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Course Title: Cognitive Computing

Course Code: IS-666

Department: Information Systems

**HSM Vision**

HSM envisions its success in the sustainable contribution that it will make to the industry, academia and research in public and private sector. HSM will lead by providing professionally competent and ethically conscious human resources engaged in the global and local context to foster socio-economic growth and sustainability for the society. HSM envisages having faculty with high research potential and a deep desire for cutting edge research including collaboration with national and international partners.

**HSM Mission**

Being a research-oriented and student-centric business school, we emphasize research publications in impact journals as well as state-of -the-art learning methodologies.  We will prepare our students to become the future ethical business leaders and the guiding post for the society, while equipping them with the knowledge and skills required by world-class professionals.  We will be the leading choice for organizations seeking highly talented human resource. HSM will foster internationalization with key stakeholders and actively work to exchange best practices with business schools across Pakistan through collaborations, workshops, conferences and other means.

**Program Objectives**

The School of Business and Economics at UMT is foreseeing the challenges ahead both at national and international level and the utility of data science.  In Pakistan the multi-dimensional economy integrated with globalization needs a boost assisted by professionally trained and skilled Data Scientists, whom may incorporate and harmonize the unlimited bucket of resources, pouring in from springs of industry, agriculture, business, and human resources etc. in a manner to achieve efficiency to its apex.
In the competitive economy the companies need to adapt data science to gain a competitive advantage in productivity, profitability and sustainable business processes to offer better products and services to their customers. To attain this goal trained and skilled workforce in this area is the need of the hour; who are equipped to manage, understand and model the data, interpret the outcome and communicate the results for business use. Professionals holding a degree in Data Science will be well positioned to help their organizations gain a competitive advantage in a data-driven world.

**Course Objectives**

Cognitive computing refers to systems that learn at scale, reason with purpose and interact with humans naturally. Rather than being explicitly programmed, they learn and reason from their interactions with us and from their experiences with their environment. They are made possible by advances in a number of scientific fields over the past half-century, and are different in important ways from the information systems that preceded them. While the digital age has brought a massive amount of industry data brimming with insights, organizations struggle to unlock its full value. Advances in cognitive computing can help bridge the gap between data access and data insights. Without new capabilities, the data paradox of having too much data and too little insight will continue. Cognitive-based systems can help because they build knowledge and learn, understand natural language, and reason and interact more naturally with human beings than traditional programmable systems.

**Learning Objectives**

* Understanding the general concepts of Cognitive Computing and its different terminologies.
* Enable to create a pace with volume, complexity and unpredictability of information and systems in the modern world.
* Create a practical approach to understand computer’s ability to mimic humans.
* Understating of how Cognitive Computing provides information of complex to meaningful bodies of data.
* Expand your understanding of NLP, deep learning, machine learning, and AI
* Explore the possibilities of using IBM Watson in your industry and business

**Pre-requisites:**

For people who possess Machine Learning, Natural Language processing or text mining, computer science, statistics, etc. background.

**Teaching Methodology (List methodologies used –example are given below)**

* Lecture
* Interactive Classes
* Case based teaching
* Class activities
* Applied Projects

**STUDENTS ARE REQUIRED TO READ AND UNDERSTAND ALL ITEMS OUTLINED IN THE PARTICIPANT HANDBOOK**

**Class Policy:-**

* Be On Time

You need to be at class at the assigned time. After 10 minutes past the assigned time, you will be marked absent.

* Mobile Policy

**TURN OFF YOUR MOBILE PHONE!** It is unprofessional to be texting or otherwise.

* Email Policy

**READ YOUR EMAILS!** You are responsible if you miss a deadline because you did not read your email.

Participants should regularly check their university emails accounts regularly and respond accordingly.

* Class Attendance Policy

A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination. Being sick and going to weddingsare absences and will not be counted as present. You have the opportunity to use 6 absences out of 30 classes. Participants with less than 80% of attendance in a course will be given grade ‘F’ (Fail) and will not be allowed to take end term exams. International students who will be leaving for visa during semester should not use any days off except for visa trip. Otherwise they could reach short attendance.

* Withdraw Policy

Students may withdraw from a course till the end of the 12th week of the semester. Consequently, grade W will be awarded to the student which shall have no impact on the calculation of the GPA of the student.A Student withdrawing after the 12th week shall be automatically awarded “F” grade which shall count in the GPA.

* Moodle

UMT –LMS (Moodle) is an Open Source Course Management System (CMS), also known as a learning Management System (LMS). Participants should regularly visit the course website on MOODLE Course Management system, and fully benefit from its capabilities. If you are facing any problem using moodle, visit <http://oit.umt.edu.pk/moodle>. For further query send your queries to moodle@umt.edu.pk

* Harassment Policy

Sexual or any other harassment is prohibited and is constituted as punishable offence. Sexual or any other harassment of any participant will not be tolerated. All actions categorized as sexual or any other harassment when done physically or verbally would also be considered as sexual harassment when done using electronic media such as computers, mobiles, internet, emails etc.

* Use of Unfair Means/Honesty Policy

Any participant found using unfair means or assisting another participant during a class test/quiz, assignments or examination would be liable to disciplinary action.

