 11-oxo- $\beta$ -amyrin, respectively). Experimental results showed that the overexpression of BPT1 and VMR1 restored the intracellular as well as extracellular GA production level under limited nutritional conditions, whereas knockout of BPT1 resulted in a total loss of GA production. These results suggest that the activity of BPT1 is required for GA production in engineered *Saccharomyces cerevisiae*. **Article.**

92. Mateen, R.M., Department of Life sciences, School of Science, University of Management and Technology, Punjab, Lahore, Pakistan; Afzal, M.S., Department of Life sciences, School of Science, University of Management and Technology, Punjab, Lahore, Pakistan. *A computer aided drug discovery based discovery of lead-like compounds against KDM5A for cancers using pharmacophore modeling and high-throughput virtual screening*. *Proteins: Structure, Function and Bioinformatics*. 90, 3.

KDM5A over-expression mediates cancer cell proliferation and promotes resistance toward chemotherapy through epigenetic modifications. As its complete mechanism of action is still unknown, there is no KDM5A specific drug available at clinical level. In the current study, lead compounds for KDM5A were determined through pharmacophore modeling and high-throughput virtual screening from Asinex libraries containing 0.5 million compounds. These virtual hits were further evaluated and filtered for ADMET properties. Finally, 726 compounds were used for docking analysis against KDM5A. On the basis of docking score, 10 top-ranked compounds were selected and further evaluated for non-central nervous system (CNS) and CNS drug-like properties. Among these compounds, N-[[[7-Methyl-4-oxo-1,2,3,4-tetrahydrocyclopenta [c] chromen-9-yl) oxy]acetyl]-l-phenylalanine (G-score:  $\hat{\sim}11.363$  kcal/mol) was estimated to exhibit non-CNS properties while 2-(3,4-Dimethoxy-phenyl)-7-methoxy-chromen-4-one (G-score:  $\hat{\sim}7.977$  kcal/mol) was evaluated as CNS compound. Docked complexes of both compounds were finally selected for molecular dynamic simulation to examine the stability. This study concluded that both these compounds can serve as lead compounds in the quest of finding therapeutic agents against KDM5A associated cancers. **Article.**

93. Umair, M., Medical Genomics Research Department, King Abdullah International Research Center (KAIMRC), King Saud Bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Ministry of National Guard Health Affairs, Riyadh, Saudi Arabia, Department of Life Sciences, School of Science, University of Management and Technology (UMT). *A Homozygous Missense Variant in PPP1R1B/DARPP-32 Is Associated With Generalized Complex Dystonia*. *Movement Disorders*. 37, 2.

Background: The dystonias are a heterogeneous group of hyperkinetic disorders characterized by sustained or intermittent muscle contractions that cause abnormal movements and/or postures. Although more than 200 causal genes are known, many cases of primary dystonia have no clear genetic cause. Objectives: To identify the causal gene in a consanguineous family with three siblings affected by a complex persistent generalized dystonia, generalized epilepsy, and mild intellectual disability. Methods: We performed exome sequencing in the parents and two affected siblings and characterized the expression of the identified gene by immunohistochemistry in control human and zebrafish brains. Results: We identified a novel missense variant (c.142G>A (NM\_032192); p.Glu48Lys) in the protein phosphatase 1

regulatory inhibitor subunit 1B gene (PPP1R1B) that was homozygous in all three siblings and heterozygous in the parents. This gene is also known as dopamine and cAMP-regulated neuronal phosphoprotein 32 (DARPP-32) and has been involved in the pathophysiology of abnormal movements. The uncovered variant is absent in public databases and modifies the conserved glutamate 48 localized close to the serine 45 phosphorylation site. The PPP1R1B protein was shown to be expressed in cells and regions involved in movement control, including projection neurons of the caudate-putamen, substantia nigra neuropil, and cerebellar Purkinje cells. The latter cells were also confirmed to be positive for PPP1R1B expression in the zebrafish brain. Conclusions: We report the association of a PPP1R1B/DARPP-32 variant with generalized dystonia in man. It might be relevant to include the sequencing of this new gene in the diagnosis of patients with otherwise unexplained movement disorders. © 2021 International Parkinson and Movement Disorder Society. © 2021 International Parkinson and Movement Disorder Society. **Article.**

94. Umair, M., Medical Genomics Research Department, King Abdullah International Medical Research Center (KAIMRC), King Saud Bin Abdulaziz University for Health Sciences, Ministry of National Guard Health Affairs (MNGH), Riyadh, Saudi Arabia, Department of Life Sciences, School of Science, University of Management and Technology (UMT), Lahore, Pakistan. *Homozygous missense variant in POPDC3 causes recessive limb-girdle muscular dystrophy type 26.* *Journal of Gene Medicine.*

Background: Limb-girdle muscular dystrophy (LGMD) comprises a heterogeneous group of diseases, affecting different muscles, predominantly skeletal muscles and cardiac muscles of the body. LGMD is classified into two main subtypes A and B, which are further subclassified into eight dominant and thirty recessive subtypes. Three genes, namely POPDC1, POPDC2 and POPDC3, encode popeye domain-containing protein (POPDC), and the variants of POPDC1 and POPDC3 genes have been associated with LGMD. Methods: In the present study, we performed whole-exome sequencing (WES) analysis on a single-family to investigate the hallmark features of LGMD. The results of WES were further confirmed by Sanger sequencing and 3D protein modeling was also conducted. Results: WES data analysis and Sanger sequencing revealed a homozygous missense variant (c.460A>G; p.Lys154Glu) at a highly conserved amino acid position in the POPDC3. Mutations in the POPDC3 gene have been previously associated with recessive limb-girdle muscular dystrophy type 26. 3D protein modeling further suggested that the identified variant might affect the POPDC3 structure and proper function. Conclusions: The present study confirms the role of POPDC3 in LGMD, and will facilitate genetic counseling of the family to mitigate the risks of the carrier or affects on future pregnancies. **Article.**

95. Afzal, M.S., Department of Life Sciences, School of Science, University of Management and Technology (UMT), Lahore, 54700, Pakistan. *Predicting COVID-19 incidence in war-torn Afghanistan: A timely response is required!* *Journal of Infection.* 84, 1.

[No abstract available]. **Letter.**

96. Afzal, M.S., Department of Life Sciences, School of Science, University of Management & Technology (UMT), Lahore, 54700, Pakistan; Khurram, M., Department of Life Sciences, School of Science, University of Management & Technology (UMT), Lahore, 54700, Pakistan. *Detection of Anti-Echinococcus granulosus Antibodies in Humans: An Update from Pakistan.* *Pathogens.* 11, 1.

Human cystic echinococcosis (CE) is a zoonotic disease caused by the larval stage of *Echinococcus granulosus* sensu lato that causes economic losses by affecting livestock and also poses a public health threat worldwide. The present study is the first retrospective report on the seroprevalence of anti-*E. granulosus* antibodies in humans in Pakistan. The study used data from 93 blood analysis reports of patients suspected of having CE from different medical centers in Lahore, Pakistan. Out of 93 sera samples, 20 (21.5%) were seropositive, and higher seropositivity (17.2%) was recorded with the indirect hemagglutination test (IHA) than with enzyme-linked immunosorbent assay (ELISA). The findings indicated that age, gender, and year had no significant relationship with the seropositivity of CE. The current study provides directions towards the management of the disease in the near future in Pakistan. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

97. Afzal, M.S., Department of Life Sciences, School of Science, University of Management and Technology (UMT), Lahore, Pakistan. *Environmental surveillance of Naegleria fowleri: A way forward for control*

*of primary amoebic meningoencephalitis cases in Pakistan. Travel Medicine and Infectious Disease.* 45.

[No abstract available]. **Letter.**

98. **Wahid, B., Department of Life Sciences, University of Management and Technology, Johar Town, Lahore, Pakistan, Monash Biomedicine Discovery Institute, Department of Microbiology, Monash University, Clayton, Melbourne, VIC 3800, Australia. Cytokine storm syndrome in SARS-CoV-2: A review. Zeitschrift fur Naturforschung - Section C Journal of Biosciences.** 77, 2-Jan.

After wreaking havoc on a global level with a total of 5,488,825 confirmed cases and 349,095 deaths as of May 2020, severe acute respiratory syndrome coronavirus 2 is truly living up to the expectations of a 21st-century pandemic. Since the major cause of mortality is a respiratory failure from acute respiratory distress syndrome, the only present-day management option is supportive as the transmission relies solely on human-to-human contact. Patients suffering from coronavirus disease 2019 (COVID-19) should be tested for hyper inflammation to screen those for whom immunosuppression can increase chances of survival. As more and more clinical data surfaces, it suggests patients with mild or severe cytokine storms are at greater risk of failing fatally and hence these cytokine storms should be targets for treatment in salvaging COVID-19 patients. © 2021 Walter de Gruyter GmbH, Berlin/Boston. **Review.**

99. **Nadeem, M., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan. Numerical analysis of a second-grade fuzzy hybrid nanofluid flow and heat transfer over a permeable stretching/shrinking sheet. Scientific Reports.** 12, 1.

In this work, the heat transfer features and stagnation point flow of Magneto hydrodynamics (MHD) hybrid second-grade nanofluid through a convectively heated permeable shrinking/stretching sheet is reported. The purpose of the present investigation is to consider hybrid nanofluids comprising of Alumina (Al<sub>2</sub>O<sub>3</sub>) and Copper (Cu) nanoparticles within the Sodium Alginate (SA) as a host fluid for boosting the heat transfer rate. Also, the effects of free convection, viscous dissipation, heat source/sink, and nonlinear thermal radiation are considered. The converted nonlinear coupled fuzzy differential equations (FDEs) with the help of triangular fuzzy numbers (TFNs) are solved using the numerical scheme bvp4c. The numerical results are acquired for various engineering parameters to study the Nusselt number, skin friction coefficient, velocity, and temperature distribution through figures and tables. For the validation, the current numerical results were found to be good as compared to existing results in limiting cases. It is also inspected by this work that with the enhancement of the volume fraction of nanoparticles, the heat transfer rate also increases. So, it may be taken as a fuzzy parameter for a better understanding of fuzzy variables. For the comparison, the volume fraction of nanofluids and hybrid nanofluid are said to be TFN [0, 0.1, 0.2]. In the end, we can see that fuzzy triangular membership functions (MFs) have not only helped to overcome the computational cost but also given better accuracy than the existent results. Finding from fuzzy MFs, the performance of hybrid nanofluids is better than nanofluids. **Article.**

100. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan. Boger nanofluid: significance of Coriolis and Lorentz forces on dynamics of rotating fluid subject to suction/injection via finite element simulation. Scientific Reports.** 12, 1.

This study briefings the roles of Coriolis, and Lorentz forces on the dynamics of rotating nanofluids flow toward a continuously stretching sheet. The nanoparticles are incorporated because of their unusual qualities like upgrade the thermal transportation, which are very important in heat exchangers, modern nanotechnology, electronics, and material sciences. The primary goal of this study is to improve heat transportation. Appropriate similarity transformations are applied for the principal PDEs to transform into nonlinear dimensionless PDEs. A widely recognized Numerical scheme known as the Finite Element Method is employed to solve the resultant convective boundary layer balances. Higher input in the solvent fraction parameter has a rising effect on the primary velocity and secondary velocity magnitude, and decreasing impact on the distributions of temperature. It is seen that growing contributions of the Coriolis, and Lorentz forces cause to moderate the primary and secondary velocities, but the temperature and concentration functions show opposite trend. The concentration, temperature, and velocities distributions for suction case is prominently than that of injection case, but inverse trend is observed for local Nusselt and Sherwood numbers. These examinations are relevant to the field of plastic films, crystal growing, paper production, heat exchanger, and bio-medicine. **Article.**

101. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Exploring the magnetohydrodynamic stretched flow of Williamson Maxwell nanofluid through porous matrix over a permeated sheet with bioconvection and activation energy.* **Scientific Reports.** 12, 1.

The evolution of compact density heat gadgets demands effective thermal transportation. The notion of nanofluid plays active role for this requirements. A comparative account for Maxwell nanofluids and Williamson nanofluid is analyzed. The bioconvection of self motive microorganisms, non Fourier heat flux and activation energy are new aspects of this study. This article elaborates the effects of viscous dissipation, Cattaneo-Christov diffusion for Maxwell and Williamson nanofluid transportation that occurs due to porous stretching sheet. The higher order non-linear partial differential equations are solved by using similarity transformations and a new set of ordinary differential equations is formed. For numerical purpose, Runge-Kutta method with shooting technique is applied. Matlab platform is used for computational procedure. The graphs for various profiles.i.e. velocity, temperature, concentration and concentration of motile micro-organisms are revealed for specific non-dimensional parameters. It is observed that enhancing the magnetic parameter  $M$ , the velocity of fluid decreases but opposite behavior happens for temperature, concentration and motile density profile. Also the motile density profile decrease down for  $Pe$  and  $Lb$ . The skin friction coefficient is enhanced for both the Williamson and Maxwell fluid. **Article.**

102. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54782, Pakistan.** *Numerical solution of 3D rotating nanofluid flow subject to Darcy-Forchheimer law, bio-convection and activation energy.* **South African Journal of Chemical Engineering.** 40.

This work discourses the dynamics of three dimensional rotating nanofluid flows subject to magnetohydrodynamic, Darcy-Forchheimer law, bioconvection self-motive microorganism, and activation energy. The numerical procedure is indicated when close agreement of the current finding is attained in comparison with the existing ones as limiting case. The leading equations based on preservation of mass, momentum, and energy are formulated with partial derivatives which are then transmuted into dimensionless differential form with the enactment of apposite similarity transformations. So, to tackle the non-linearity of these equations, numerical procedure based on shooting technique and Runge-Kutta method is bound to be coded on MATLAB platform. The emerging parameters are varied to observe the change of microorganism distribution, velocity, concentration of nano species, and temperature distribution. Results are displayed graphically and discussed. It is noticed that liquid velocity is decelerated against the constraints of inertia and porosity. The temperature field is strengthened with thermophoresis and Brownian motion. The concentrations of nanoparticle and microorganism are depreciated against Lewis number and bio-Lewis number respectively. The concentration of microorganism is improved for greater peclet number  $Pe$  but it lessens with growth in bioconvection Lewis number  $Lb$ . The function  $\hat{u}(\hat{r})$  and  $\hat{t}(\hat{r})$  showed increasing response to thermophoresis parameter  $Nt$ . The parameter of Brownian motion has noticeable growing impact on concentration of nano particles but decreasing  $Nb$  for  $\hat{u}(\hat{r})$  temperature. © 2022. **Review.**

103. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St., Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, 54770, Lahore, Pakistan.** *Mathematical modeling and stability analysis of the COVID-19 with quarantine and isolation.* **Results in Physics.** 34.

The present paper focuses on the modeling of the COVID-19 infection with the use of hospitalization, isolation and quarantine. Initially, we construct the model by splitting the entire population into different groups. We then rigorously analyze the model by presenting the necessary basic mathematical features including the feasible region and positivity of the problem solution. Further, we evaluate the model possible equilibria. The theoretical expression of the most important mathematical quantity of major public health interest called the basic reproduction number is presented. We are taking into account to study the disease free equilibrium by studying its local and global asymptotical analysis. We considering the cases of the COVID-19 infection of Pakistan population and find the parameters using the estimation with the help of nonlinear least square and have  $R_0 \approx 1.95$ . Further, to determine the influence of the model parameters on disease dynamics we perform the sensitivity analysis. Simulations of the model are presented using estimated parameters and the impact of various non-pharmaceutical interventions on disease dynamics is shown with the help of graphical results. The graphical interpretation justify that the effective utilization of keeping the social-distancing, making the quarantine of people (or contact-tracing policy) and to make hospitalization of confirmed infected people that dramatically reduces the number of infected individuals (enhancing the quarantine or contact-tracing by 50% from its



baseline reduces 84% in the predicted number of confirmed infected cases). Moreover, it is observed that without quarantine and hospitalization the scenario of the disease in Pakistan is very worse and the infected cases are raising rapidly. Therefore, the present study suggests that still, a proper and effective application of these non-pharmaceutical interventions are necessary to curtail or minimize the COVID-19 infection in Pakistan. © 2022. [Article](#).

104. **Manzoor, R., Department of Mathematics, University of Management and Technology, Johar Town Campus, Lahore, 54782, Pakistan; Kamal, A., Department of Mathematics, University of Management and Technology, Johar Town Campus, Lahore, 54782, Pakistan.** *The Coupling effects of  $f(R, T^{\bullet})$  gravity on axial gravitational waves.* [Physics of the Dark Universe](#). 35.  
The motive of this paper is to study the axial type gravitational waves within flat FRW universe and in the context of  $f(R, T^{\bullet})$  gravity (where  $T^{\bullet}$  corresponds to the trace of stress energy tensor of  $\ddot{\phi}$ , a scalar field). For this purpose, we consider the famous Regge-Wheeler axial perturbation scheme for geometry as well as assume the corresponding perturbations in the scalar field. We derived the field equations for both unperturbed and axially perturbed scenarios. The simultaneous solution of both sets of field equations lead to some expressions for unknown perturbation parameters. In view of these expressions, we concluded that the propagation of axial gravitational waves is influenced by the scalar field potential and the coupling of geometry and scalar field. The plots of conformal time function emanating from axial metric perturbations, for different values of  $\hat{\lambda}$  and  $\hat{\mu}$ , indicate this impact. [Article](#).
105. **Hussain, M.T., School of Sciences, Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Fractional-order dynamics of human papillomavirus.* [Results in Physics](#). 34.  
Human papillomavirus (HPV) is a reproductive tract infection common to sexually active human. Many of the low-risk HPV infections clear up without any medications but the High-risk HPV-related diseases can remain in the body for a long time. Most of the cases of cervical cancers and other genital cancers are consequences of HPV-related diseases. As HPV-related diseases are on the increase and controlling the spread is becoming difficult, this present study explores the influence of vaccination on the spread of the diseases. A fractional order mathematical model that captures different HPV risk level is developed in this study. The basic reproduction ratio is obtained for the fractional order model and a locally asymptotically stable disease-free equilibrium is shown to exist. A comprehensive analysis of the effect of vaccination efficacy and rate of vaccination is carried out and the results indicate that the spread of HPV infection can be mitigated by vaccination. © 2022 The Author(s). [Article](#).
106. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St., Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Modeling the dynamics of coronavirus with super-spreader class: A fractal-fractional approach.* [Results in Physics](#). 34.  
Super-spreaders of the novel coronavirus disease (or COVID-19) are those with greater potential for disease transmission to infect other people. Understanding and isolating the super-spreaders are important for controlling the COVID-19 incidence as well as future infectious disease outbreaks. Many scientific evidences can be found in the literature on reporting and impact of super-spreaders and super-spreading events on the COVID-19 dynamics. This paper deals with the formulation and simulation of a new epidemic model addressing the dynamics of COVID-19 with the presence of super-spreader individuals. In the first step, we formulate the model using classical integer order nonlinear differential system composed of six equations. The individuals responsible for the disease transmission are further categorized into three sub-classes, i.e., the symptomatic, super-spreader and asymptomatic. The model is parameterized using the actual infected cases reported in the kingdom of Saudi Arabia in order to enhance the biological suitability of the study. Moreover, to analyze the impact of memory index, we extend the model to fractional case using the well-known Caputo-Fabrizio derivative. By making use of the Picard-Lindelöf theorem and fixed point approach, we establish the existence and uniqueness criteria for the fractional-order model. Furthermore, we applied the novel fractal-fractional operator in Caputo-Fabrizio sense to obtain a more generalized model. Finally, to simulate the models in both fractional and fractal-fractional cases, efficient iterative schemes are utilized in order to present the impact of the fractional and fractal orders coupled with the key parameters (including transmission rate due to super-spreaders) on the pandemic peaks. © 2022. [Article](#).
107. **Rashid, T., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *A modified VIKOR method for group decision-making based on aggregation operators for hesitant intuitionistic fuzzy linguistic term sets.* [Soft Computing](#). 26, 5.

