SHREE MUTHUKUMARASWAMY COLLEGE CHENNAI-118

DEPARTMENT OF COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

UNIVERSITY OF MADRAS

SEMESTERS SYLLABUS

III B.SC (CS with AI) – SEMESTER-V

SUBJECT : NATURAL LANGUAGE PROCESSING

Year: III **Semester: V**

Natural Language Processing Common for B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326C5B**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To grasp the significance of natural language processing in solving real-world problems.
- To map the appropriate processing technique to a problem and implement the technique.
- To demonstrate required design skills for large collection sets.
- To appreciate the theoretical formulation of the natural language processing techniques.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Describe the fundamental concepts and techniques of natural language processing.

CO2: Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each.

CO3: Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.

CO4: Analyse large volume text data generated from a range of real-world applications.

Units	Contents
I	**Introduction:** Overview: Origins and challenges of NLP- Theory of Language Features of Indian Languages – Issues in Font –Models and Algorithms- NLP Applications.
II	**MORPHOLOGY AND PARTS-OF-SPEECH:** Phonology – Computational Phonology - Words and Morphemes – Segmentation – Categorization and Lemmatisation – Word Form Recognition – Valency - Agreement - Regular Expressions – Finite State Automata – Morphology- Morphological issues of Indian Languages – Transliteration.

III	**PROBABILISTIC MODELS:** Probabilistic Models of Pronunciation and Spelling – Weighted Automata – N- Grams – Corpus Analysis – Smoothing – Entropy - Parts-of-Speech – Taggers – Rule based – Hidden Markov Models – Speech Recognition.
IV	**SYNTAX:** Basic Concepts of Syntax – Parsing Techniques – General Grammar rules for Indian Languages – Context Free Grammar – Parsing with Context Free Grammars – Top Down Parser – Earley Algorithm – Features and Unification - Lexicalised and Probabilistic Parsing.
V	**SEMANTICS AND PRAGMATICS:**Representing Meaning – Computational Representation – Meaning Structure of Language – Semantic Analysis – Lexical Semantics – WordNet – Pragmatics – Discourse – Reference Resolution – Text Coherence – Dialogue Conversational Agents.

Learning Resources:

TEXT BOOK:

Ronald Hausser, "Foundations of Computational Linguistics", Springer-Verleg, 1999.

REFERENCES:

1. Daniel Jurafskey and James H. Martin "Speech and Language Processing", Prentice Hall, 2009.
2. Christopher D.Manning and Hinrich Schutze, "Foundation of Statistical Natural Language Processing", MIT Press, 1999.
3. James Allen, "Natural Language Understanding", Benjamin/Cummings Publishing Co. 1995.
4. Applied Natural Language Processing with Python: Implementing Machine Learning and Deep Learning Algorithms for Natural Language Processing, By Taweh Beysolow II, September 2018

WEB REFERENCES:

1. https://blog.algorithmia.com/introduction-natural-language-processingnlp/
2. https://www.udacity.com/course/natural-language-processingnanodegree--nd892. https://www.coursera.org/learn/language-processing
3. https://towardsdatascience.com/a-practitioners-guide-to-naturallanguage-processingpart-i-processing-understanding-text-9f4abfd13e72
4. https://www.edx.org/course/natural-language-processing

SUBJECT : COMPUTER VISION LAB

Year: III **Semester: V**

Computer Vision Practical	**326C51**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Understand What Is A Digital Image and what is Manipulating Images
- Understand Manipulating Images One Pixel At a Time, Pixel Transformations, geometric Operations

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement Spatial Operations in Image Processing

CO2: Implement the Image Gradients and Edge Detection Techniques

CO3: Implement Extraction of desired features

CO4: Implement object detection

Contents

1. Perform the image transformations that include the geometric and morphological transformations.
2. Perform the image enhancement by applying contrast limited adaptive histogram Equalization
3. Perform the Contours and Region based segmentation in images
4. Perform the Wavelet Transforms on image using PyWavelets.
5. Perform the K-Means clustering for Image segmentation using CV2 library.
6. Perform basic motion detection and tracking using python and OpenCV
7. Perform face detection using OpenCV library
8. Perform Foreground Extraction in an image
9. Perform Pedestrian Detection using OpenCV and Python.

SUBJECT : COMPUTER NETWORK

Year: III **Semester: V**

Computer Networks Common for B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5A**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)
To understand the concept of Data communication and Computer network
To get a knowledge on routing algorithms.

- To impart knowledge about networking and inter networking devices
- To gain the knowledge on Security over Network communication

Course Outcomes: (for students: To know what they are going to learn)
CO1: To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models
CO2: To gain knowledge on Telephone systems and Satellite communications
CO3: To impart the concept of Elementary data link protocols
CO4: To analyse the characteristics of Routing and Congestion control algorithms
CO5: To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

Units	**Contents**
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography.

Learning Resources:

Recommended Texts

1. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.

Reference Books

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2015.
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008.
3. D. Bertsekas and R. Gallagher, “Data Networks”, 2nd Edition, PHI, 2008.
4. Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

SUBJECT : SOFTWARE ENGINEERING

Year: III **Semester: V**

Software Engineering Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5B**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce the software development life cycles
- To introduce concepts related to structured and objected oriented analysis & design co
- To provide an insight into UML and software testing techniques

Course Outcomes: (for students: To know what they are going to learn)

1. The students should be able to specify software requirements, design the software using tools
2. To write test cases using different testing techniques.

Units	Contents
I	Introduction – Evolution – Software Development projects – Emergence of Software Engineering.Software Life cycle models – Waterfall model – Rapid Application Development – Agile Model – SpiralModel
II	Requirement Analysis and Specification – Gathering and Analysis – SRS – Formal System Specification
III	Software Design – Overview – Characteristics – Cohesion & Coupling – Layered design – Approaches Function Oriented Design – Structured Analysis – DFD – Structured Design – Detailed design
IV	Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Interaction, Activity, State Chart – Postscript
V	Coding & Testing – coding – Review – Documentation – Testing – Black-box, White-box, Integration, OO Testing, Smoke testing.

TEXT BOOK:

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI 2018, 5th Edition.

REFERENCE BOOKS:

1. Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, McGraw Hill 2010, 7thEdition.

2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House 2011,3rd Edition.

WEB REFERENCES:

NPTEL online course – Software Engineering - https://nptel.ac.in/courses/106105182/

SUBJECT : BIG DATA ANALYTICS

Year: III **Semester: V**

Big Data Analytics Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5E**
Credits 3	**Lecture Hours: 4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.

Course Outcomes: (for students: To know what they are going to learn) CO1: Work with big data tools and its analysis techniques.
CO2: Analyse data by utilizing clustering and classification algorithms.
CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.
CO4: Perform analytics on data streams.
CO5: Learn NoSQL databases and management.

Units	**Contents**
I	INTRODUCTION TO BIG DATA : Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model
II	CLUSTERING AND CLASSIFICATION: Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. - Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier
III	ASSOCIATION AND RECOMMENDATION SYSTEM:Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches

IV	STREAM MEMORY: Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform (RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

V	NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION: NoSQL Databases: Schema-less Models- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Learning Resources:

Recommended Texts

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CambridgeUniversity Press, 2012.

Reference Books

1. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration withTools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013.
2. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.

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