* Plagiarism Policy

All students are required to attach a “Turnitin” report on every assignment, big or small. Any student who attempts to bypass “Turnitin” will receive “F” grade which will count towards the CGPA. The participants submit the plagiarism report to the resource person with every assignment, report, project, thesis etc. If student attempts to cheat “Turnitin”, he/she will receive a second “F” that will count towards the CGPA. There are special rules on plagiarism for final reports etc. all outlined in your handbook.
* Communication of Results

The results of quizzes, midterms and assignments are communicated to the participants during the semester and answer books are returned to them. It is the responsibility of the course instructor to keep the participants informed about his/her progress during the semester. The course instructor will inform a participant at least one week before the final examination related to his or her performance in the course.

**Course Outline**

|  |  |
| --- | --- |
| Program | MS Data Sciences |
| Credit Hours | 3 |
| Duration | 15 Weeks |
| Prerequisites (If any) | N/A |
| Resource PersonName and Email |  |
| Counseling Timing |  |
| Contact no. |  |
| Web Links:-(Face book, Linked In, Google Groups, Other platforms) |  |

**Chairman/Director Program signature………………………………….Date……………………..**

**Dean’s signature………………………… ………………….Date………………………………………….**

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 15%

Assignments 15%

Mid Term 25%

Attendance & Class Participation 5%

Term Project and Presentation 40%

Total 100%

**Reference Books:**

* Introduction to Cognitive Computing by Mark Watson
* Natural Language Processing in Support of a Cognitive System by Judith Hurwitz, Marcia Kaufman and Adrian Bowles

**Softwares:**

* UIMA hands on
* Watson ecosystem
* Watson Path and WEA

**Course: -Cognitive Computing Course code: Book:**

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| --- | --- | --- | --- | --- | --- | --- |
| **No** | **Topics to be****covered in the course** | **Learning Objective****of this topic** | **Expected Outcomes from Students** | **Teaching Method** | **Assessment Criteria** | **Deadlines and Homework** |
| 1 | Introduction to Cognitive Computing | foundation of Cognition Technology with Philosophy (especially how it pertains to Knowledge Management and Knowledge Representation), Linguistics, general AI, and Neuroscience | Students will be able to understand the basic terminology Cognitive Computing | Lecture | Assignment | Within a Week |
| 2 | Using Machine Learning and Deep Learning Neural Networks to Model Cognition | Understanding the concept of Deep Learning Neural Networks for classification, logistic regression, Knowledge Representation, and Natural Language Processing | Students will be able to learn Machine Learning and Deep Learning Neural Networks to Model Cognition | Case Discussion | Assignment | Within a Week |
| 3 | Using Machine Learning and Deep Learning Neural Networks to Model Cognition(Cont.1) | Understanding simple standalone programs (written in Type Script, with Java Scipt versions also included) and then use Google's Tensorflow machine learning library for more complex examples | They will be in position to understand Google's Tensorflow machine learning | Case Discussion + Lecture | Class Activity | Within a Week |
| 4 | The Deep QA Architecture | IBM Watson's DeepQA architecture is described in. The design structure of Watson includes software architecture for building Question-Answering systems and a methodology to research, develop, and integrate algorithmic techniques into the system.  | After this lecture, students will be able to determine the basic of DeepQA Architecture. | Lecture + Lab work | Quiz | Within a Week |
| 5 | The DeepQA Architecture (Cont.1) | Understanding how to Build the Watson corpus, Question analysis, Hypotheses generation, and Scoring and confidence estimation. | They will be able to work on different components of DeepQA Architecture. | Case Discussion + Lecture | Class Activity | Within a Week |
| 6 | Semantic Integration and Machine Learning | Understand the key parameters of Semantic Integration and Machine Learning. | Students will understand the foundation and Applications  | Case Discussion + Lab Work | Quiz | Within two Weeks |
| 7 | Distributional Semantics | Providing an understanding on Distributional hypothesis includes similarity-based generalization, data sparsity.Also Distributional Semantics modeling and composition | After this, students will learn the use of Distributional Semantics in different applications | Lecture  | Class Activity | Within two Weeks |
| 8 | Mid Term | Mid Term | Mid Term | Mid Term | Mid Term | Mid Term |
| 9 | Unstructured Information Management Architecture | Understanding the Unstructured Information Management Architecture using UMIA software | After this lecture, students have understood (UIM) applications in order to analyze unstructured information (text, audio, video, images, and so on)  | Case Discussion+ Lab work | Assignment | Within a Week |
| 10 | Unstructured Information Management Architecture(Cont.1) | Understanding the Unstructured Information Management Architecture using UMIA software at advance level. | After this lecture, students have understood (UIM) applications in order to discover, organize, and deliver relevant knowledge to the user | Case Discussion+ Lab work | Class Activity | Within a Week |
| 11 | Structured Knowledge in Watson | Understanding the basics of structured knowledge in IBM Watson. | After this lecture, they are able to understand the foundation of Structured knowledge in Watson and how this knowledge will help in future. | Lab Work + Case Study | Quiz | Within a Week |
| 12 | Structured Knowledge in Watson. (Cont.1) | Understanding and working on IBM Watson Explorer Advanced Edition (WEA) | Student will fully perform analytics using IBM Watson Explorer Advanced Edition (WEA) | Lab Work + Case Discussion | Assignment | Within two Weeks |
| 13 | Domain Adaptation | Understanding of basic formalization and different types of domain adaptation  | They will be able to understand Domain Adaptation at foundation level. | Lecture | Quiz | Within two Weeks |
| 14 | Ethics and Sustainability | Discussion on ethics and technological sustainability.  |  | Discussion and documentary | Class Activity | Within a Week |
| 15 | Final Term Project and Presentation |  |  | Presentation | Presentation |  |