The methodology of managing hesitancy situations is improving step by step with new basics and tools which have their specific characteristics. As a rule, aggregation operators can undoubtedly deal with the data in a definite way. Employing hesitant intuitionistic fuzzy linguistic term sets (HIFLTs), the adaptability in creating assessment data under uncertainty can be accomplished to a bigger degree than either intuitionistic linguistic sets or hesitant fuzzy linguistic term sets do. In this view, this paper provides a multi-criteria group decision-making (MCGDM) method based on new aggregation operators for HIFLTs and the proposed modified VIKOR method. Besides, some operational laws for HIFLTs are studied with their important properties, which is followed by the definitions of some aggregation operators, including the hesitant intuitionistic fuzzy linguistic weighted averaging (HIFLWA) operator and the hesitant intuitionistic fuzzy linguistic weighted geometric (HIFLWG) operator. The hesitant intuitionistic fuzzy linguistic individual regret (HIFLIR) measure and hesitant intuitionistic fuzzy linguistic compromise (HIFLC) measure are established with the help of hesitant intuitionistic fuzzy group utility measure. After that, by using the proposed aggregation operators, we develop a modified VIKOR method in the context of HIFLTs. The outcome of this research is ranking and selecting of best alternative with the help of modified VIKOR method based on aggregation operators for HIFLTs. A numerical problem is provided to verify the proposed approach, and its accuracy and effectiveness have been demonstrated through the comparative analysis of the modified VIKOR method with the TOPSIS method for the selection of the best alternative. This research study showed that the proposed approach can describe the fuzziness and uncertainty of experts more relevantly and the ranking results calculated with the modified VIKOR method are effective and reliable. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

108. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Significance of Lorentz and Coriolis forces on dynamics of water based silver tiny particles via finite element simulation.* **Ain Shams Engineering Journal.** 13, 2.

This study is briefings the roles of volume fraction, Coriolis, and Lorentz forces on the dynamics of rotating water based silver tiny particles flow toward a continuously stretching sheet. The Coriolis force play a significance role on the dynamic of fluid in oceanography, Astrophysics, meteorology, and Stellar dynamics by effecting the fluid movement on the earth surface. The nanoparticles are incorporated because of their unusual qualities like upgrade the thermal transportation, which are very important in heat exchangers, modern nanotechnology, electronics, and material sciences. The primary goal of this study is to improve heat transportation. Appropriate similarity transformations are applied for the principal PDEs to transform into nonlinear dimensionless PDEs. A widely recognized Numerical scheme known as the Finite Element Method is employed to solve the resultant convective boundary layer balances. It is seen that growing contributions of the Coriolis, and Lorentz forces cause to decline the primary and secondary velocities, but the temperature function and skin friction factor show opposite trend. The temperature distribution and reduced Nusselt number are prominent against growing volume fraction, but inverse trend is observed for velocities distributions. These examinations are relevant to the field of plastic films, crystal growing, paper production, heat exchanger, and bio-medicine. © 2021. **Article.**

109. **Ali, A., Department of Mathematics, School of Sciences, University of Management and Technology, Lahore, Pakistan.** *Integrating technical-environmental-economical perspectives for optimizing rubber content in concrete by multi-criteria analysis.* **Construction and Building Materials.** 319.

Removal of waste tyre rubber (WTR) has turned into a critical ecological hazard all around the world and one of the viable solutions for the recycling is to use as a filler or substitute aggregate in concrete mixture. Although there are many of material performance study, the useful framework for decision making policy integrating its technical-environmental-economic performance is still missing. This study employed four types of multi-criteria-decision-making (MCDM) techniques to suggest the the priority of optimum rubberized concrete mixture. In experimentation, three types of rubberized concrete were formulated by replacing, cement, fine (sand) and coarse (gravel) aggregate up to 20 % in vol. with WTR of powder, crumb and chip, respectively. For technical perspective, there are 10 criteria. Thus, fresh properties, designated mechanical properties (compressive, splitting tensile and flexural strengths) along with durability (chloride ion penetration resistance) tests were conducted. Besides, for environmental and economic perspectives, volume utilization of raw material, CO<sub>2</sub>, footprints, and cost were quantified. Experimental observation reveals that in technical perspective the performance of rubber crumb incorporated concrete has better properties among all mixtures. However, the CO<sub>2</sub>, emissions and cost were less for powder rubber incorporated concrete and raw material conservation is better for rubber chip incorporated concrete. Finally, all perspectives were integrated, and a framework was developed, having 13 criteria and the weightage of each criterion was evaluated by Entropy method. As a result, 5% rubber chip concrete showed the top ranking. Obtained result has a wide application for selection of concrete according

to its application; structural, non-structural, geotechnical etc., and may help the policy makers to use WTR in construction industry. © 2021 Elsevier Ltd. [Article](#).

110. **Rehman, A.U., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Shah, Z.H., Department of Physics, University of Management and Technology, Lahore, 54770, Pakistan.** *Generalized Mittag-Leffler Kernel Form Solutions of Free Convection Heat and Mass Transfer Flow of Maxwell Fluid with Newtonian Heating: Prabhakar Fractional Derivative Approach. Fractal and Fractional.* **6, 2.**

In this article, the effects of Newtonian heating along with wall slip condition on temperature is critically examined on unsteady magnetohydrodynamic (MHD) flows of Prabhakar-like non integer Maxwell fluid near an infinitely vertical plate under constant concentration. For the sake of generalized memory effects, a new mathematical fractional model is formulated based on a newly introduced Prabhakar fractional operator with generalized Fourier's law and Fick's law. This fractional model has been solved analytically and exact solutions for dimensionless velocity, concentration, and energy equations are calculated in terms of Mittag-Leffler functions by employing the Laplace transformation method. Physical impacts of different parameters such as  $\hat{\Gamma}_\pm$ ,  $Pr$ ,  $\hat{\Gamma}^2$ ,  $Sc$ ,  $Gr$ ,  $\hat{\Gamma}^3$ , and  $Gm$  are studied and demonstrated graphically by Mathcad software. Furthermore, to validate our current results, some limiting models such as classical Maxwell model, classical Newtonian model, and fractional Newtonian model are recovered from Prabhakar fractional Maxwell fluid. Moreover, we compare the results between Maxwell and Newtonian fluids for both fractional and classical cases with and without slip conditions, showing that the movement of the Maxwell fluid is faster than viscous fluid. Additionally, it is visualized that both classical Maxwell and viscous fluid have relatively higher velocity as compared to fractional Maxwell and viscous fluid. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

111. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Afzal, S., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *An Analysis for Variable Physical Properties Involved in the Nano-Biofilm Transportation of Sutterby Fluid across Shrinking/Stretching Surface. Nanomaterials.* **12, 4.**

In this article, we explore how activation energy and varied transit parameters influence the two-dimensional stagnation point motion of nano-biofilm of Sutterby fluids incorporating gyrotactic microbes across a porous straining/shrinking sheet. Prior investigations implied that fluid viscosity as well as thermal conductance are temperature based. This research proposes that fluid viscosity, heat capacity and nanofluid attributes are all modified by solute concentration. According to some empirical research, the viscosity as well as heat conductivity of nanoparticles are highly based on the concentration of nanoparticles instead of only the temperature. The shooting approach with the RK-4 technique is applied to acquire analytical results. We contrast our outcomes with those in the existing research and examine their consistency and reliability. The graphic performance of relevant factors on heat, velocity, density and motile concentration domains are depicted and discussed. The skin friction factor, Nusselt number, Sherwood number and the motile density are determined. As the concentration-dependent properties are updated, the speed, temperature, concentration and motile density profiles are enhanced, but for all concentration-varying factors, other physical quantities deteriorate. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

112. **Noor, Z.A., Nonlinear Analysis Group (NAG), Mathematics Department, Virtual University of Pakistan, Lahore, 540000, Pakistan, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Numerical Study of Caputo Fractional-Order Differential Equations by Developing New Operational Matrices of Vieta's Lucas Polynomials. Fractal and Fractional.* **6, 2.**

In this article, we develop a numerical method based on the operational matrices of shifted Vieta's Lucas polynomials (VLPs) for solving Caputo fractional-order differential equations (FDEs). We derive a new operational matrix of the fractional-order derivatives in the Caputo sense, which is then used with spectral tau and spectral collocation methods to reduce the FDEs to a system of algebraic equations. Several numerical examples are given to show the accuracy of this method. These examples show that the obtained results have good agreement with the analytical solutions in both linear and non-linear FDEs. In addition to this, the numerical results obtained by using our method are compared with the numerical results obtained otherwise in the literature. [Article](#).

113. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowski St., Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Numerical Study of Natural Convection of*

**Power Law Fluid in a Square Cavity Fitted with a Uniformly Heated T-Fin. *Mathematics*. 10, 3.**

Flow of a liquid in an enclosure with heat transfer has drawn special focus of researchers due to the abundant thermal engineering applications. So, the aim of present communication is to explore thermal characteristics of natural convective power-law liquid flow in a square enclosure rooted with a T-shaped fin. The formulation of the problem is executed in the form of partial differential expressions by incorporating the rheological relation of the power-law fluid. The lower wall of the enclosure along with the fin is uniformly heated and vertical walls are prescribed with cold temperature. For effective heat transfer within the cavity the upper boundary is considered thermally insulated. A finite element based commercial software known as COMSOL is used for simulations and discretization of differential equations and is executed incorporating a weak formulation. Domain discretization is performed by dividing it into triangular and rectangular elements at different refinement levels. A grid independence test is accomplished for quantities of engineering interest like local and average Nusselt numbers to attain accuracy and validity in results. Variation in the momentum and thermal distributions against pertinent parameters is analyzed through stream lines and isothermal contour plots. Measurement of the heat flux coefficient along with the calculation of kinetic energy against involved parameters is displayed through graphs and tables. After the comprehensive overview of attained results it is deduced that kinetic energy elevates against the upsurging magnitude of the Rayleigh number, whereas contrary behavior is encapsulated versus power-law index ( $n$ ). Elevation in the Nusselt number for the shear thinning case (i.e.,  $n = 0.5$ ) adheres as compared to Newtonian (i.e.,  $n = 1$ ) and shear thickening cases (i.e.,  $n = 1.5$ ). It is perceived that by the upsurging power-law index viscosity augmentations and circulation zones increases. Heat is transferred quickly against Rayleigh number ( $Ra$ ) due to production of temperature difference in flow domain. © 2021 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

114. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, Pakistan. *On time dependent MHD nanofluid dynamics due to enlarging sheet with bioconvection and two thermal boundary conditions. *Microfluidics and Nanofluidics*. 26, 2.***

The current study pertains to heat and mass transportation of magnetic fluid flow having dilute diffusion of nanoparticles and motile microorganisms over a permeable stretched sheet to examine the influence of thermal radiation and activation energy. Similarity functions are utilized to convert the highly mixed non-linear partial differential equations into higher-order non-linear ordinary differential equations. Five coupled equations are derived to be resolved numerically by employing a computing function Bvp4c, built-in Matlab. Two sets of thermal boundaries prescribed surface temperature (PSF) and prescribed heat flux (PHF) are considered. Basic physical quantities, temperature distribution, concentration, velocity field, and motile micro-organism profiles are observed as influenced by emerging parameters. The microorganisms distribution undergoes decreasing behavior against growing values of bio-convection Lewis number and Peclet number. These results are highly useful in the application of heat-transmitting devices and microbial fuel cells. It is seen that decreasing trend is observed in velocity profile when parameters  $Nr$  and  $Nc$  are uplifted. Also, the motility of the nanofluid decreases when the  $Lb$  parameter is raised. On the other hand, an increase in Peclet number  $Pe$  showed a rising trend in motility profile. Additionally, the implications of Brownian motion, Rayleigh number, Bioconvection Lewis number thermophoresis parameter, Peclet number, and buoyancy ratio parameter are discussed. Moreover, the obtained outcomes are validated as compared to the existing ones as limiting cases. Representative findings for microorganism concentration, skin friction coefficient, temperature gradient, local Sherwood number and density number of motile microorganisms, velocity field, temperature, the volumetric concentration of nanoparticles, are discussed in tabulated and graphical form. © 2022, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

115. **Murtaza, G., Department of Mathematics, University of Management and Technology, Lahore, 54700, Pakistan. *Post-Quantum Midpoint-Type Inequalities Associated with Twice-Differentiable Functions. *Axioms*. 11, 2.***

In this study, first we establish a  $(p, q)$ -integral identity involving the second  $(p, q)$ -derivative, and then, we use this result to prove some new midpoint-type inequalities for twice- $(p, q)$ -differentiable convex functions. It is also shown that the newly established results are the refinements of the comparable results in the literature. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

116. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St, Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan. *Double Diffusive Magneto-Free-Convection***

*Flow of Oldroyd-B Fluid over a Vertical Plate with Heat and Mass Flux. Symmetry. 14, 2.*

The purpose of this research is to analyze the general equations of double diffusive magnetofree convection in an Oldroyd-B fluid flow based on the fundamental symmetry that are presented in non-dimensional form and are applied to a moving heated vertical plate as the boundary layer flow up, with the existence of an external magnetic field that is either moving or fixed consistent with the plate. The thermal transport phenomenon in the presence of constant concentration, coupled with a first order chemical reaction under the exponential heating of the symmetry of fluid flow, is analyzed. The Laplace transform method is applied symmetrically to tackle the non-dimensional partial differential equations for velocity, mass and energy. The contribution of mass, thermal and mechanical components on the dynamics of fluid are presented and discussed independently. An interesting property regarding the behavior of the fluid velocity is found when the movement is observed in the magnetic intensity along with the plate. In that situation, the fluid velocity is not zero when it is far and away from the plate. Moreover, the heat transfer aspects, flow dynamics and their credence on the parameters are drawn out by graphical illustrations. Furthermore, some special cases for the movement of the plate are also studied. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

117. **Asjad, M.I., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Faridi, W.A., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *The generalization of Hermite-Hadamard type Inequality with exp-convexity involving non-singular fractional operator. AIMS Mathematics. 7, 4.*

The theory of convex function has a lot of applications in the field of applied mathematics and engineering. The Caputo-Fabrizio non-singular operator is the most significant operator of fractional theory which permits to generalize the classical theory of differentiation. This study consider the well known Hermite-Hadamard type and associated inequalities to generalize further. To full fill this mileage, we use the exponential convexity and fractional-order differential operator and also apply some existing inequalities like Holder, power mean, and Holder-Iscan type inequalities for further extension. The generalized exponential type fractional integral Hermite-Hadamard type inequalities establish involving the global integral. The applications of the developed results are displayed to verify the applicability. The establish results of this paper can be considered an extension and generalization of the existing results of convex function and inequality in literature and we hope that will be more helpful for the researcher in future work. © 2022 the Author(s), licensee AIMS Press. [Article](#).

118. **Naseem, A., Department of Mathematics, University of Management and Technology, Lahore 54770, Pakistan.; Rehman, M.A., Department of Mathematics, University of Management and Technology, Lahore 54770, Pakistan.** *A Novel Root-Finding Algorithm with Engineering Applications and Its Dynamics Via Computer Technology. IEEE Access.*

Root-finding of non-linear equations is one of the most appearing problems in engineering sciences. Most of the complicated engineering problems can be modeled easily by means of non-linear functions. The role of iterative algorithms via computers for solving such functions is much important and cannot be denied in the modern age. In an iterative algorithm, the convergence order and the computational cost per iteration are the main characteristics that depict its efficiency and performance i.e., a method with higher-order and lower computational cost will be more efficient and vice versa. Keeping these facts into consideration, the main goal of this paper is to introduce a new derivative-free iterative method that performs better. We develop this algorithm by utilizing the forward- and finite-difference schemes on well-known Householder's method, resulting in an efficient and derivative-free algorithm with a low per iteration computing cost. We also look at the developed algorithm's convergence criterion and show that it is quartic-order convergent. We investigate nine test-examples and solve them to demonstrate its correctness, validity, and efficiency numerically. Some real-world engineering problems in civil and chemical engineering are also included in these examples. The numerical results of the test-examples reveal that the newly constructed method outperforms the existing similar algorithms found in the literature. We consider various different-degrees complex polynomials for the graphical analysis and used a computer tool to create the polynomiographs of the proposed quartic-order algorithm and compare it to other comparable existing approaches. The graphical findings show that the developed method has a faster convergence speed than the other comparable algorithms. [Article](#).

119. **Aleem, M., Department of Mathematics, University of Management and Technology, Lahore, 54700, Pakistan; Asjad, M.I., Department of Mathematics, University of Management and Technology, Lahore, 54700, Pakistan.** *Fractional Study for Transient Free Convection Flow in a Channel with Mittag-Leffler*

**Memory. Mathematical Problems in Engineering. 2022.**

Fractional-order convective transient flow of viscous and incompressible fluids transiting through two infinite hot parallel upright plates is investigated analytically in the presence of chemical reaction, radiative heat flux, and mass diffusion at the boundary. A physical model for transient incompressible unsteady flow is developed with a comparatively new fractional derivative, namely, Atangana-Baleanu with nonsingular, nonlocal kernel. The developed fractional model is studied with means of an integral transform, i.e., Laplace transform method. Results obtained for the concentration, velocity, and temperature are expressed in the form of generalized Mqpy function. The impact of various physical parameters like fractional and flow parametric quantities is demonstrated diagrammatically. At last, we envisioned that for the fractional model, temperature and concentration could be enhanced for smaller fractional parameter a values while velocity for larger values of a, respectively. The proposed model gives the better results in the presence of memory effect besides the Caputo and Caputo-Fabrizio model when compared with the existing literature. © 2022 Shahzad Sarwar et al. **Article.**

120. **Ali, B., Department of Mathematics, School of Science (SSc), University of Management and Technology (UMT), C-II, Johar Town, Lahore, 54770, Pakistan; Khan, A.A., Department of Mathematics, School of Science (SSc), University of Management and Technology (UMT), C-II, Johar Town, Lahore, 54770, Pakistan. Best Proximity Points of Multivalued Hardy-Roger's Type (Cyclic) Contractive Mappings of b-Metric Spaces. Journal of Mathematics. 2022.**

In this article, we introduce a new type of generalized multivalued Hardy and Roger's type proximal contractive and proximal cyclic contractive mappings of b-metric spaces and develop some results for the existence of best proximity point(s). Moreover, we obtain some results for the existence and uniqueness of best proximity points for single-valued mappings. Examples are given to explain the main results. © 2022 Basit Ali et al. **Article.**

121. **Zulqarnain, R.M., Department of Mathematics, School of Science, University of Management and Technology Sialkot Campus, Punjab, Lahore, 54770, Pakistan; Siddique, I., Department of Mathematics, School of Science, University of Management and Technology, Lahore, 54770, Pakistan. Einstein-Ordered Weighted Geometric Operator for Pythagorean Fuzzy Soft Set with Its Application to Solve MAGDM Problem. Mathematical Problems in Engineering. 2022.**

The Pythagorean fuzzy soft set (PFSS) is the most influential and operative tool for maneuvering compared to the Pythagorean fuzzy set (PFS), which can accommodate the parameterization of alternatives. It is also a generalized form of intuitionistic fuzzy soft sets (IFSS), which delivers healthier and more exact valuations in the decision-making (DM) procedure. The primary purpose is to extend and propose ideas related to Einstein's ordered weighted geometric aggregation operator from fuzzy structure to PFSS structure. The core objective of this work is to present a PFSS aggregation operator, such as the Pythagorean fuzzy soft Einstein-ordered weighted geometric (PFSEOWG) operator. In addition, the basic properties of the proposed operator are introduced, such as idempotency, boundedness, and homogeneity. Moreover, a DM method based on a developed operator has been presented to solve the multiattribute group decision-making (MAGDM) problem. A real-life application of the anticipated method has been offered for a capitalist to choose the most delicate business to finance his money. Finally, a brief comparative analysis with some current methods demonstrates the proposed approach's effectiveness and reliability. © 2022 Rana Muhammad Zulqarnain et al. **Article.**

122. **Rashid, I., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Nazeer, I., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Rashid, T., Department of Mathematics, University of Management and Technology, Lahore, Pakistan. Intuitionistic fuzzy incidence graphs. Journal of Intelligent and Fuzzy Systems. 42, 3.**

Connectivity parameters have a crucial role in the study of different networks in the physical world. The notion of connectivity plays a key role in both theory and application of different graphs. In this article, a prime idea of connectivity concepts in intuitionistic fuzzy incidence graphs (IFIGs) with various examples is examined. IFIGs are essential in interconnection networks with influenced flows. Therefore, it is of paramount significance to inspect their connectivity characteristics. IFIGs is an extended structure of fuzzy incidence graphs (FIGs). Depending on the strength of a pair, this paper classifies three different types of pairs such as an  $\hat{I}$ -strong,  $\hat{I}^2$ -strong, and  $\hat{I}^3$ -pair. The benefit of this kind of stratification is that it helps to comprehend the fundamental structure of an IFIG thoroughly. The existence of a strong intuitionistic fuzzy incidence path among vertex, edge, and pair of an IFIG is established. Intuitionistic fuzzy incidence cut pairs (IFICPs) and intuitionistic fuzzy incidence trees (IFIT) are characterized using the idea of strong pairs (SPs). Complete

IFIG is defined, and various other structural properties of IFIGs are also investigated. The proof that complete IFIG does not contain any  $\hat{\Gamma}$ -pair is also provided. A real-life application of these concepts related to the network of different computers is also provided. © 2022-IOS Press. All rights reserved. **Article.**

123. **Tabassum, M.F., Department of Mathematics, University of Management and Technology, Lahore, 54000, Pakistan; Akram, S., Department of Mathematics, University of Management and Technology, Lahore, 54000, Pakistan.** *Solution of Non-Linear Chemical Processes using Novel Differential Gradient Evolution Algorithm. Discontinuity, Nonlinearity, and Complexity.* 11, 1.

Optimization for all disciplines is very important and relevant. Optimization has played a key role in the design and operation of industrial reactors, separation processes, heat exchangers and complete plants in Chemical Engineering. In this paper, a novel hybrid meta-heuristic optimization algorithm which is based on Differential Evolution (DE), Gradient Evolution (GE) and Jumping Technique (+) named as Differential Gradient Evolution Plus (DGE+) is presented. The main concept of this hybrid algorithm is to enhance its exploration and exploitation ability. The proposed algorithm hybridizes the above-mentioned algorithms with the help of an improvised dynamic probability distribution, additionally provides a new shake off method to avoid premature convergence towards local minima. The performance of DGE+ is investigated in thirteen benchmark unconstrained functions and the results are compared to the other state-of-the-art metaheuristics. The comparison shows that the proposed algorithm is able to outperform the other state-of-the-art meta-heuristics in almost all benchmark functions. To evaluate the efficiency of the DGE+ it has also been applied to complex constrained non-linear chemical design problems such as optimal operation of alkylation unit, reactor network design, optimal design of heat exchanger network, optimization of an isothermal continuous stirred tank reactor, the results of comparison revealed that the proposed algorithm is able to provide very compact, competitive and promising performance. © 2022. L&H Scientific Publishing, LLC. All Rights Reserved. **Article.**

124. **Rashid, T., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *A q-rung orthopair hesitant fuzzy stochastic method based on regret theory with unknown weight information. Journal of Ambient Intelligence and Humanized Computing.*

The present study introduces a q-rung orthopair hesitant fuzzy stochastic method based on regret theory to capture the psychological behavior of decision makers (DMs) in decision making. For this, first, according to the score and variance function of q-rung orthopair hesitant fuzzy number (q-ROHFN), a novel group satisfaction degree is defined, which can precisely mirror the overall level and group divergence. And then, on this basis, an optimization model of criteria weights is constructed, and the Lagrange function is formulated to cope with the situation where the information about criteria weights is entirely unknown. Next, the regret value and the rejoice value are obtained by the provided regret-rejoice function, and the alternatives are ranked according to the total psychological perception values of DMs under multi-state situations. Lastly, a case study concerning stock investment is addressed to demonstrate the implantation of the provided method. Besides this, detailed sensitivity analysis and comparison with relevant literature are performed to discuss the stability and superiority of the presented method. © 2022, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

125. **Saleem, N., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Single and Multivalued Maps on Parametric Metric Spaces Endowed with an Equivalence Relation. Advances in Mathematical Physics.* 2022.

This article presents the E-parametric metric space, which is a generalized concept of parametric metric space. After that, the discussion is concerned with the existence of fixed points of single and multivalued maps on E-parametric metric spaces satisfying some contractive inequalities defined by an auxiliary function. © 2022 Muhammad Usman Ali et al. **Article.**

126. **Khan, A.A., Department of Mathematics, School of Science, University of Management and Technology, C-II, Johar Town, Lahore, 54770, Pakistan; Ali, B., Department of Mathematics, School of Science, University of Management and Technology, C-II, Johar Town, Lahore, 54770, Pakistan.** *Completeness of metric spaces and existence of best proximity points. AIMS Mathematics.* 7, 5.

In this paper, we discuss the existence of best proximity points of new generalized proximal contractions of metric spaces. Moreover, we obtain a completeness characterization of underlying metric space via the best proximity points. Some new best proximity point theorems have been derived as consequences of main results in (partially ordered) metric spaces. © 2022 the Author(s). **Article.**

127. **Murtaza, G., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Hermite-Hadamard and Ostrowski type inequalities in h-calculus with applications.* **AIMS Mathematics.** 7, 4.

In this paper, we prove Hermite-Hadamard inequality for convex functions in the framework of h-calculus. We also use the notions of h-derivative and h-integral to prove Ostrowski's and trapezoidal type inequalities for bounded functions. It is also shown that the newly established inequalities are the generalization of the comparable inequalities in the literature. Finally, using some examples, we demonstrate the validity of newly formed inequalities and show how they can be used to special means of real numbers. © 2022 the Author(s), licensee AIMS Press. **Article.**

128. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Computation of Topological Indices of Double and Strong Double Graphs of Circumcoronene Series of Benzenoid Hm.* **Journal of Mathematics.** 2022.

Topological indices are very useful to assume certain physiochemical properties of the chemical compound. A molecular descriptor which changes the molecular structures into certain real numbers is said to be a topological index. In chemical graph theory, to create quantitative structure activity relationships in which properties of molecule may be linked with their chemical structures relies greatly on topological indices. The benzene molecule is a common chemical shape in chemistry, physics, and nanoscience. This molecule could be very beneficial to synthesize fragrant compounds. The circumcoronene collection of benzenoid Hm is one family that generates from benzene molecules. The purpose of this study is to calculate the topological indices of the double and strong double graphs of the circumcoronene series of benzenoids Hm. In addition, we also present a numerical and graphical comparison of topological indices of the double and strong double graphs of the circumcoronene series of benzenoid Hm. **Article.**

129. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Hydrodynamics and sensitivity analysis of calendaring process of a viscoelastic material.* **Archive of Applied Mechanics.**

In this article, equations of motion for the process of calendaring using a non-Newtonian upper-convected material calendaring with the porous rolls are modeled and analyzed. Lubrication approximation theory is used to simplify the equations of motion. The non-dimensionalized equations are solved for the pressure and velocity profiles. Engineering interest quantities such as maximum pressure, power input and roll separating forces are obtained numerically by using composite Simpson's rule. Using response surface methodology, sensitivity analysis is also applied to analyze the effects of Reynolds number and viscoelastic parameter on the sheet thickness, roll separating forces and power input. It is examined that the involved parameter Reynolds number has a greater impact on velocity distribution, pressure distribution and detachment point which are suitable for the process of calendaring. The roll separating force and the power input decrease for increasing the values of viscoelastic parameter. The sheet thickness is positively sensitive toward Reynolds number and viscoelastic parameter, while roll separating forces and power input are negatively sensitive to lower and middle levels of input parameters. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

130. **Nadeem, A., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Kashif, A., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Zafar, S., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *On the Fault Tolerant Partition Resolvability of Toeplitz Networks.* **Mathematical Problems in Engineering.** 2022.

In any interconnection network, fault tolerance is the most desirable property to achieve reliability. Toeplitz networks are used as interconnection networks due their smaller diameter, symmetry, simpler routing, high connectivity, and reliability. The partition dimension of a network is presented as an extension of metric dimension of networks. Its applications can be seen in several areas including robot navigation, network designing, image processing, and chemistry. In this article, the fault tolerant partition dimension,  $pd_2T_n(t)$ , of Toeplitz networks, is shown to be bounded below by 4 for  $t \geq 2, n \geq 4$ , whereas it is bounded above by 5 for  $t=3, n \geq 14$ . Further, it is shown that the exact value of  $pd_2T_n(t)$  equals 4 for  $t=2, n \geq 4$ ;  $t=3, n \in \{5, 6, \dots, 13\}$ ; and  $t \geq 4, n \geq t+2, t+3, t+4$ . **Article.**

131. **Tabassum, M.F., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Akram, S., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Optimal solution of engineering design problems through differential gradient evolution*



*plus algorithm: A hybrid approach. Physica Scripta. 97, 1.*

It is very necessary and applicable to optimize all disciplines. In practical engineering problems the optimization has been a significant component. This article presents the hybrid approach named as differential gradient evolution plus algorithm which is the combination of differential evolution algorithm and gradient evolution algorithm. was used to diversify and was used for intensification with a perfect equilibrium between exploration and exploitation with an improvised distribution of dynamic probability and offers a new shake-off approach to prevent premature convergence to local optimum. To describe the success, the proposed algorithm is compared to modern meta-heuristics. To see the accuracy, robustness, and reliability of it has been implemented on eight complex practical engineering problems named as: pressure vessel, belleville spring, tension/compression spring, three-bar truss, welded beam, speed reducer, gear train and rolling element bearing design problem, the results revealed that algorithm can deliver highly efficient, competitive and promising results. © 2022 IOP Publishing Ltd. [Article](#).

132. **Nadeem, M., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Jamil, R.N., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Study of Third-Grade Fluid under the Fuzzy Environment with Couette and Poiseuille Flows. Mathematical Problems in Engineering. 2022.*

In this work, fundamental flow problems, namely, Couette flow, fully developed plane Poiseuille flow, and plane Couette-Poiseuille flow of a third-grade non-Newtonian fluid between two horizontal parallel plates separated by a finite distance in a fuzzy environment are considered. The governing nonlinear differential equations (DEs) are converted into fuzzy differential equations (FDEs) and explain our approach with the help of the membership function (MF) of triangular fuzzy numbers (TFNs). Adomian decomposition method (ADM) is used to solve fundamental flow problems based on FDEs. In a crisp environment, the current findings are in good accord with their previous numerical and analytical results. Finally, the effect of the  $\alpha$ -cut  $\alpha \in [0,1]$  and other engineering constants on fuzzy velocity profile are investigated in graphically and tabular forms. Also, the variability of the uncertainty is studied through the triangular MF. © 2022 Muhammad Nadeem et al. [Article](#).

133. **Jafar, M.N., Department of Mathematics, University of Management and Technology, Lahore, 54000, Pakistan, Saeed, M., Department of Mathematics, University of Management and Technology, Lahore, 54000, Pakistan.** *Distance and Similarity Measures Using Max-Min Operators of Neutrosophic Hypersoft Sets With Application in Site Selection for Solid Waste Management Systems. IEEE Access. 10.*

The idea of a neutrosophic hypersoft set (NHSS) was coined by Smarandache in 2018 as a generalization of the soft set. This structure is a hybrid of a neutrosophic set with a hypersoft set. It can be a valuable structure for dealing with multi-attributes, multi-objective problems with disjoint attributive values. Similarity measures (SM) play a vital role in measuring the similarity index that how much the things are similar. Different types of similarity measures were developed in literature with different fuzzy, intuitionistic, and neutrosophic theories. It is intended to merge the neutrosophic theory with the hypersoft set theory and propose different similarity measures with the help of new proposed distances with max-min operators. Also, we proved different theorems and properties of distance and similarity measures. Then as solid waste management is a global issue, and there are some Solid Waste Management Systems (SWMS) for environment protection, so an example will be given for the site selection for SWMS to check the validity of proposed techniques. To verify the validity and superiority of the suggested work, it is contrasted to several existing methodologies, which show that decision-making issues with more bifurcation attributes provide more accurate and precise outcomes and can only be solved using this technique. In the future, the presented methodologies could be used in case studies with several qualities that are further bifurcated and multiple decision-makers. This proposed work can also be extended to many existing hypersoft set hybrids, such as Fuzzy hypersoft sets (FHSs), Intuitionistic hypersoft sets (IHSs), bipolar hypersoft sets (Bi-HSs), m-polar HSs, and Pythagorean hypersoft sets (PHSs). [Article](#).

134. **Saeed, M., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Ahsan, M., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan; Saeed, M.H., Department of Chemistry, University of Management and Technology, Lahore, 54770, Pakistan; Mehmood, A., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *The Prognosis of Allergy-Based Diseases Using Pythagorean Fuzzy Hypersoft Mapping Structures and Recommending Medication. IEEE Access. 10.*

The Pythagorean fuzzy set (PFS), which Yager extended, is a novel tool for dealing with ambiguity when considering membership (MS) grade  $p$  and non-membership (NMS)  $q$  that fulfil the criteria  $p^2 + q^2 \leq 1$  allowing the structure to characterise fuzziness more thoroughly and precisely than intuitionistic fuzzy sets. The Pythagorean Fuzzy Hypersoft (PFHS) set theory is a useful method for dealing with abnormalities and uncomfortable information in real-life situations. The Pythagorean fuzzy set and the Hypersoft set, which comprise the truthfulness grade (TG) and falsehood grade (FG) in the Pythagorean environment, are combined in the PFHS principle. This study tries to define the arguments around allergy diagnosis and the effects that arise with it. After considering the dire outcomes of Allergies, it becomes challenging to distinguish between the various types of Allergies and their complexity. Because the false portions of practical assessments are usually ignored, precision in the person's developmental history is difficult to recognize, and number of sessions cannot be projected. This work presents the PFHS set and PFHS mapping with its inverse mapping (INM) to alleviate these constraints. These notions are capable and necessary for correctly analyzing the problem by combining it with scientific modelling. This study establishes a link between symptoms and medications, lowering the narrative's complexity. For the various types of allergies, a table based on a fuzzy interval between  $[0, 1]$  is created. The techniques that are based on PFHS-mapping, which is used to effectively identify a problem then choose the right treatment for each patient's condition. © 2013 IEEE. **Article.**

135. **Rashid, T., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Sarwar Sindhu, M., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Selection of an alternative based on interval-valued hesitant picture fuzzy sets. Journal of Intelligent and Fuzzy Systems.* 42, 1.

Motivated by interval-valued hesitant fuzzy sets (IVHFSs) and picture fuzzy sets (PcFSs), a notion of interval-valued hesitant picture fuzzy sets (IVHPcFSs) is presented in this article. The concept of IVHPcFSs is put forward and some operational rules are developed to deal with it. The cosine similarity measures (SMs) are modified for IVHPcFSs to deal with interval-valued hesitant picture fuzzy (IVHPcF) data and the linear programming (LP) methodology is used to find out the criteria's weights. A multiple criteria decision making (MCDM) approach is then developed to tackle the vague and ambiguous information involved in MCDM problems under the framework of IVHPcFSs. For the validation and strengthen of the proposed MCDM approach a practical example is put forward to select the educational expert at the end. **Article.**

136. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Computational Analysis of Fluid Forces on an Obstacle in a Channel Driven Cavity: Viscoplastic Material Based Characteristics. Materials.* 15, 2.

In the current work, an investigation has been carried out for the Bingham fluid flow in a channel-driven cavity with a square obstacle installed near the inlet. A square cavity is placed in a channel to accomplish the desired results. The flow has been induced using a fully developed parabolic velocity at the inlet and Neumann condition at the outlet, with zero no-slip conditions given to the other boundaries. Three computational grids, C1, C2, and C3, are created by altering the position of an obstacle of square shape in the channel. Fundamental conservation and rheological law for viscoplastic Bingham fluids are enforced in mathematical modeling. Due to the complexity of the representative equations, an effective computing strategy based on the finite element approach is used. At an extra-fine level, a hybrid computational grid is created; a very refined level is used to obtain results with higher accuracy. The solution has been approximated using  $P_2 \sim P_1$  elements based on the shape functions of the second and first-order polynomial polynomials. The parametric variables are ornamented against graphical trends. In addition, velocity, pressure plots, and line graphs have been provided for a better physical understanding of the situation. Furthermore, the hydrodynamic benchmark quantities such as pressure drop, drag, and lift coefficients are assessed in a tabular manner around the external surface of the obstacle. The research predicts the effects of Bingham number ( $Bn$ ) on the drag and lift coefficients on all three grids C1, C2, and C3, showing that the drag has lower values on the obstacle in the C2 grid compared with C1 and C3 for all values of  $Bn$ . Plug zone dominates in the channel downstream of the obstacle with augmentation in  $Bn$ , limiting the shear zone in the vicinity of the obstacle. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

137. **Saleem, N., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *A New Study on the Fixed Point Sets of Proinov-Type Contractions via Rational Forms. Symmetry.* 14, 1.

In this paper, we presented some new weaker conditions on the Proinov-type contractions which guarantees that a self-mapping  $T$  has a unique fixed point in terms of rational forms. Our main results improved the conclusions provided by Andreea Fulga (On  $(\hat{I}, \hat{I}^*)$ -Rational Contractions) in which the continuity assumption can either be reduced to orbital

continuity,  $k^*$ -continuity, continuity of  $T_k$ , T-orbital lower semi-continuity or even it can be removed. Meanwhile, the assumption of monotonicity on auxiliary functions is also removed from our main results. Moreover, based on the obtained fixed point results and the property of symmetry, we propose several Proinov-type contractions for a pair of self-mappings  $(P, Q)$  which will ensure the existence of the unique common fixed point of a pair of self-mappings  $(P, Q)$ . Finally, we obtained some results related to fixed figures such as fixed circles or fixed discs which are symmetrical under the effect of self mappings on metric spaces, we proposed some new types of  $(\tilde{I}, \tilde{I}^*)$ -rational contractions and obtained the corresponding fixed figure theorems on metric spaces. Several examples are provided to indicate the validity of the results presented. Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

138. **Siddique, I., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *On the role of bioconvection and activation energy for time dependent nanofluid slip transpiration due to extending domain in the presence of electric and magnetic fields.* [Ain Shams Engineering Journal](#). **13**, 1.

A mathematical analysis for slip effects on MHD nanofluid in the presence of electromagnetic field and gyrotactic microorganisms is considered. The influence of activation energy and thermal radiation are also discussed. The transportation of nanofluids provides a feasible option for the enhancement of thermal distribution. A rather new aspect of this work is the diffusion and bioconvection of motile microorganisms. It may avoid possible settling of nano-entities. A system of highly non-linear partial differential equations is transformed into Ordinary differential equations by using suitable similarity transformation. The converted ordinary differential equations are then solved numerically by utilizing the shooting technique is built-in function bvp4c solver on the plate form of commercial software Matlab. The results obtained are verified through acceptable agreement with those of the existing one as a special case. The quantities of interest are observed physically. The characteristics of various emerging parameters on the velocity field, temperature distribution and volumetric concentration of nanoparticles, microorganism concentration as well as skin friction coefficient, the gradient of temperature, local Sherwood number, and density number of motile microorganisms are interpreted and reflected in tabulated and graphical form. It is noticed that velocity decreases with the rising values of  $M$ . Also, the temperature rises directly with  $N_b$  and  $N_t$ . With the growing values of  $L_b$ , the microorganism profile does down. © 2021. [Article](#).

139. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Heat and flow control in cavity with cold circular cylinder placed in non-newtonian fluid by performing finite element simulations.* [Coatings](#). **12**, 1.

A study on strategies regarding advancement in heat transfer characteristics in two-di-mensional closed domains by placing cold cylinders is conducted. This effort is undertaken due to the fact that active and passive control in heat transmission is connected with provision of temperature differences at different locations of enclosures. Based on the experiments, researchers have concluded that placement of cold cylinder in non-uniformly distributed heat in a cavity is the most effective technique to enrich heat transfer rate, along with reducing the the waste of extra heat generation in processes such as polymer and aero dynamical extrusion, glass cooling, refrigeration, heating and cooling systems. Thus, the prime goal of this work is to outline heat and flow characteristics of non-linear fluid occupied in a square enclosure with adjustment of the cold cylinder. Heat transfer attributes are incorporated by accounting buoyancy forces and forming coupling of molecular diffusion of fluid within the flow domain. Formulation of the problem in dimensionless form is attained by encapsulating the aspects of natural convection in view of principal partial differential equations. Parametric study for governing expressions is computed numerically with the finite element method based on COMSOL Multiphysics version 5.6. Quadric interpolating functions are used to obtain information about velocity and temperature on nodes in elements. Hybrid mesh-ing is manifested for discretization of the domain into rectangular and triangular elements. For the optimized variation in flow structures, prospective parameters are varied from  $0.5 \times 1.5$ ,  $5 \times 35$  and  $10 \times 10$ . The achieved results are projected graphically through stream-lines, isotherms, and local and average Nusselt numbers. Tabular data for kinetic energy and wall heat flux are also calculated. It is inferred through the analysis that, with uplift in the Rayleigh number ( ) elevation in the magnitude of kinetic energy and convective heat transfer arises, whereas the reverse pattern is depicted versus the power-law index ( ). © 2021 by the authors. Licensee MDPI, Basel, Switzerland. [Article](#).

140. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 8 Stefanowskiego St., Lodz, 90-924, Poland, Department of Mathematics, University of**

**Management and Technology, Lahore, Pakistan.** *Investigating the spread of a disease on the prey and predator interactions through a nonsingular fractional model.* **Results in Physics.** 32.

In the present contribution, an iterative process is used in solving prey and predator interactions through a nonsingular fractional model. The structure used in this model is the general Holling type interactions. The theoretical properties of the system, including the local stability conditions of equilibrium points along with the proof of existence and uniqueness of solutions for the model is also investigated. To highlight the effect of the parameters in the model, various simulations have been performed to better clarify the role of some parameters in the problem. The fractional operator used in the model of this paper can be considered a powerful tool in better describing the phenomenon. Our results confirm that the considered ecosystem can approximately simulate the expected conditions in the real problem. These results encourage us to use fractional structures with non-single kernels in modeling similar computational problems in the transmission of epidemic diseases. © 2021 The Authors. **Article.**

141. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St., Lodz, 90924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Dynamics of fractional order delay model of coronavirus disease.* **AIMS Mathematics.** 7, 3.

The majority of infectious illnesses, such as HIV/AIDS, Hepatitis, and coronavirus (2019-nCov), are extremely dangerous. Due to the trial version of the vaccine and different forms of 2019-nCov like beta, gamma, delta throughout the world, still, there is no control on the transmission of coronavirus. Delay factors such as social distance, quarantine, immigration limitations, holiday extensions, hospitalizations, and isolation are being utilized as essential strategies to manage the outbreak of 2019-nCov. The effect of time delay on coronavirus disease transmission is explored using a non-linear fractional order in the Caputo sense in this paper. The existence theory of the model is investigated to ensure that it has at least one and unique solution. The Ulam-Hyres (UH) stability of the considered model is demonstrated to illustrate that the stated model's solution is stable. To determine the approximate solution of the suggested model, an efficient and reliable numerical approach (Adams-Bashforth) is utilized. Simulations are used to visualize the numerical data in order to understand the behavior of the different classes of the investigated model. The effects of time delay on dynamics of coronavirus transmission are shown through numerical simulations via MATLAB-17. © 2022 the Author(s), licensee AIMS Press. **Article.**

142. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St., Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, C-II Johar Town., Lahore, 54770, Pakistan.** *Numerical scheme and stability analysis of stochastic Fitzhugh-Nagumo model.* **Results in Physics.** 32.

This article deals with the Fitzhugh-Nagumo equation in the presence of stochastic function. A numerical scheme has been developed for the solution of such equations which preserves the certain structure of the unknown functions, also we have given the stability analysis, consistency of the problem, and explicitly optimal a priori estimates for the existence of solutions of such equations. A unique solution has been guaranteed. The corresponding explicit estimates in the function spaces are formulated in the form of theorems. Lastly, one important feature of the article is the simulation of the proposed numerical scheme in the form of the 2D and 3D plots which shows the efficacy of the stochastic analysis of such nonlinear partial differential equations. © 2021. **Article.**

143. **Iqbal, Z., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Aziz-Ur Rehman, M., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Ahmed, N., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Structure preserving algorithm for fractional order mathematical model of COVID-19.* **Computers, Materials and Continua.** 71, 2.

In this article, a brief biological structure and some basic properties of COVID-19 are described. A classical integer order model is modified and converted into a fractional order model with  $\frac{1}{4}$  as order of the fractional derivative. Moreover, a valued structure preserving the numerical design, coined as Grunwald-Letnikov non-standard finite difference scheme, is developed for the fractional COVID-19 model. Taking into account the importance of the positivity and boundedness of the state variables, some productive results have been proved to ensure these essential features. Stability of the model at a corona free and a corona existing equilibrium points is investigated on the basis of Eigen values. The Routh-Hurwitz criterion is applied for the local stability analysis. An appropriate example with fitted and estimated set of parametric values is presented for the simulations. Graphical solutions are displayed for the chosen values of  $\frac{1}{4}$

(fractional order of the derivatives). The role of quarantined policy is also determined gradually to highlight its significance and relevancy in controlling infectious diseases. In the end, outcomes of the study are presented. © 2022 Tech Science Press. All rights reserved. **Article.**

144. **Rahman, A.U., Department of Mathematics, University of Management and Technology, Lahore, Pakistan; Saeed, M., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Decision making algorithmic techniques based on aggregation operations and similarity measures of possibility intuitionistic fuzzy hypersoft sets.* **AIMS Mathematics.** 7, 3.

Soft set has limitation for the consideration of disjoint attribute-valued sets corresponding to distinct attributes whereas hypersoft set, an extension of soft set, fully addresses this scarcity by replacing the approximate function of soft sets with multi-argument approximate function. Some structures (i.e., possibility fuzzy soft set, possibility intuitionistic fuzzy soft set) exist in literature in which a possibility of each element in the universe is attached with the parameterization of fuzzy sets and intuitionistic fuzzy sets while defining fuzzy soft set and intuitionistic fuzzy soft set respectively. This study aims to generalize the existing structure (i.e., possibility intuitionistic fuzzy soft set) and to make it adequate for multi-argument approximate function. Therefore, firstly, the elementary notion of possibility intuitionistic fuzzy hypersoft set is developed and some of its elementary properties i.e., subset, null set, absolute set and complement, are discussed with numerical examples. Secondly, its set-theoretic operations i.e., union, intersection, AND, OR and relevant laws are investigated with the help of numerical examples, matrix and graphical representations. Moreover, algorithms based on AND/OR operations are proposed and are elaborated with illustrative examples. Lastly, similarity measure between two possibility intuitionistic fuzzy hypersoft sets is characterized with the help of example. This concept of similarity measure is successfully applied in decision making to judge the eligibility of a candidate for an appropriate job. The proposed similarity formulation is compared with the relevant existing models and validity of the generalization of the proposed structure is discussed. © 2022 the Author(s), licensee AIMS Press. **Article.**

145. **Riaz, M.B., Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 1/15 Stefanowskiego St., Lodz, 90-924, Poland, Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Phase portrait, multi-stability, sensitivity and chaotic analysis of Gardner's equation with their wave turbulence and solitons solutions.* **Results in Physics.** 32.

The Gardner's equation is investigate in this article, and numerous unique solutions are discover by utilizing direct-algebraic technique. We can view a big series of innovative outcomes in a more intuitive and simple way than with the old method for executing Gardner's solutions. Many solitons solution are obtain and evaluate by using various software like Mathematica, maple and MATLAB. We use Mathematica for obtain solution representation of 2D, 3D graphs. After that, we use Galilean transformation to transform the system into a planer dynamical system. All potential examples of phase portraiture are represent by graphs in terms of the parameters. Furthermore, our recent job is actually enquiry quite advantageous and valuable in supporting us in fixing concerns including shock waves, solitonic behaviour, and so on. We apply sensitive analysis theory, which offers us with a wide range of linear periodic and first rate periodic character. In this paper, sensitivity analysis, chaos analysis, and multi-stability analysis of Gardner's equation are examine. © 2021 The Author(s). **Article.**

146. **Murtaza, G., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *Post-quantum simpson's type inequalities for coordinated convex functions.* **AIMS Mathematics.** 7, 2.

In this paper, we prove some new Simpson's type inequalities for partial  $(p, q)$ -differentiable convex functions of two variables in the context of  $(p, q)$ -calculus. We also show that the findings in this paper are generalizations of comparable findings in the literature. © 2022 the Author(s), licensee AIMS Press. This is an open access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>). **Article.**

147. **Rashid, T., Department of Mathematics, University of Management and Technology, Lahore, 54770, Pakistan.** *Three-way decision with conflict analysis approach in the framework of fuzzy set theory.* **Soft Computing.** 26, 1.

This paper aims to develop a novel conflict resolution model using decision-theoretic fuzzy rough set to handle more complex real scenarios by allowing decision-makers to express their opinions more freely on a scale from  $\hat{1}$  to 1. Further, many algorithms are developed to handle change in information systems, and detailed experimental analysis is

done to validate the proposed model's efficiency and practicality. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. [Article](#).

148. **Riaz, M.B., Department of Mathematics, University of Management and Technology, Lahore, 54000, Pakistan.** *Periodic solutions for two dimensional quartic non-autonomous differential equation. Intelligent Automation and Soft Computing.* 31, 3.

In this article, the maximum possible numbers of periodic solutions for the quartic differential equation are calculated. In this regard, for the first time in the literature, we developed new formulae to determine the maximum number of periodic solutions greater than eight for the quartic equation. To obtain the maximum number of periodic solutions, we used a systematic procedure of bifurcation analysis. We used computer algebra Maple 18 to solve lengthy calculations that appeared in the formulae of focal values as integrations. The newly developed formulae were applied to a variety of polynomials with algebraic and homogeneous trigonometric coefficients of various degrees. We were able to validate our newly developed formulae by obtaining maximum multiplicity nine in the class C4,1 using algebraic coefficients. Whereas the maximum number of periodic solutions for the classes C4,4; C5,1; C5,5; C6,1; C6,6; C7,1 is eight. Additionally, the stability of limit cycles belonging to the aforementioned classes with algebraic coefficients is briefly discussed. Hence, we conclude from the above-stated facts that our new results are a credible, authentic and pleasant addition to the literature. © 2022, Tech Science Press. All rights reserved. [Article](#).

149. **Saleem, N., Department of Mathematics, University of Management and Technology, Lahore, Pakistan.** *On two new contractions and discontinuity on fixed points. AIMS Mathematics.* 7, 2.

This paper deals with a well known open problem raised by Kannan (Bull. Calcutta Math. Soc., 60: 71–76, 1968) and B. E. Rhoades (Contemp. Math., 72: 233–245, 1988) on the existence of general contractions which have fixed points, but do not force the continuity at the fixed point. We propose some new affirmative solutions to this question using two new contractions called  $(\tilde{I}, \tilde{I}^*)$ -A-contraction and  $(\tilde{I}, \tilde{I}^*)$ -A<sup>2</sup>-contraction inspired by the results of H. Garai et al. (Applicable Analysis and Discrete Mathematics, 14(1): 33–54, 2020) and P. D. Proinov (J. Fixed Point Theory Appl. (2020) 22: 21). Some new fixed point and common fixed point results in compact metric spaces and also in complete metric spaces are proved in which the corresponding contractive mappings are not necessarily continuous at their fixed points. Moreover, we show that new solutions to characterize the completeness of metric spaces. Several examples are provided to verify the validity of our main results. © 2022 the Author(s), licensee AIMS Press. [Article](#).

150. **Ali, B., Department of Mathematics, School of Science, University of Management and Technology, C-II Johar Town, Lahore, Pakistan; Sundus, N., Department of Mathematics, School of Science, University of Management and Technology, C-II Johar Town, Lahore, Pakistan.** *Fixed Points of Multivalued  $(\tilde{I}, \tilde{I}^*)$ -Contractions and Metric Transforms. Studies in Systems, Decision and Control.* 373.

The functions when composed with metrics yield another metric, are known as metric preserving functions in the literature. A particular case of metric preserving functions are metric transforms. Metric transform is a function  $I: [0, \infty) \rightarrow \mathbb{R}$  which is strictly increasing and concave with  $I(0) = 0$ . There are metric preserving functions which are not metric transforms. In this chapter, we consider the concept of existence of fixed point sets of multivalued mappings of metric spaces in connection with metric transforms. In this context, we consider  $(\tilde{I}, \tilde{I}^*)$  contractions, multivalued  $(\tilde{I}, \tilde{I}^*)$  contractions,  $(\tilde{I}, \tilde{I}^*)$  uniform local multivalued contraction and generalized multivalued  $(\tilde{I}, \tilde{I}^*)$  contractions. Our purpose is to extend some fixed point results for multivalued contractions to the case multivalued  $(\tilde{I}, \tilde{I}^*)$  contractions. Further, we used the metrics which are sequentially, strong semi sequentially and semi sequentially equivalent to the Hausdorff metric on collection of non-empty, closed and bounded subsets to obtain more general fixed point results. We obtain important fixed point results in the literature as the corollaries of the main theorem in this paper. We present some examples to manifest the applicability, usefulness and generality of our conclusions. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG. [Book Chapter](#).

151. **Saeed, M., Department of Mathematics, University of Management and Technology, C-2 Johar Town, Lahore, 54000, Pakistan.** *Fuzzy Logic Controller for Aviation Parking with 5G Communication Technology. Studies in Systems, Decision and Control.* 372.

The fourth industrial revolution is the current trend of automation. Devices that are connected with multiple networks are still unable to connect fastly, and the world is looking for the application of the massive IoT, whereas the 5G network is enabled to meet the demand. It is a dire need to automate the aviation industry with this technology. So, in this research, a Fuzzy Logic Controller (FLC) for the parking of aircrafts is proposed and all the calculations are done using the fuzzy logic controller toolbox of MATLAB. An aircraft can be parked without human interference by seeking the

information of flights and the availability of parking space in the garage along with the clearance of the runway. Membership values of FLC are taken in the form of a neutrosophic number and then converted into a fuzzy number using the accuracy function. Results evaluate that 5G will automate the Aviation automation industry with precision and efficiency in operation. 5G also has an ability of flexibility support to the upcoming technologies which are unknown to us. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG. **Book Chapter.**

152. **Imran, M.A., Department of Mathematics, University of Management and Technology Lahore, Lahore, 54770, Pakistan.** *Unsteady flow of fractional Burgers's fluid in a rotating annulus region with power law kernel.* *Alexandria Engineering Journal.* 61, 1.

Keeping in view of the complex fluid mechanics in bio-medicine and engineering, the Burgers's fluid with a fractional derivatives model analyzed through a rotating annulus. The governing partial differential equation solved for velocity field and shear stress by using integral transformation method and using Bessel equations. The transformed equation inverted numerically by using Gaver-Stehfest's algorithm. The approximate analytical solution for rotational velocity, and shear stress are presented. The influence of various parameters like fractional parameters, relaxation and retardation time parameters material constants, time and viscosity parameters are drawn numerically. It is found that the relaxation time and time helps the flow pattern, on the other hand other material constants resist the fluid rotation. Fractional parameters effect on fluid flow is opposite to each other. Finally, to check the validity of the solution there are comparisons for velocity field and shear stress for obtained results with another numerical algorithm named Tzou's algorithm. © 2021. **Article.**

153. **Riaz, M.B., Department of Mathematics, University of Management and Technology, Lahore, Pakistan, Institute for Groundwater Studies, University of the Free State, South Africa.** *Numerical analysis of a bi-modal covid-19 SITR model.* *Alexandria Engineering Journal.* 61, 1.

This study presents a structure preserving nonstandard finite difference scheme to analyze a susceptible-infected-treatment-recovered (SITR) dynamical model of coronavirus 2019 (covid-19) with bimodal virus transmission in susceptible population. The underlying model incorporates the possible treatment measures as the emerging scenario of covid-19 vaccines. Keeping in view the fact that the real time data for covid-19 is updated at discrete time steps, we propose a new structure preserving numerical scheme for the proposed model. The proposed numerical scheme produces realistic solutions of the complex bi-modal SITR nonlinear model, converges unconditionally to steady states and reflects dynamical consistency with continuous sense of the model. The analysis of the model reveals that the model remains stable at the steady state points. The basic reproduction number  $R_{covid}$  falls less than 1 when treatment rate is increased and disease will die out. On the other hand, it predicts that human population may face devastating effects of pandemic if the treatment measures are not strictly implemented. © 2021. **Article.**

154. **Nadeem, A., Department of Physics, School of Science, University of Management and Technology Lahore, Pakistan; Iqbal, M.A., Department of Physics, School of Science, University of Management and Technology Lahore, Pakistan.** *Optoelectronic investigation of lithium di-manganese oxide with doping of Nickel via  $Li_{1-x}Ni_xMn_2O_4$  where  $x = 4\%$  and  $8\%$  composition and their application.* *Journal of Solid State Chemistry.* 309.

Spinel Compounds have potential applications in electrical and optoelectronics fields. In this study, we explore the electronic and optical properties of  $Li_{1-x}Ni_xMn_2O_4$  where ( $x = 4\%$  and  $8\%$ ) are calculated by first-principles method based on the approximation known as the GGA  $+U$  ( $U$  is the Hubbard parameter). The local density approximation (LDA) and generalized gradient approximation (GGA) do not treat properly the transition metal. Therefore we have used the GGA  $+U$ . The band-gap-dependent optical characteristics such as dielectric constant, reflectivity, optical conductivity and, refractive index are calculated and examined. The replacement of the cation is observed and investigated for the studied compound and a prominent change is noticed. The reinforcement of the cation percentage of Ni reduces the band-gap and its dependent optical parameters. For device fabrication in different regions of the spectrum, this variation is highly recommended. © 2022 Elsevier Inc. **Article.**

155. **Nadeem, A., Department of Physics, University of Management and Technology, Lahore, Pakistan; Azhar Iqbal, M., Department of Physics, University of Management and Technology, Lahore, Pakistan.** *First-principles quantum analysis on the role of V-doping on the tuning of electronic and optical properties of spinel oxides  $MnTi_2O_4$ .* *Materials Science and Engineering B: Solid-State Materials for Advanced Technology.* 278.

Role of half-metallic ferromagnetic spinels is of great interest in spintronic and optoelectronic energy-efficient devices. In this work, we report a systematic investigation on the structural, electronic, optical and magnetic properties for undoped and V-doped magnetic spinels  $\text{MnTi}_2\text{O}_4$ . In particular, we investigated the role of V-doping on the electronic and optical properties of V-doped  $\text{MnTi}_2\text{O}_4$  compounds via  $\text{MnTi}_{2-x}\text{VO}_4-x$ ,  $\text{MnTi}_2\text{O}_4-x$ ,  $\text{MnTi}_2\text{O}_{1-x}$  and  $\text{MnTi}_{1-x}\text{VO}_4$  (where  $x = \text{V}$ ) doping schemes. To better investigate the magnetic character and half-metallicity of the compounds, we calculated electronic properties both for up and down spin polarized electronic states. To count for correlation-effect, corrections owing to on-site coulomb repulsion arising from 3d electrons of Ti, Mn and V, we applied WC-GGA + U and LSDA + U methods for the calculations of magnetic properties of  $\text{MnTi}_2\text{O}_4$ . While the electronic and optical properties were performed by GGA + U method. After V-doping at the positions of Ti and O elements, we noted a considerable modification on the electronic and the optical properties of  $\text{MnTi}_2\text{O}_4$ . In particular, the intermediate band gap semiconducting nature of the un-doped  $\text{MnTi}_2\text{O}_4$  spinel oxide changed into a wide band gap semiconducting and of half-metallic nature after V doping. Our results on the magnetic properties predict an improvement of orders over the earlier reported theoretical values. The spin polarized splitting of density of states for majority and minority spin and the calculated magnetic moments revealed half-metallic ferrimagnetic and ferromagnetic nature of the compounds with different potentials. © 2022 Elsevier B.V. **Article.**

156. **Ain, Q., Department of Physics, University of Management and Technology, Lahore, Pakistan.** *Electronic structure and optical response of double perovskite  $\text{Rb}_2\text{NaCoF}_6$  for optoelectronic devices.* **Physica B: Condensed Matter.** 627.

The bonding nature, structural, electrical, and optical properties of  $\text{Rb}_2\text{NaCoF}_6$  has been investigated using density functional theory (DFT) calculations in this communication. The results are based on the total energy calculations using density functional theory by employing the Full-Potential Linearized Augmented Plane Wave (FP-LAPW) approach. A direct band gap of 1.5eV is observed along  $(X\hat{\sim}X)$  points with generalized gradient approximation (GGA). The improvement in the band gap i.e. 2.2eV is achieved with modified Becke-Johnson potential. The total and partial density of states shows a good agreement with the band structure. The bonding nature of the compound is studied with a contour plot of electron density. Further emphasis has been given to  $\text{Rb}_2\text{NaCoF}_6$  hexafluoroperovskite absorption and reflection spectra, which reveal substantial absorption and reflection in the ultraviolet region. From the current work in  $\text{Rb}_2\text{NaCoF}_6$ , it is expected that the numerous quantum mechanical phenomena would be able to provide a better understanding in designing the practical devices. © 2021 Elsevier B.V.

**Article**

157. **Shaheen, S., Department of Physics, School of Science, University of Management and Technology, Lahore, 54000, Pakistan; Iqbal, A., Department of Physics, School of Science, University of Management and Technology, Lahore, 54000, Pakistan.** *Graphene oxide-ZnO nanorods for efficient dye degradation, antibacterial and in-silico analysis.* **Applied Nanoscience (Switzerland).** 12, 2.

Numerous concentrations of graphene oxide (GO)-doped into ZnO nanostructures were synthesized with co-precipitations method. The characterization of the designed composite was carried out using a number of techniques, and their photocatalytic ability was also evaluated. The parameters such as plane orientation, interplanar distance as confirmed using XRD were consistent with HRTEM results. The PL analysis revealed a blueshift in the energies associated with NBEs, which verified the impact of dopant quenching. The findings indicate that ZnO was loaded uniformly on the GO surface due to an efficient interface coupling. Due to such interface coupling between ZnO and GO, electrons can be passed directly from the ZnO (VB) to the GO. The facile nanocomposites (NCs) exhibited excellent photoactivity and are considered to offer a new path for designing next-generation graphene-based semiconductor composites. Furthermore, as-synthesized samples exhibited promising bactericidal potential towards gram-positive (G + ve) and gram-negative (G - ve) bacteria in *S. aureus* and *E. coli* media, respectively for bacterium. Furthermore, molecular docking studies was employed to unveil the mystery behind bactericidal activity of GO-ZnO NRs and suggested inhibition of  $\beta$ -lactamase and DNA gyrase as mechanism behind these in vitro findings. © 2021, King Abdulaziz City for Science and Technology.

**Article.**

158. **Ain, Q., Department of Physics, University of Management and Technology, Lahore, Pakistan.** *Ground state electronic structure, optical and thermoelectric response of Zintl phase  $\text{MgAl}_2\text{X}_2$  ( $X = \text{C}, \text{Sb}$ ) for renewable energy applications.* **Physica B: Condensed Matter.**

Zintl compounds have gained exceptional interest in optoelectronic and thermoelectric applications. The present work includes the detailed study of electronic, optical and thermal response of Zintl phase  $\text{MgAl}_2\text{X}_2$  ( $X = \text{C}, \text{Sb}$ ) under the



umbrella of density functional theory (DFT). Generalized gradient approximation (GGA) and modified Becke-Johnson (mBJ) potentials are used to determine the exchange-correlation potential. The structures are optimized and the stability is achieved with formation energy. An indirect bandgap of 2.74eV is observed in MgAl<sub>2</sub>C<sub>2</sub> with mBJ potential whereas MgAl<sub>2</sub>Sb<sub>2</sub> shows a metallic nature. The optical response of both compounds is calculated which confirms the potential of MgAl<sub>2</sub>C<sub>2</sub> in future optoelectronic devices. The material's thermoelectric response is also evaluated using the BoltzTrap code. The figure of merit (ZT) value is achieved up to 0.83 in the case of MgAl<sub>2</sub>C<sub>2</sub> which indicates that it exhibits strong thermoelectric behavior and it is a promising candidate for applications in renewable energy devices. © 2022 Elsevier B.V. **Article.**

## School of Food & Agricultural Sciences

159. **Khalid, N., Schools of Food and Agricultural Sciences, University of Management and Technology, Lahore, 54000, Pakistan; Khan, R.S., Schools of Food and Agricultural Sciences, University of Management and Technology, Lahore, 54000, Pakistan.** *Formulation and characterization of yogurt prepared with enzymatically hydrolyzed potato powder and whole milk powder.* **Journal of Food Science and Technology.** 59, 3.

This study highlights the optimization of a suitable amount of enzymatically hydrolyzed potato powder (EHPP) with whole milk powder (WMP) to produce a quality yogurt. The yogurt was prepared with different levels of EHPP (0, 10, 15, 20, 25, 35 and 50% w/w) with WMP and evaluated after 24 h at 4 °C. The resulted product was analyzed on the basis of physicochemical, sensory, texture, antioxidant activity and microbiological analysis. The prepared yogurt showed a significant ( $p < 0.05$ ) decrease in pH, protein and fat while acidity, moisture and ash contents were increased compared with control yogurt. In addition, textural parameters like hardness and adhesiveness were decreased while no significant ( $p < 0.05$ ) change was found in springiness and cohesiveness. Moreover, color parameters such as  $L^*$  and  $a^*$  values decreased while  $b^*$  values were increased. The current study suggested that the yogurt sample supplemented with 25% EHPP of WMP certainly improved the physicochemical, texture, microstructure, color, antioxidant and sensory properties of yogurt with EHPP. The prepared yogurt with EHPP provided an excellent flavor, satisfying sweetness, and homogeneous texture. The yogurt prepared from the EHPP presented potential industrial applications. © 2021, Association of Food Scientists & Technologists (India). **Article.**

160. **Akhtar, A., School of Food and Agricultural Sciences, University of Management and Technology, Lahore, 54000, Pakistan; Nazir, W., School of Food and Agricultural Sciences, University of Management and Technology, Lahore, 54000, Pakistan.** *Characterisation of O/W emulsions encapsulating ergocalciferol using onion skin waste saponins: insights on formulation and release properties.* **International Journal of Food Science and Technology.** 57, 2.

The study was conducted to produce ergocalciferol (Vit-D<sub>2</sub>) loaded oil-in-water (O/W) emulsions utilising the onion skin waste saponins (OSW) as a natural emulsifier and almond oil as carrier oil. The impact of different formulations upon the digestibility of lipids, LCT (long-chain triglycerides) or MCT (medium-chain triglycerides), and bioaccessibility of Vit-D<sub>2</sub> was analysed. The mean particle size diameter of almond oil-based O/W emulsions was decreased with increasing homogenisation pressure and emulsifier concentration. During 120 mins of digestion in small intestinal fluids (SIF), almond oil in high-lipid emulsions (5% w/w) was not fully digested, resulting in a lower bioaccessibility of ergocalciferol than low-lipid samples. Almond oil emulsions with larger particle size have a slower rate of lipid digestion than the smaller size particles, but the release rate of free fatty acids was constant throughout the digestion process. Moreover, almond oil emulsions showed similar Vit-D<sub>2</sub> bioaccessibility to the oil-based emulsions but were much higher than MCTs. © 2021 Institute of Food Science and Technology. **Article.**

161. **Rahman, U.U., School of Food and Agricultural Sciences, University of Management and Technology, Lahore, Pakistan.** *Gelatin extraction from fish waste and potential applications in food sector.* **International Journal of Food Science and Technology.** 57, 1.

Fish solid wastes include different by-products such as bones, scales and hides that are high in collagen content and account for up to 75% of the total body weight. These wastes can be utilised for the extraction of different products such as gelatin that can be used in different food and pharmaceutical industries. Fish gelatin can be used as a replacement for mammalian gelatin due to its nutritional profile as it contains all the amino acids: essential and non-essential. Fish gelatin cannot only be used as a replacement for bovine and porcine gelatin but it also increases the utilisation of fish waste and reduces pollution. This review summarises the potential utilisation of different fish waste byproducts, extraction

techniques and its application in different food products as an alternative to commercially available porcine and bovine gelatin. © 2021 Institute of Food, Science and Technology (IFSTTF). **Review.**

162. **Khalid, N., School of Food and Agricultural Sciences, University of Management and Technology, Lahore, 54000, Pakistan.** *Fabrication and Characterization of Dodecenyl Succinic Anhydride Modified Kudzu Starch.* *Starch/Staerke.* 74, 2-Jan.

The dodecenyl succinic anhydride (DDSA) modified kudzu starch is fabricated and characterized in this study. After modification, granule size of kudzu starch exhibits bigger than that of native kudzu starch. The viscosity of DDSA-modified kudzu starch is increased in comparison with the native one. However, there is no detectable surface change of kudzu starch granules before and after modification. To elucidate the esterification between starch molecules and DDSA groups or octenyl succinic anhydride (OSA) groups, the characteristic peaks of DDSA-modified or OSA-modified kudzu starch are determined using Fourier transform infrared spectroscopy (FT-IR). Moreover, differential scanning calorimetry (DSC) thermograms reveal that the gelatinization temperatures and enthalpy of modified kudzu starch are lower than that of the native counterpart. Stable O/W emulsions are obtained after storage at room temperature for 30 days, as the concentration of modified kudzu starch is above 2% (w/w) according to the results of oil droplet size and confocal laser scanning microscopy analysis. This study demonstrates that DDSA modification can improve properties of kudzu starch and then potentially broaden its applications. © 2021 Wiley-VCH GmbH. **Article.**

### School of Pharmacy

163. **Khan, A.Q., Faculty of Pharmacy, University of Management and Technology, Lahore, Pakistan** *Pharmacological exploration of anti-arthritic potential of terbutaline through in-vitro and in-vivo experimental models.* *Pakistan Journal of Pharmaceutical Sciences.* 35, 1.

Terbutaline have been reported to have anti-inflammatory activity. Present study aimed to check the antiarthritic activity of terbutaline. The drug was tested using in vitro models (bovine serum albumin denaturation, egg albumin denaturation and HRBC membrane stabilization) and in vivo (formaldehyde induced arthritis). Results of bovine serum albumin denaturation assay illustrated that terbutaline inhibited 89.54±0.46% denaturation at 6400µg/ml concentration. Terbutaline resulted in dose dependent impediment of protein denaturation in egg albumin denaturation assay with 74.40±0.72% inhibition at concentration of 6400µg/ml. Terbutaline also showed protection of HRBC membrane against hypotonic stress in a dose dependent manner, with maximum 76.45±0.62% prevention at 6400µg/ml concentration. Results of formaldehyde induced arthritis model showed that paw volume was significantly declined by terbutaline with maximum percentage inhibition at 10th day of study period which implies immune inhibitory potential of terbutaline. Findings of present study concluded that terbutaline has arthritis reducing potential possible through inhibitory effects on synthesis and release of inflammatory mediators as well as limiting the formation of autoantigen. Thus, terbutaline might be the potential candidate for use in treatment of arthritis. © 2022 Pakistan Journal of Pharmaceutical Sciences. All rights reserved. **Article.**

164. **Cheema, E., School of Pharmacy, University of Management and Techbology, Lahore, Pakistan** *Efficacy and safety of delafloxacin, ceftaroline, ceftobiprole, and tigecycline for the empiric treatment of acute bacterial skin and skin structure infections: A network meta-analysis of randomized controlled trials.* *Saudi Pharmaceutical Journal.*

Background: This review aimed to conduct an indirect comparison using a Bayesian network meta-analysis of randomized controlled trials (RCTs) to compare the efficacy and safety of delafloxacin versus other single antibiotic regimens for the empiric treatment of Acute Bacterial Skin and Skin Structure Infections. Method: A systematic search with no start date restrictions was conducted. The Cochrane Risk of Bias tool was used to assess the quality of included RCTs. Results: Of the 577 studies initially identified, nine RCTs were included in the review. The network meta-analysis showed that ceftaroline, ceftobiprole, delafloxacin and tigecycline had similar efficacy in the indirect comparisons [Ceftaroline Odds Ratio (OR) = 1.2, 95% CrI = 0.46–3.6), ceftobiprole (OR = 1.3, 95% CrI = 0.34–3.0) and tigecycline (OR = 0.96, 95% CrI = 0.30–2.9)]. However, the ranking plot for the intention to treat (ITT) population showed that delafloxacin had a probability of 80.8% to be ranked first followed by ceftobiprole (13.1%). The analysis of the overall adverse events showed that ceftaroline (OR = 0.88, 95% CrI = 0.65–1.2), ceftobiprole (OR = 1.1, 95% CrI = 0.69–2.0), delafloxacin (OR = 0.88, 95% CrI = 0.57–1.3) and tigecycline (OR = 1.4, 95% CrI = 0.88–2.2) had similar safety profiles. Conclusion: Delafloxacin did not show any statistically significant differences when compared to ceftaroline, ceftobiprole, and tigecycline in terms of efficacy and safety. However, the surface under the cumulative ranking curve (SUCRA) probability ranked delafloxacin as the first option for the ITT population. © 2022 The Authors. **Article.**

## UMOs

165. Saeed, M., Office of Research Innovation and Commercialization, University of Management and Technology, C-II Block C 2 Phase 1 Johar Town, Punjab, Lahore, 54770, Pakistan. *Carbon Emissions and Socioeconomic Drivers of Climate Change: Empirical Evidence from the Logarithmic Mean Divisia Index (LMDI) Base Model for China*. *Sustainability (Switzerland)*. 14, 4.

The main objective of the present study was to examine the impact of socioeconomic factors on environmental degradation or preservation using the logarithmic mean disivia index (LMDI). The study used the latest data from thirty Chinese provinces from 2012 to 2020. Pooled mean group (PMG) results were estimated to determine the long-term and short-term impact of the aforementioned compound variables on carbon emissions. The study results revealed that population growth, per capita GDP growth, and fossil fuel-led energy consumption, positively impacted environmental degradation in China at the provincial level. However, clean energy intensity and a transition towards renewable energy in China are helping to reduce carbon emissions. Similarly, clean energy intensity is also helping to lower carbon emissions. The study proposed that at the provincial level, joint efforts were required to control environmental degradation in China. The positive impact of renewable energy intensity on carbon emissions encourages the transition from fossil fuels to clean energy sources for environmentally friendly growth. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. **Article.**

166. Sarwar, T., University of Management and Technology, Lahore, Pakistan. *Information professionals' quality of work-life and its impact on their job performance*. *Library Management*.

Purpose: Job performance (JP) of employees is a key indicator of success for any organization; however, job performance is dependent on many factors including personal and organizational. The current study aims to investigate this phenomenon concerning the quality of work-life (QoWL). Design/methodology/approach: The study design was quantitative, and a questionnaire was filled by 130 professional librarians based on a convenient sampling technique. The research population was academic information professionals (IPs) serving the university libraries of Lahore, Pakistan. Data were analyzed using SPSS (20.0). Findings: Job career satisfaction is proved a key indicator of JP along with job control and general well-being (GWB). Counterproductive work behavior (CWB), which is a negative behavior, is significantly affected by poor job satisfaction (JS), stress, feelings of unhappiness and low workplace autonomy. Practical implications: The study suggests that if poor JS, stress, feelings of unhappiness and low workplace autonomy could be manipulated positively, CWB may be reduced and there are chances to improve the JP of IPs. Originality/value: This is one of the first attempts that focuses on QoWL and its impact on JP of IPs. The study findings may help leaders and library administration to take employees' friendly decisions to provide a conducive work environment. © 2021, Emerald Publishing Limited. **Article.**

167. Ameen, A., Office of Research Innovation and Commercialization, University of Management and Technology, Lahore, Pakistan. *Health and environmental effects of heavy metals*. *Journal of King Saud University – Science*. 34, 1.

Seafood safety is a critical requirement for sustained global quantitative and qualitative development. In recent years, unintended poisons have damaged human health and food quality. Heavy metals (HMs) distribution, speciation, bioaccumulation, and toxicity evaluation in aquatic settings are at their peak. Safe ecosystems have a significant influence in the possible composition of safe aquaculture products, which serve as the foundation of every food web. HMs eventually impose a number of stresses on the living organisms, contributing to increased mortality. Therefore, this study reflects and explains the exposure of heavy metals to aquatic food as well as the resulting health risks to humans. A more in-depth review on the translocation processes of metal toxins into seafood is provided. Finally, for achieving stability in aquatic environments, management techniques, genetic engineering, and remediation are recommended. © 2021 The Author(s). **Review.**

## Articles without Schools/Departmental affiliation

168. Farooq, M.S., University of Management and Technology, Lahore, Lahore, Pakistan. *Big Data Processing and Analysis in Internet of Vehicles: Architecture, Taxonomy, and Open Research Challenges*. *Archives of Computational Methods in Engineering*. 29, 2.

The extensive progression in the Internet of Vehicles (IoV) and the exponential upsurge in data consumption reflect the importance of big data in IoV. In general, big data has gained a significant attraction in academia and industry to provide valuable business intelligence and evidence-based decisions. This has been a key enabler for the advancement of the

Internet of Vehicles (IoV) in which big data can be leveraged for efficient processing and valuable decisions. Moreover, data acquired from connected vehicles, traffic monitoring, social media feeds, and, crowd-sourcing can strengthen urban development and management. The purpose of this study is to synthesize a systematic review of all related research articles from January 2014 to September 2020 in well-alleged venues. We have rigorously surveyed the research papers to understand potential opportunities, methodologies, and challenges of using big data in IoV. This review shows that big data can play a key role in providing sound and valuable predictions and also provide a comprehensive analysis of several methods, tools, and techniques for the use of big data in IoV. Apart from reviewing the state-of-the-art studies of using big data in IoV, a taxonomy of the said also has been proposed. Furthermore, the article outlined and discussed several key challenges in IoV with notable recommendations and open research dimensions for using big data in IoV. © 2021, CIMNE, Barcelona, Spain. **Review.**

169. **Mushtaq, M.T., University of Management and Technology, Lahore, Pakistan.** *Experimental testbed evaluation of cell level indoor localization algorithm using Wi-Fi and LoRa protocols.* **Ad Hoc Networks.** 125.

Exact location of an object is not required in some scenarios of indoor localization and all we need to know is the area or a cell where the object is present in a room or a hall. For instance, the object to be located is large and we are interested in knowing the locations of the cell in which the object lies, or we want to find the quadrant of a room in which the object of interest lies. For such cases, in this paper, we propose a novel 2-phase cell localization algorithm based on trilateration. In the first phase we find the path loss exponent for each anchor node using RSSIs and in second phase we divide the available space into virtual cells and find the location of the cell in which the object is present. We have conducted real testbed experiments using Wi-Fi and LoRa with different transmission powers and calculated the error. Results show that the proposed algorithm successfully performs cell localization and Wi-Fi based localization is better than that of LoRa. Moreover, we have also studied how the accuracy of localization is affected by cell size in both of the wireless protocol. © 2021 Elsevier B.V. **Article.**

170. **Aurooj, A., University of Management and Technology, Lahore, Pakistan; Mahmood, Z., University of Management and Technology, Lahore, Pakistan.** *Subjective Experiences of Alzheimer's Disease in the Pakistani Cultural Context: An Exploratory Study.* **Journal of Religion and Health.** 61, 1.

Studying Alzheimer's disease with the fluctuating environmental, individual, and cultural factors in pertinence to the Diagnostic Statistical Manual (DSM-5) requires information, awareness, and understanding of the disease. Studies have calibrated sociocultural factors to be imperative in the expression of functional symptomology of Alzheimer's disease. Pakistan as a sociocentric, predominantly Muslim country, calls for such efforts. The current research was conducted to study the functional symptomology and experiences of Alzheimer's disease. A qualitative approach was adopted in which in-depth interviews of three dyads of patients with Alzheimer's disease and their caregivers (N = 6) were conducted. Interpretative Phenomenological Analysis was applied to acquire the thematic analysis of data. Results showed sociocentrism as a forefront factor. Cognition, behavior, and emotions were found to be functionally expressed by religion, unawareness, respect of older people, stigmatization, and isolation within family dynamics. The study could be an instigator for further culture-oriented assessment and management providing services. © 2021, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature. **Article.**

171. **ul Hassan, S., Department of Chemistry, COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan, University of Management & Technology, Lahore Campus, Lahore, 54770, Pakistan.** *Synthesis of mesoporous zirconium manganese mixed metal oxide nanowires for photocatalytic reduction of CO<sub>2</sub>.* **Journal of Materials Research.** 37, 2.

A facile hydrothermal route was successfully adopted for the synthesis of novel mixed zirconium manganese oxide (ZrO<sub>2</sub>•Mn<sub>3</sub>O<sub>4</sub>) nanowires with the help of surfactant. The synthesized sample was analyzed by powder XRD, ED-XRF, SEM, FTIR, UV-visible, and XPS analysis. The XRD analysis confirmed the formation of mixed zirconium manganese oxide (ZrO<sub>2</sub>•Mn<sub>3</sub>O<sub>4</sub>) nanowires. ED-XRF analysis provided the chemical composition of the material. The surface properties of the zirconium manganese oxide nanowires were studied by XPS analysis. The pore size distribution and pore volume measurements carried out by gas sorption method confirmed the formation of single pore in nanowires. These nanowires were successfully utilized for the photo reduction of CO<sub>2</sub> through water as a solvent under UV light. The nanowires exhibited an average photocatalytic reduction CO<sub>2</sub> into CH<sub>4</sub> (1.46 × 10<sup>-4</sup> mol L<sup>-1</sup> h<sup>-1</sup>) which is higher than commercial photocatalysts. Graphical abstract: [Figure not available: see fulltext.] © 2021, The Author(s), under exclusive licence to The Materials Research Society. **Article.**

172. Sami, F., University of Management and Technology, Lahore, Pakistan; Butt, M.M., University of Management and Technology, Lahore, Pakistan. *On the ridge estimation of the Conway-Maxwell Poisson regression model with multicollinearity: Methods and applications*. *Concurrency and Computation: Practice and Experience*. 34, 1.

In data analysis, count data modeling contributing a significant role. The Conway-Maxwell Poisson (COMP) is one of the flexible count data models to deal over and under dispersion. In the COMP regression model, when the explanatory variables are correlated, then the maximum likelihood estimator does not give efficient results due to the large standard error (SE) of the estimates. To overcome the effect of multicollinearity, we have proposed some ridge regression estimators in the COMP regression model by introducing dispersion parameter in the context of overdispersion, equidispersion, and underdispersion. The Iterative reweighted least method is used for the estimation of ridge regression coefficients in the COMP regression model. To evaluate the performance of the proposed estimators, we use mean squared error (MSE) as the performance evaluation criteria. Theoretical comparison of the proposed estimators with the competitor estimators is made and conditions of efficiency have been derived. The proposed estimator is evaluated with the help of a simulation study and two real applications. The results of the simulation study and real applications show the superiority of the proposed estimator because the proposed estimator produces smaller MSE and SEs of the COMP regression estimates with multicollinearity. © 2021 John Wiley & Sons Ltd. **Article.**

173. Yousafzai, A., School of Electronics and Information, Kyung Hee University, Seoul, South Korea, University of Management and Technology, Lahore, Pakistan. *Blockchain-based incentive management framework for desktop clouds*. *Cluster Computing*.

Desktop clouds connect several desktop computers into a cloud computing architecture to reap the potential of untapped commodity computing power over the Internet. In desktop clouds, what benefit (incentive) a participant will get for sharing its computational resources, and how participants will contribute (pay) after consuming computational resources from other participants. This inexistence of monetary incentives hinders the widespread adoption of desktop clouds as there is no motivation for the participants to join and remain in the desktop cloud environment. In this article, we propose a decentralized escrow approach over the ethereum blockchain for enhancing the expectation of a participating node to join and offer services in desktop cloud networks. We then propose a distributed multi-agent framework for desktop cloud environments. Moreover, we present the agents' full algorithmic behavior with their interaction to the escrow over the ethereum smart contract. The proposed framework provides monetary incentives using blockchain-based cryptocurrencies managed through decentralized escrow over ethereum smart contract to the desktop cloud participants in a trusted manner. Lastly, we present simulation results from a testbed verifying the monetization of desktop cloud participants in the proposed framework. © 2022, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature. **Article.**

174. Hussain, B., University of Management and Technology (UMT), Lahore, Pakistan, Visiting Fellow, Nottingham University Business School, University of Nottingham, Nottingham, United Kingdom. *Performance measurement and management in the British higher education sector*. *Quality and Quantity*.

Theoretical enquiry and empirical studies demonstrate the significance of performance management (PM) in the higher education sector and it is a fulcrum for developing a strategic role for people management within universities. In spite of the perceived weaknesses of people management in the higher education sector, in general, the current period of rapid and substantial contextual change may necessitate greater formalisation of HR practices across the British higher education sector. In addition to the changing role of the HR function and line managers, these developments may result in an increasingly stringent performance regime across the sector, especially in more hard-pressed institutions. Through a literature review and a pilot study, this paper attempts to address two main research questions: (i) what are the current performance management practices in the British Higher Education sector? and (ii) what needs to be done to strategically align these practices within HEIs in the UK? This paper discusses the wider literature related to performance management in general and to academic institutions in particular. We also undertook a small-scale qualitative study to explore the views of HR professionals on the need for, and the current performance measurement systems in their universities in the UK. The preliminary findings confirmed that PM is a key issue in the respondents' institutions, with substantial and recent changes in policy. This underscores the need for a large-scale research agenda to capture the current dynamics of change the sector is undergoing. The paper concludes by stimulating a policy debate and placing a number of research calls, along with suggestions on how these research questions may be investigated. © 2022, The

Author(s), under exclusive licence to Springer Nature B.V. [Article](#).

175. **Raja, A.A., University of Management and Technology, Lahore, Pakistan.** *Financial risks and performance of conventional and Islamic banks: Do reputational risk matters?* [Journal of Islamic Accounting and Business Research](#).

Purpose: The purpose of this paper is to shed light on the reputational risk, which is elusive and difficult to measure due to the lack of its conclusive definition. Literature supports the notion that financial risks may translate into reputational risks that pose threat to bank performance. However, empirical investigations in this context are still at their nascent stage. Design/methodology/approach: This study has used a panel dataset for the sample of 24 conventional and Islamic banks regarding the period 2007–2017 by using a structural equation model. Findings: The results of this study show that reputational risk partially mediates the relationship between financial risks and the performance of conventional banks. However, for Islamic banks, the reputational risk remains insignificant as a mediator. This study provides significant implications to risk managers in banks, regulators and academics to understand the role of reputational risk linked to financial risks for the improvement of bank performance. Originality/value: This study aims to add to the literature by measuring reputational risk through the shareholders reputational score index, which is used as a mediator to determine whether financial risks of banks affect the performance of conventional and Islamic banks in Pakistan. © 2022, Emerald Publishing Limited. [Article](#).

176. **Tariq, U., University of Management and Technology (UMT), Johar Town Lahore, Pakistan.** *Language Analysis and the Role of Facebook Hashtags in Pakistan.* [Social Science Computer Review](#).

Over the past few years, online hashtags have gained tremendous fame mainly because of two reasons: first, as digital information trackers and second, as short and spontaneous communication tags. The present study aims to explore language factors in three types of Facebook hashtags, that is, long, short, and multiple mixed. It further investigates each factor's role in online communication by performing an in-depth examination through activities and close-ended questions. First, it identifies factors through the writing activities where participants wrote different hashtags with their intention behind each hashtag. It follows interpretation activities in which other participants wrote their interpretations about the already written hashtags. Further, a 5-point Likert scale questionnaire was developed to note participants' opinions about hashtags which were evaluated by the SPSS factor analysis test. Results of the study are divided into three sections and showed that lack of adequate vocabulary and lower casing is an important factor affecting digital communication in Pakistan. It is also suggested that teachers should play their part to improve informal writing and digital literacy in Pakistan. © The Author(s) 2022. [Article](#).

177. **Mukhtar, S., University of Management and Technology, Lahore, Pakistan.** *A Public Health Perspective of "My Body, My Choice" in Aurat March of Pakistan: A Crisis of Marital Rape During COVID-19 Pandemic.* [Asia-Pacific Journal of Public Health](#).

[No abstract available]. [Article](#).

178. **Alvi, A., University of Management and Technology, Lahore, 54770, Pakistan.** *Interpretable and adaptable early warning learning analytics model.* [Computers, Materials and Continua](#). 71, 2.

Major issues currently restricting the use of learning analytics are the lack of interpretability and adaptability of the machine learning models used in this domain. Interpretability makes it easy for the stakeholders to understand the working of these models and adaptability makes it easy to use the same model for multiple cohorts and courses in educational institutions. Recently, some models in learning analytics are constructed with the consideration of interpretability but their interpretability is not quantified. However, adaptability is not specifically considered in this domain. This paper presents a new framework based on hybrid statistical fuzzy theory to overcome these limitations. It also provides explainability in the form of rules describing the reasoning behind a particular output. The paper also discusses the system evaluation on a benchmark dataset showing promising results. The measure of explainability, fuzzy index, shows that the model is highly interpretable. This system achieves more than 82% recall in both the classification and the context adaptation stages. © 2022 Tech Science Press. All rights reserved. [Article](#).

179. **Mahboob, A., University of Management and Technology, Lahore, Pakistan; Rashid, T., University of Management and Technology, Lahore, Pakistan; Sindhu, M.S., University of Management and Technology, Lahore, Pakistan.** *An optimization preference based approach with hesitant intuitionistic linguistic distribution in group decision making.* [Expert Systems with Applications](#). 187.

Multi-criteria group decision making (MCGDM) performs the central role for a selection of attributes in different firms.

The conventional techniques for the selection of alternatives are insufficient. A weighted preference method using hesitant intuitionistic linguistic distribution (HILD) has been suggested to overcome this difficulty by comparing it with the (technique for order of preference by similarity to ideal solution) TOPSIS method for the selection of the best ideal solution. The proposed technique has been introduced to select the best ideal solution for an organization. Moreover, sensitivity analysis (SA) based on weights and time complexity (TC) are performed to empower the proposed technique. After calculating the best ideal solution based on HILD preference technique, the TOPSIS technique has been applied. Finally, the comparison of these two techniques is highlighted. © 2021 Elsevier Ltd. **Article.**

180. **Rashid, H., University of Management and Technology, Lahore, Pakistan.** *Comparative Study of Data Driven Approaches Towards Efficient Electricity Theft Detection in Micro Grids.* **Lecture Notes in Networks and Systems.** 279.

In this research article, we tackle the following limitations: high misclassification rate, low detection rate and, class imbalance problem and no availability of malicious or theft samples. The class imbalanced problem is severe issue in electricity theft detection that affects the performance of supervised learning methods. We exploit the adaptive synthetic minority oversampling technique to tackle this problem. Moreover, theft samples are created from benign samples and we argue that the goal of theft is to report less than consumption actual electricity consumption. Different machine learning and deep learning methods including recently developed light and extreme gradient boosting (XGBoost), are trained and evaluated on a realistic electricity consumption dataset that is provided by an electric utility in Pakistan. The consumers in the dataset belong to different demographics and, different social and financial backgrounds. Different number of classifiers are trained on acquired data; however, long short-term memory (LSTM) and XGBoost attain high performance and outperform all classifiers. The XGBoost achieves a 0.981 detection rate and 0.015 misclassification rate. Whereas, LSTM attains 0.976 and 0.033 detection and misclassification rate, respectively. Moreover, the performance of all implemented classifiers is evaluated through precision, recall, F1-score, etc. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG. **Conference Paper.**

181. **Riaz, M.B., University of Management and Technology, Lahore, Pakistan, Institute for Groundwater Studies, University of the Free State, South Africa.** *A generalized operational matrix of mixed partial derivative terms with applications to multi-order fractional partial differential equations.* **Alexandria Engineering Journal.** 61, 1.

In this paper, a computational approach based on the operational matrices in conjunction with orthogonal shifted Legendre polynomials (OSLPs) is designed to solve numerically the multi-order partial differential equations of fractional order consisting of mixed partial derivative terms. Our computational approach has ability to reduce the fractional problems into a system of Sylvester types matrix equations which can be solved by using MATLAB builtin function `lyap(.)`. The solution is approximated as a basis vectors of OSLPs. The efficiency and the numerical stability is examined by taking various test examples. © 2021 THE AUTHORS. **Article.**

## Sialkot Campus

### KUBEAC

182. **Sadaf, M., Knowledge Unit of Business, Economics, Accountancy and Commerce (KUBEAC), University of Management and Technology, Sialkot Campus.** *Antibiotics and antibiotic resistant genes in urban aquifers.* **Current Opinion in Environmental Science and Health.** 26.

The prevalence of antibiotics and antibiotic resistant genes (ARGs) in groundwater has piqued attention in recent years, owing to their potential public health risks. Antibiotic resistome, including ARGs and antibiotic resistance bacteria (ARB), can be transferred to urban aquifers through several pathways such as discharges from hospitals, aquaculture farms, livestock farms, domestic sewerage, wastewater treatment plants, and landfill leachate. The current review explores comprehensive information about the occurrence and sources of frequently reported antibiotics and related resistance genes in global groundwater resources, mainly located in urban areas. Besides, nexus among antibiotics™ production, groundwater occurrence, and associated ARGs is highlighted as a case study for tetracycline antibiotics. Further, the transfer and dissemination mechanisms of ARGs and potential health impacts of antibiotic resistance development are also elucidated. Furthermore, existing research gaps and prospects for further areas of research on antibiotics and ARGs in urban aquifers are also addressed. © 2021 Elsevier B.V. **Review.**

183. **Mirza, F., KUBEAC Department, University of Management and Technology, Sialkot, Pakistan.** *Untying the Influence of Advertisements on Consumers Buying Behavior and Brand Loyalty Through Brand Awareness: The Moderating Role of Perceived Quality.* **Frontiers in Psychology. 12.**

Consumer buying behavior is an important aspect in every marketing strategy to produce maximum output from the market. This study aims to determine how advertisement affects consumer buying behavior and brand loyalty by considering a mediator between brand awareness and the moderating role of perceived quality. For this purpose, this study targets the rising cosmetics industry. This study used the purposive sampling technique to collect data from 300 respondents with the help of an online survey method via Google doc. The partial least squares structural equation modeling PLS-SEM was applied to verify the hypotheses relationships. The findings have confirmed that advertisements substantially predicted brand awareness, brand loyalty, and consumer buying behavior. Furthermore, brand awareness partially mediated the association of advertisement with brand loyalty and consumer buying behavior. Also, perceived quality is significantly moderated on the association of brand awareness with brand loyalty and consumer buying behavior. Based on such findings, this study has contributed to the literature and provided new insights into the practical implications alongside the future roadmap of the survey. Copyright © 2022 Zhao, Butt, Murad, Mirza and Saleh Al-Faryan. **Article.**

184. **Feroz, H.M.B., Knowledge Unit of Business Economics Accountancy and Commerce (KUBEAC), University of Management and Technology, Sialkot Campus, Sialkot, Pakistan.** *Examining multiple engagements and their impact on students' knowledge acquisition: the moderating role of information overload.* **Journal of Applied Research in Higher Education. 14, 1.**

Purpose: Knowledge acquisition is a pivotal concern for the students and many sources help them to obtain knowledge. In this paper, the authors theoretically examine three engagements such as social media, peer and academic engagement by the theoretical foundation of engagement theory which tells that students interact and collaborate, sharing information for the acquisition of knowledge that enhances their academic performance. But due to the abundance of information, knowledge and resources available to students for the acquisition of knowledge, it becomes difficult for them to comprehend the most relevant information. In this vein, this study examined the impact of information overload on the relationship between social media, peer and academic engagement and knowledge acquisition of students. Design/methodology/approach: The proposed model and structural relationships were validated using the structural equation modeling (SEM) technique through AMOS, version 24.0. To empirically test the hypothesized model, data are collected from the universities of the Sahiwal region (Sahiwal, Okara, Pakpattan) using structured questionnaires. Findings: The findings revealed that social media engagement and academic engagement are positively associated with knowledge acquisition, whereas peer engagement is negatively associated with knowledge acquisition. Moreover, the results of the study further suggested that information overload dampens the positive relationship between social media, peer and academic engagement and knowledge acquisition, which causes negative consequences on students' knowledge acquisition and learning outcomes. Research limitations/implications: Researchers can use this study as the literature as many of the previous studies focused on the positive side of social networking sites and technologies for knowledge purposes, but this study extends the research and focused on the other side of the picture which has been ignored earlier by researchers. The authors theoretically explained the adverse effects of information overload on students' academic progress caused by social media and the abundance of irrelevant information these advanced technologies offer daily. The current research focused on identifying the critical role of social media, peer and academic institutions providing a lot of information to students which caused stress, anxiety and other psychological issues in them. So, this study adds to the literature by highlighting the adverse effects of unnecessary information provided by multiple resources to students. Practical implications: Educationalists can adopt this study as a tool in academic institutions for promoting learning and to actively engage students in collaborative learning activities. As the findings of the study confirm that information overload is caused by the imbalanced use of information technology (IT) and social media sites, so teachers can help students in developing creativity and maintaining the balance between using technology and innovation in their studies pattern. Universities and institutions can play a vital role by exploring further opportunities for students and by making such policies that can help students in their learning progress. For this purpose, the authors developed a model based on the literature and theories that could change the academic system of Pakistan and enhance students' practical knowledge by motivating students in taking part in learning activities by making the higher education system of Pakistan more engaging. Social implications: The authors are presenting simulation games-



based learning as an alternate approach to learning and teaching that can positively influence students' engagement with learning activities in Pakistan. By adopting this model, the education system of Pakistan could improve as it can lead to better academic performance of students, which ultimately leads to a better education system. Thus, games if correctly designed and implemented in the education system of Pakistan, it can make a great difference in students' value of learning experience. The enjoyment, interactive and realistic nature of the simulation games appears to produce this value, and students tend to engage more toward these types of games rather than traditional learning methods. Simulation games provide students with an opportunity to engage in both hard (financial management, strategy making, decision-making) and soft skills (negotiation, collaboration) in business by challenging their thinking and decision-making power in a safe learning environment. Originality/value: The phenomena of overload have become increasingly viable due to abundance of resources providing unnecessary information to students as they can get information from peers, teachers, social media platforms, blogs, wikis and many other platforms, which ultimately exhaust their capacity and leading them toward poor academic performance and other negative consequences (Yu, 2019; Bosch, 2016). This study focuses on students of higher education in Pakistan (Sahiwal region) and discusses the major challenges and opportunities that they had to face with the advancement of technology and the current social state of the knowledge in society. © 2021, Emerald Publishing Limited. **Article.**

185. **Raza, A., Knowledge Unit of Business, Economics, Accountancy and Commerce, University of Management and Technology Lahore, Sialkot Campus, Sialkot, Pakistan.** *CMS at 13: a retrospective of the journey.* *Chinese Management Studies.* 16, 1.

Purpose: To commemorate the 13th anniversary of the Chinese Management Studies (CMS) and suggest future research directions, this study aims to present an overview of the CMS through a systematic bibliometric analysis from 2007 to 2019. The analysis emphasizes the trend of themes, structure of publications and citations, the most cited publications, the most productive authors, universities, countries and regions. Design/methodology/approach: The study uses the data extracted from the Scopus database to present an overview; besides, it also uses VOSviewer and Bibliometrix software packages to visualize the intellectual network of CMS. Findings: This analysis is based on 486 publications between 2007 and 2019. Results show that there is a rising trend in the number of citations to CMS. The researchers from China were the most frequent contributors to the journal, whereas researchers from the USA, Taiwan, Singapore and Australia were well represented. In addition, the results show that innovation, leadership, human resource management and corporate social responsibility have been the most important research themes in the journal. Practical implications: This study offers an objective view of the CMS publication structure. The study's findings can help the journal readers obtain a quick snapshot of the leading trends occurring in the journal. Furthermore, this study provides future research directions for the journals by underscoring important themes. Originality/value: As the journal's first retrospective, this study not only educates and enriches CMS's global readers and aspiring contributors but can also be useful to its editorial board, as it provides several inputs in the form of future research directions to guide the journal's progress. © 2021, Emerald Publishing Limited. **Article.**

186. **Iqbal, S., KUBEAC, University of Management and Technology, Sialkot Campus, Pakistan.** *Energy Financing, Covid-19 Repercussions and Climate Change: Implications For Emerging Economies.* *Climate Change Economics.*

This study is intended to test the role of renewable energy financing on climate change and to present the implications for the key stakeholders towards the acquisition of post-covid-recovery in the Asian and ASEAN economies. For this, data envelopment analysis (DEA) technique is applied to draw an inference between the constructs. Study finding resulted that higher energy consumption and rise in environmental pollution has brought a great change in the ASEAN and Asian economies' climate, for which, modern and renewable energy sources are suggested to use for the climate change mitigation. A sufficient amount of funds and the supply of energy finance to mitigate the climate change are eminently needed for the post-covid-recovery. Different financial institutions, banks and finance ministries of countries belonging from the both regions are suggested to play the best role. This is solely possible by pooling the funds in renewable energy sectors to enhance energy efficiency and control the climate change. This must be executed for the long-run period to get the desired outcomes. All the countries of both regions are further suggested to expedite the practices to apply strategic development goals (SDGs) for affordable and clean energy (SDG-7), climate change action (SDG-13) to achieve the national and global strategic objectives. © 2022 World Scientific Publishing Company. **Article.**

187. **Iqbal, S., KUBEAC, University of Management & Technology, Sialkot Campus, Pakistan.** *Financial stability's role on climate risks, and climate change mitigation: Implications for green economic recovery.* **Environmental Science and Pollution Research.**

As a response to the topic of how financial stability might be used to effectively finance for the mitigation of climate change and climate risks, it is important to look at the carbon risk that is still present in G-5 nations. The goal of our research is to determine the impact of financial stability on climate risk in order to effectively manage climate mitigation efforts. A technique called GMM is used to achieve this goal. Climate change mitigation was found to be substantial at 18 percent, while financial stability and carbon hazards were found significant at 21 percent, according to the conclusions of the study. Furthermore, the G-5 countries' 19.5% correlation between financial stability and emissions drift, which raises climate change concerns, is noteworthy. In order to implement green economic recovery methods, one of the most strongly regarded approaches to mitigating climate change and ensuring long-term financial potential at the national scale, a country's financial stability is required. The research on green economic expansion also offers the associated stakeholders with detailed policy implications on this relevance. © 2022, The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature. **Article.**

188. **Raza, A., Knowledge Unit of Business, Economics, Accountancy and Commerce, University of Management and Technology, Sialkot, Pakistan.** *Innovative work behaviour: the what, where, who, how and when.* **Personnel Review.**

Purpose: This study aims to analyse the current trends and set the future research agenda in employee-level innovative work behaviour (IWB) research. Design/methodology/approach: A portfolio of 910 publications on IWB collected from the Scopus database was systematically analysed using different bibliometric techniques. Findings: Based on the performance analysis and science mapping of innovative work behaviour research, the study identifies the most prolific sources of IWB publications and lists several future research directions. Originality/value: This paper could serve as one-stop information that may facilitate transdisciplinary endeavours by assisting scholars and practitioners in identifying peer-recognised publications and scholarly communities. © 2021, Emerald Publishing Limited. **Article.**

## KUST

189. **Ashraf, M.U., Department of Computer Science, University of Management and Technology, Sialkot, Pakistan.** *Local-tetra-patterns for face recognition encoded on spatial pyramid matching.* **Computers, Materials and Continua.** 70, 3.

Face recognition is a big challenge in the research field with a lot of problems like misalignment, illumination changes, pose variations, occlusion, and expressions. Providing a single solution to solve all these problems at a time is a challenging task. We have put some effort to provide a solution to solving all these issues by introducing a face recognition model based on local tetra patterns and spatial pyramid matching. The technique is based on a procedure where the input image is passed through an algorithm that extracts local features by using spatial pyramid matching and max-pooling. Finally, the input image is recognized using a robust kernel representation method using extracted features. The qualitative and quantitative analysis of the proposed method is carried on benchmark image datasets. Experimental results showed that the proposed method performs better in terms of standard performance evaluation parameters as compared to state-of-the-art methods on AR, ORL, LFW, and FERET face recognition datasets. © 2022 Tech Science Press. All rights reserved. **Article.**

190. **Mehak, S., Knowledge Unit of System and Technology, University of Management and Technology, Sialkot Campus 51310, Pakistan; Usman Ashraf, M., Department of Computer Science, University of Management and Technology, Sialkot Campus 51310, Pakistan.** *Automated grading of breast cancer histopathology images using multilayered autoencoder.* **Computers, Materials and Continua.** 71, 2.

Breast cancer (BC) is the most widely recognized cancer in women worldwide. By 2018, 627,000 women had died of breast cancer (World Health Organization Report 2018). To diagnose BC, the evaluation of tumours is achieved by analysis of histological specimens. At present, the Nottingham Bloom Richardson framework is the least expensive approach used to grade BC aggressiveness. Pathologists contemplate three elements, 1. mitotic count, 2. gland formation, and 3. nuclear atypia, which is a laborious process that witnesses variations in expert's opinions. Recently,

some algorithms have been proposed for the detection of mitotic cells, but nuclear atypia in breast cancer histopathology has not received much consideration. Nuclear atypia analysis is performed not only to grade BC but also to provide critical information in the discrimination of normal breast, non-invasive breast (usual ductal hyperplasia, atypical ductal hyperplasia) and pre-invasive breast (ductal carcinoma in situ) and invasive breast lesions. We proposed a deep-stacked multi-layer autoencoder ensemble with a softmax layer for the feature extraction and classification process. The classification results show the value of the multilayer autoencoder model in the evaluation of nuclear polymorphisms. The proposed method has indicated promising results, making them more fit in breast cancer grading. © 2022 Tech Science Press. All rights reserved. [Article](#).

## KUS

191. **Ali, S., Department of Biotechnology, University of Management and Technology, Sialkot, Pakistan** *Syzygium cumini (L.) Skeels extracts; in vivo anti-nociceptive, anti-inflammatory, acute and subacute toxicity assessment.* [Journal of Ethnopharmacology](#). 287.

Ethnopharmacological relevance: *Syzygium cumini* (L.) Skeels has been extensively used in the ancient medical system of Pakistan, India, Bangladesh, and Sri Lanka to combat diabetes, inflammation, and renal disorders. These health-promoting aspects of *S. cumini* are related to bioactive metabolites such as phenolic acids, anthocyanins, tannins, and flavonoids. Aim of the study: Earlier to this study, we have reported *S. cumini* extracts as potential sources of bioactive compounds bearing antioxidant and anti-inflammatory properties. However, prior further suggesting *S. cumini* fruit extracts for consumption against inflammatory disorders, it was mandatory to validate the claim and explore toxicity of the extracts. This study aims to determine the in vivo anti-nociceptive, anti-inflammatory, acute, and subacute toxicity properties of *S. cumini* crude extracts, followed by identifying and quantifying bioactive metabolites. Material and methods: In the present study, the anti-nociceptive and anti-inflammatory potential of *S. cumini* sequential crude extracts were evaluated using formalin and glutamate-induced paw licking method in mice. The acute and sub-acute toxicity assessment of active extract was performed by oral administration in rats. An acute toxicity trial was performed with two different doses, i.e., 2000 mg/kg and 3000 mg/kg for consecutive 14 days, whereas a sub-acute toxicity study was conducted at doses of 750 mg/kg and 1500 mg/kg for the next 28 days. Identification of bioactive compounds was performed using HPLC, and at the end, in silico docking calculations of identified compounds were performed. Results: The 100% methanolic extract (SCME) protected the mice from painful stimulation of formalin and glutamate in a dose-dependent manner with the maximum effect of 49% and 67% at 200 mg/kg, respectively, followed by moderate and non-influential effects of 50% methanolic extract and dichloromethane (DCM) extracts when compared to control, i.e., normal saline. The results of acute toxicity recorded LD50 of SCME over 3000 mg/kg, and no antagonistic effects were recorded during the subacute study when SCME dispensed at the rate of 750 mg/kg and 1500 mg/kg. SCME was found to induce no adverse effects to kidney, heart, liver, spleen, and paired lungs examined by hematological, serum biochemical, histological analysis. HPLC analysis of *S. cumini* 100% methanolic extracts revealed the presence of delphinidin 3-glucoside, peonidin-3,5-diglucoside, scopoletin, and umbelliferone at the concentration of 127.4, 2104, 31.3, 10.4 µg/g whereas in 50% methanolic extract, the quinic acid, catechin, and myricetin were present at the concentration of 54.9, 63.7, 12.3 µg/g, respectively. Umbelliferone and scopoletin are newly reported compounds in the present study. In silico docking calculations of these compounds indicated the potential of anti-nociceptive and anti-inflammatory activities. Conclusions: These findings validate that *S. cumini* fruit extracts are a rich source of bioactive compounds that needs to be considered to enhance biological activities with lesser side effects. © 2021. [Article](#).

192. **Ahmed, S., Knowledge Unit of Science, University of Management and Technology, Sialkot, Pakistan.** *On the Graphs of Minimum Degree at Least 3 Having Minimum Sum-Connectivity Index.* [Journal of Mathematics](#). 2022.

For a graph  $G$ , its sum-connectivity index is denoted by  $\chi(G)$  and is defined as the sum of the numbers  $d_u + d_v - 1/2$  over all edges  $uv$  of  $G$ , where  $d_w$  denotes the degree of a vertex  $w \in V(G)$ . In this study, we find a sharp lower bound on the sum-connectivity index of graphs having minimum degree of at least 3 under certain constraints and characterize the corresponding extremal graphs. © 2022 Wael W. Mohammed et al. [Article](#).

193. **Malik, A., Department of Mathematics, University of Management and Technology, Sialkot Campus, Pakistan.** *Analysis of Charged Compact Stars in Modified  $f(R, \dot{R})$  Theory of Gravity.* [New Astronomy](#).

93.

This paper investigates the behavior of charged compact stars in the modified  $f(R, \dot{\phi})$  theory of gravity, where  $R$  and  $\dot{\phi}$  denote the Ricci scalar and scalar field respectively. The modified field equations of  $f(R, \dot{\phi})$  theory of gravity are solved by using Krori's Barua metric (Krori and Barua, 1975), which describes the geometry of the inner space. The physical aspects like energy density, radial pressure, tangential pressure, anisotropic factor, mass-radius relationship, compactness parameter, surface redshift have been analyzed. Furthermore, the Tolman-Oppenheimer-Volkoff equation, Abreu's criterion (Abreu et al., 2007) and relativistic adiabatic index have been checked to investigate the stability of the model. The compact stars like Her X - I, Cen X - III, EXO 1785 - 248 and LMC X - IV are used for the current analysis. Moreover, energy conditions have been investigated for all these candidates to observe the viability of the model. Observing all these aspects, our proposed model for charged compact stars is stable and viable in the background  $f(R, \dot{\phi})$  theory of gravity. © 2022 Elsevier B.V. **Article.**

194. **Shafiq, M.K., Department of Mathematics, University of Management and Technology, Sialkot Campus, Pakistan.** *Graph Indices for Cartesian Product of F-sum of Connected Graphs.* **Combinatorial Chemistry and High Throughput Screening.** 25, 3.

Background: A topological index is a real number associated with a graph that provides information about its physical and chemical properties and their correlations. Topological indices are being used successfully in Chemistry, Computer Science, and many other fields. Methods: In this article, we apply the well-known Cartesian product on F-sums of connected and finite graphs. We formulate sharp limits for some famous degree-dependent indices. Results: Zagreb indices for the graph operations  $T(G)$ ,  $Q(G)$ ,  $S(G)$ ,  $R(G)$ , and their F-sums have been computed. By using orders and sizes of component graphs, we derive bounds for Zagreb indices, F-index, and Narumi-Katayana index. Conclusion: The formulation of expressions for the complicated products on F-sums, in terms of simple parameters like maximum and minimum degrees of basic graphs, reduces the computational complexities. **Article.**

195. **Saleem, M., Department of Mathematics, University of Management and Technology Lahore, Sialkot Campus, 51310, Pakistan; Tufail, M.N., Department of Mathematics, University of Management and Technology Lahore, Sialkot Campus, 51310, Pakistan.** *Significance of the physical quantities for the non-Newtonian fluid flow in an irregular channel with heat and mass transfer effects: Lie group analysis.* **Alexandria Engineering Journal.** 61, 3.

Physical quantities such as skin friction coefficient, local Nusselt number, and local Sherwood number for Casson fluid flow in an irregular channel are determined in this article. Casson fluid properties are primarily enhanced in this flow due to the effects of magnetohydrodynamic (MHD), porous medium, thermal radiation, viscous dissipation, and chemical reaction. Because of the pressure gradient, oscillatory waves formed at the ends of the walls, which are also kept at constant temperatures and concentrations. The Lie group method is used to convert partial differential equations (PDEs) to ordinary differential equations (ODEs). Analytical solutions are provided for the momentum, energy, and concentration equations with benchmark solutions. Dimensionless numbers are computed to interpret physical quantities for this type of flow via graphs and tables. According to the variations of the emerging parameters, physical quantities exhibited reverse behaviour between the upper and lower walls. The velocity profile has an increasing attitude toward the Casson fluid parameter, the Darcy parameter, the wavelength, and the Reynolds number, but a decreasing attitude toward the Hartmann number. The concentration profile is decreasing due to the oscillation effect, but the Schmidt number has a growing influence. © 2021. **Article.**

196. **Malik, A., Department of Mathematics, University of Management and Technology, Sialkot Campus, Pakistan; Kiran, Department of Mathematics, University of Management and Technology, Sialkot Campus, Pakistan.** *A study of anisotropic compact stars in  $f(R, \dot{\phi}, X)$  theory of gravity.* **International Journal of Geometric Methods in Modern Physics.** 19, 2.

In this paper, we investigate the behavior of anisotropic compact stars in generalized modified gravity, namely  $f(R, \dot{\phi}, X)$  gravity, where  $R$  represents the Ricci scalar,  $\dot{\phi}$  is the scalar potential function and  $X$  is a kinetic term of  $\dot{\phi}$ . We consider the spherically symmetric spacetime to analyze the feasible exposure of compact stars. We observe the behavior of anisotropic compact stars which includes Her X1, SAX J 1808.4-3658 and 4U 1820-30. From the graphical evaluation of energy density, tangential pressure, radial pressure, equilibrium conditions, energy conditions, mass-radius relationship,

compactness and stability analysis of compact stars, it is concluded that the behavior of candidates of compact stars is regular in  $f(R, \ddot{t}, X)$  gravity for the considered parameter. © 2022 World Scientific Publishing Company. [Article](#).

197. **Asif, M., Department of Mathematics, University of Management and Technology, Sialkot Campus, Sialkot, Pakistan.** *A Novel Image Encryption Technique Based on Cyclic Codes over Galois Field.* [Computational intelligence and neuroscience](#). 2022.

In the modern world, the security of the digital image is vital due to the frequent communication of digital products over the open network. Accelerated advancement of digital data exchange, the importance of information security in the transmission of data, and its storage has emerged. Multiple uses of the images in the security agencies and the industries and the security of the confidential image data from unauthorized access are emergent and vital. In this paper, Bose Chaudhary Hocquenghem (BCH) codes over the Galois field are used for image encryption. The BCH codes over the Galois field construct MDS (maximum distance separable) matrices and secret keys for image encryption techniques. The encrypted image is calculated, by contrast, correlation, energy, homogeneity, and entropy. Histogram analysis of the encrypted image is also assured in this paper. The proposed image encryption scheme's security analysis results are improved compared to the original AES algorithm. Further, security agencies can utilize this work for their confidential image data. Copyright © 2022 Muhammad Asif et al. [Article](#).

## KUE

198. **Farhan, M., Mechanical Engineering Department, University of Management and Technology, 51310 Sialkot Campus, Lahore, Pakistan.** *Recent advancements in latent heat phase change materials and their applications for thermal energy storage and buildings: A state of the art review.* [Sustainable Energy Technologies and Assessments](#). 49.

Phase change materials (PCMs) have received substantial interest for their ability to store and release latent heat for energy conservation and thermal control purposes. PCMs are available in a variety of latent heat and melting points but their performance is low due to low value of thermal conductivity which limits its usage. The addition of highly thermal conductivity nanoparticles, porous metal foams and encapsulation methods have been used to address this issue and try to fix the low thermal conductivity of PCMs which is broadly discussed in this manuscript. The ability of PCM to store and release the thermal energy prompted the researchers to use it in potential applications. The energy retained and emitted by PCMs may be used for a variety of purposes, such as in photovoltaic (PV) panels, thermoelectric generators, building air-conditioning, air and water heating systems, heat exchangers, desalination solar stills, textiles, thermal management of electronic equipment and batteries and food packaging. Therefore, in this review, first the advancements in thermal properties of PCMs are thoroughly discussed in terms of enhancement in melting and solidification rates. After that, the use of PCMs in various applications is then explored, and conclusions are drawn accordingly. Based on analysis of recent literature, it was discovered that the phase transition temperature, phase transition enthalpy and thermal conductivity are three important parameters for the selection of an appropriate PCM for use in various applications. The current status of these advanced energy storage materials is also presented in this review. Lastly, some challenges and future recommendation are also proposed for future researchers which will bring a revolution in thermal management field. © 2021 Elsevier Ltd. [Article](#).

199. **Arif, Z.U., Department of Mechanical Engineering, University of Management Technology Lahore, Sialkot Campus, Pakistan; Khalid, M.Y., Department of Mechanical Engineering, University of Management Technology Lahore, Sialkot Campus, Pakistan; Ahmed, W., Department of Mechanical Engineering, University of Management Technology Lahore, Sialkot Campus, Pakistan; Arshad, H., Department of Mechanical Engineering, University of Management Technology Lahore, Sialkot Campus, Pakistan; Ullah, S., Department of Mechanical Engineering, University of Management Technology Lahore, Sialkot Campus, Pakistan.** *Recycling of the glass/carbon fibre reinforced polymer composites: A step towards the circular economy.* [Polymer-Plastics Technology and Materials](#).

There is an urgent need to recycle glass fiber-reinforced polymer (GFRP) and carbon fiber-reinforced polymer (CFRP) composites due to environmental challenges caused by incineration and traditional landfilling. This review incorporates an overview of the latest knowledge on the recycling techniques for different GFRP and CFRP composites. The

applications of these chopped fibers are limited due to significant depreciation in their mechanical properties after recycling. The high-value applications of the composites remanufactured through recycled fibers are outlined. This review also incorporates the present challenges and modern trends in the recycling of fiber-reinforced composites. It is expected that further innovations in recycling technologies will be helpful to establish a circular economy and sustainable benign environment. © 2022 Taylor & Francis. **Review.**

200. Arif, Z.U., Mechanical Engineering Department, University of Management and Technology, Lahore, Sialkot Campus51041, Pakistan; Khalid, M.Y., Mechanical Engineering Department, University of Management and Technology, Lahore, Sialkot Campus51041, Pakistan; ur Rehman, E., Mechanical Engineering Department, University of Management and Technology, Lahore, Sialkot Campus51041, Pakistan. *Laser deposition of high-entropy alloys: A comprehensive review.* **Optics and Laser Technology.** 145.

Since the advent in 2004, high-entropy alloys (HEAs) have become an attraction for the world and applied in the extensive engineering fields due to their outstanding properties. These materials are exhibiting their potentiality for challenging conditions where coatings are applied through laser deposition technology. Laser deposition also known as laser cladding (LC) is a modern technology that can be applied for surface modification through HEAs. Nobler properties of the LC-HEA depositions over the conventional alloys have further explored this field in the last few years. Here, this paper provides a comprehensive state-of-the-art review for LC-HEA-based coatings, focusing on the use of laser deposition technique for HEAs, the effect of laser process parameters on mechanical properties, and microstructural evolution. The mechanical characteristics include but are not limited to hardness, wear, corrosion, and erosion resistance are discussed, with regard to their microstructure and phase composition. Besides, the existing problems, possible future developments regarding the LC-HEA depositions are predicted. Due to excellent mechanical properties and functional potential as well as a variety of element constitutions for HEA designing, laser-assisted depositions containing blended HEAs as feedstock material will have promising applications prospects in the field of material science and engineering. © 2021 Elsevier Ltd. **Review.**

201. Khalid, M.Y., Department of Mechanical Engineering, University of Management & Technology Lahore, Sialkot Campus51041, Pakistan; Arif, Z.U., Department of Mechanical Engineering, University of Management & Technology Lahore, Sialkot Campus51041, Pakistan; Ahmed, W., Department of Mechanical Engineering, University of Management & Technology Lahore, Sialkot Campus51041, Pakistan; Arshad, H., Department of Mechanical Engineering, University of Management & Technology Lahore, Sialkot Campus51041, Pakistan. *Recent trends in recycling and reusing techniques of different plastic polymers and their composite materials.* **Sustainable Materials and Technologies.** 31.

The rising environmental concerns caused by the excess use of synthetic materials have diverted the world's attention towards sustainable materials along with a circular economy approach using recycling routes. Nowadays, composite materials have been enormously utilized in different industrial sectors, thus, causing serious accumulation of plastic waste in the environment. The end-of-life (EOL) treatments for plastic composites are imperative as these materials cannot be easily disposed of. The recycling methodologies adopted for polymer composites have two major advantages. Firstly, recycling techniques control plastic composite waste consumption. Secondly, the energy required in the recycling of plastic composite materials is quite low, compared to conventional manufacturing techniques. In this review, we highlight some recent recycling and reusing techniques adopted for plastics and their composite materials. Among all the reported recycling techniques for polymer composites, thermal recycling is best suited for the recycling of carbon fibers (CFs) and glass fibers (GFs). Through thermal recycling, the properties of recycled materials can meet the properties of virgin materials and energy is significantly lower than chemical recycling. However, mechanical recycling requires very low energy for the recycling of composites as compared to the other recycling process. It was concluded that the composite materials consumption in different industries would only be justified when recycling and reusing of composites should be given equal consideration. Additionally, the recycling of polymer composites will boost the circular economy. © 2021 Elsevier B.V. **Review.**

## Articles without Units/Departmental affiliation

202. **Sheikh, M.F., University of Management and Technology, Lahore, Sialkot Campus, Pakistan.** *Prediction of fatigue crack growth rate in aircraft aluminum alloys using optimized neural networks.* **Theoretical and Applied Fracture Mechanics.** 117.

In aerospace industry, Fatigue Crack Propagation pose a serious threat to the professionals involved in designing mechanical assembly of the aircraft structures. In these structures crack growth is a problem that needs to be handled seriously, as human life risk is concerned in addition to economic loss. Fatigue Crack Growth (FCG) Rate is the rate at which crack grows with number of cycles subjected to constant amplitude loading. FCG curve is drawn between crack growth rate on y-axis and Stress Intensity Factor (SIF) range on x-axis. It needs to be predicted accurately to avoid losses. Upon analyzing the curve, it becomes obvious that the correlation between Stress Intensity Factor (SIF) ranges  $\propto$  with FCG rate  $\frac{da}{dN}$  is deviating linear relationship considering region II of the curve that is also called Paris Region. Empirical formulation methods cannot deal with linearity factor satisfactorily. Other hybrid techniques are also found incapable of dealing with non-linearity suitably. In contrast to the prior methods, machine learning algorithms are capable to deal with the non-linearity issue in a much better way owing to their admirable learning ability and flexible nature. In this research work three distinct MLA based Optimized Neural Networks are utilized for prediction of FCG rate. The used algorithms include Genetic Algorithm based Optimized Neural Network, Hill Climbing based Optimized Neural Network and Simulated Annealing based Optimized Neural Network. The algorithms presented in the proposed technique are validated by testing on different aluminum alloys used for aerospace industry that includes 2324-T39, 7055-T7511 and 6013-T651 aluminum alloys. The least predicted MSE for 2324-T39 aluminum alloy is achieved by Hill Climbing based Optimized Neural Network that is  $3.1069 \times 10^{-8}$ . For 7055-T7511 alloy, minimum predicted MSE is  $1.4284 \times 10^{-9}$  which is achieved by Hill Climbing based Optimized Neural Network. Finally, the least predicted MSE for 6013-T651 is  $1.0559 \times 10^{-9}$  that is achieved by Simulated Annealing based optimized Neural Network. Taking all alloys on which experiments were held with used algorithms, the least predicted MSE that is attained is  $1.0559 \times 10^{-9}$  for 6013-T651 Aluminum Alloy with Simulated Annealing based Optimized Neural Network. Moreover, the results demonstrate an exceptional conformity to the data conceived during experimentation process. © 2021 Elsevier Ltd. **Article.**

203. **Latif, S., University of Management and Technology, Sialkot Campus, Sialkot, Pakistan.** *Respect: give it to get it! Does leadership complimented with respect can foster creativity?* **International Journal of Emerging Markets.** 17, 2.

Purpose: The purpose of this study is to advance the prevalent leadership “creativity perspective by examining respectful engagement as a missing link between transformational leadership and employees creativity in the tourism and hospitality industry of Pakistan. Design/methodology/approach: Data were collected from 288 supervisor “subordinate dyads of hotel and tourism industry in Pakistan. Partial least square structural equation modeling (PLS-SEM) technique was used to validate the measurement model and to test the proposed hypotheses using SmartPLS 3.0. Findings: The results suggest that transformational leadership and respectful engagement are significantly related and that respectful engagement fosters employee creativity. The study further confirmed that respectful engagement mediates the relationship between transformational leadership and employee creativity. Practical implications: Besides theoretical contribution, the study has several managerial implications for the tourism and hospitality industry. Globally, in the tourism and hospitality industry, the service selling proposition is largely based on creativity. Hence, the study suggests the managers of tourism and hospitality industry should adopt a transformational leadership style to achieve a sustainable competitive advantage of creativity. The study further recommends the managers capitalize on their transformational leadership style to observe respectful engagement in the workplace, which in turn can encourage employees to behave creatively. Originality/value: Theoretically, this paper contributes to the existing body of knowledge in a couple of ways. Firstly, while several empirical studies have discussed the impact of transformational leadership on employee creativity, and various mediating models have also been tested in this regard, little effort has been made to study the links between transformational leadership and employee creativity despite existing awareness about the importance of respectful engagement for employee creativity. Thus, the current study examines employee creativity with the lens of transformational leadership and respectful engagement. Secondly, the study integrates the theories of transformational leadership, employee engagement and employee creativity. © 2020, Emerald Publishing Limited. **Article.**

204. **Ashraf, M.U., University of Management and Technology, Sialkot Campus, Pakistan**

*Ontology driven testing strategies for IoT applications.* **Computers, Materials and Continua.** 70, 3.

Internet-of-Things (IoT) has attained a major share in embedded software development. The new era of specialized intelligent systems requires adaptation of customized software engineering approaches. Currently, software engineering has merged the development phases with the technologies provided by industrial automation. The improvements are still required in testing phase for the software developed to IoT solutions. This research aims to assist in developing the testing strategies for IoT applications, therein ontology has been adopted as a knowledge representation technique to different software engineering processes. The proposed ontological model renders 101 methodology by using Protégé. After completion, the ontology was evaluated in three-dimensional view by the domain experts of software testing, IoT and ontology engineering. Satisfied results of the research are showed in interest of the specialists regarding proposed ontology development and suggestions for improvements. The Proposed reasoning-based ontological model for development of testing strategies in IoT application contributes to increase the general understanding of tests in addition to assisting for the development of testing strategies for different IoT devices. © 2022 Tech Science Press. All rights reserved. **Article.**



Table: 1

<b>SCHOOL-WISE NUMBER OF PUBLICATIONS</b>		
1.	Dr. Hasan Murad School of Management	18
2.	School of Engineering	12
3.	School of Food & Agricultural Sciences	04
4.	School of Governance & Society	03
5.	School of Health Sciences	04
6.	School of Pharmacy	02
7.	School of Professional Advancement	01
8.	School of Sciences	81
9.	School of Social Sciences & Humanities	11
10.	School of Systems and Technology	28
11.	UMOs	03
12.	Without School/Department's Affiliation	14

Table: 2

<b>SCHOOLS/INSTITUTES WITH ZERO (0) PUBLICATIONS</b>	
1.	Institute of Aviation Studies
2.	Institute of Liberal Arts
3.	School of Architecture and Planning
4.	School of Commerce and Accountancy
5.	School of Design and Textiles
6.	School of Law and Policy
7.	School of Media and Communication Studies
8.	School of Professional Psychology

Table: 3

<b>SIALKOT CAMPUS (KNOWLEDGE UNIT-WISE NUMBER OF PUBLICATIONS)</b>		
1.	<b>KUBEAC</b> ( <i>Knowledge Unit of Business, Economics, Accountancy &amp; Commerce</i> )	07
2.	<b>KUST</b> ( <i>Knowledge Unit of Systems &amp; Technology</i> )	02
3.	<b>KUS</b> ( <i>Knowledge Unit of Science</i> )	07
4.	<b>KUE</b> ( <i>Knowledge Unit of Engineering</i> )	04
5.	Without Unit/Department's Affiliation	03
	<b>Total</b>	<b>23</b>

Table: 4

<b>KNOWLEDGE UNITS WITH ZERO (0) PUBLICATIONS</b>	
1.	<b>KUSSH</b> ( <i>Knowledge Unit of Social Sciences &amp; Humanities</i> )
2.	<b>KUDT</b> ( <i>Knowledge Unit of Designs &amp; Textiles</i> )
3.	<b>KUHS</b> ( <i>Knowledge Unit of Health Sciences</i> )

Table: 5

<b>BREAK-UP BY DOCUMENT TYPE</b>		
1.	Article	185
2.	Review	14
3.	Book Chapter	02
4.	Conference Paper	01
5.	Letter	02
6.	Erratum	02
	<b>Total</b>	<b>206</b>

Table: 6

<b>AFFILIATED UNIVERSITIES FOR THE PUBLICATIONS</b>		
<b>National</b>		
1.	University of the Punjab	13
2.	University of Engineering and Technology, Lahore	11
3.	University of Lahore	10
<b>International</b>		
4.	King Khalid University	16
5.	King Abdulaziz University	13
6.	China Medical University	12
7.	Lodz University of Technology	13
8.	Taif University	10
9.	Çankaya Üniversitesi	11

**Criterion:** 10 and above publications

Table: 7

<b>TOP 5 SCHOOLS</b>		
1.	School of Sciences	81
2.	School of Systems and Technology	28
3.	Dr. Hasan Murad School of Management	18
4.	School of Engineering	12
5.	School of Social Sciences & Humanities	11

Table: 8

<b>TOP 5 DEPARTMENTS</b>		
1.	Department of Mathematics	54
2.	Department of Computer Science	16
3.	Department of Chemistry	11
4.	Department of Economics & Statistics	09
5.	Department of Life Sciences	09

Table: 9

<b>TOP AUTHORS</b>		
1.	Siddique, I. ( <i>Department of Mathematics</i> )	13
2.	Riaz, M. B. ( <i>Department of Mathematics</i> )	12
3.	Farooq, M.S. ( <i>Department of Computer Science</i> )	06
4.	Mehmood, U. ( <i>Department of Political Science</i> )	06
5.	Javed, M. ( <i>Department of Chemistry</i> )	06
6.	Rashid, T. ( <i>Department of Mathematics</i> )	06
7.	Afzal, M. S. ( <i>Department of Life Sciences</i> )	05

**Criterion:** 05 and above publications