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Other university B.E./B.Tech - G IT Level 4 syllabus

Data Mining

05 1x22 DATA MINING

Credit : 5

1. Introduction : Motivated Data Mining Data Mining on what kind of Data, Data Mining Functionalities, Classification of Data Mining System, Major issues in Data Mining.

2. Data Warehouse and OLAP Technology for Data Mining : Data Warehouse, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data cube technology, Data Warehousing to Data Mining.

3. Data Preprocessing : Data cleaning, Data Integration and Transformation, Data Reduction, Discrimination and concept Hierarchy Generation.

4. Data Mining Primitives, Primitives, Languages and System Architectures : Data Mining Primitives, Data Mining query language, Designing GUI on a Data Mining query language, Architectures of Data Mining System.

5. Mining Association rules in large database : Association rules mining, Mining single-dimensional Boolean Association rules from transaction database, mining multilevel Association rules from transaction database, Mining multidimensional Association rules from relational databases and Data warehouses, Association mining to correlation analysis, Constraint based association mining.

6. Classification and Prediction : What is classification and prediction, Issues regarding classification and prediction, Classification by decision tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts

from association rule mining, Prediction, Classification accuracy.

7. Cluster Analysis : What is cluster analysis, Types of data in cluster analysis, A categorization of major clustering methods, Partitioning methods, Hierarchical Methods, Density based methods, Grid based methods, Model based clustering methods.

8. Applications and trends in Data Mining : Data mining applications, Social impacts of Data Mining, Trends in Data Mining.

Text Books :

1. Data Mining Concepts and Techniques by Jiawei Han, Micheline Kamber, Elsevier.
2. Data Mining. A tutorial-based Primer by Roiger, Michael W. Geatz and Pearson Education.
3. Data Mining Introductory & advanced topic by Margaret H. Dunham , Pearson Education

Reference Books :

1. Data Mining : Next Generation Challenges and Future Direction by Kargupta, et al, PHI.
2. Data Warehousing, Data Mining & OLAP by Alex Berson Stephen J.Smith.

Distributed Systems

CS7L02. DISTRIBUTED SYSTEMS

Section I

UNIT 1: Introduction

Definition, Goals, Types of distributed systems: Distributed Computing System, Distributed Information System, Architecture: Architectural, Styles, System Architecture

UNIT 2: Communication and Synchronization :

Remote Procedure Call, Message Oriented Transient Communication, Physical Clock
Synchronization, Logical Clock, Mutual exclusion, Election Algorithms

UNIT 3: Distributed File Systems and Fault Tolerance

Architecture, Processes, Communication, Naming, Synchronization,

Consistency and Replication, Introduction to fault tolerance, Process Resilience, Distributed Commit, Recovery.

Section II

UNIT 4: Introduction to Cloud

Getting to know the Cloud, Cloud and other similar configurations, Components of Cloud Computing, Cloud Types and Models: Private Cloud, Community Cloud, Public Cloud, Hybrid Clouds.

UNIT 5: Virtualization

Introduction and benefits, Implementation Levels of Virtualization, Virtualization at the OS Level, Virtualization Structure, Virtualization Mechanism, Open Source Virtualization Technology, Xen Virtualization Architecture, Binary Translation with Full Virtualization, Paravirtualization, Virtualization of CPU, Memory and I/O Devices.

UNIT 6: Cloud Computing Services and Data Security in Cloud

Infrastructure as a Service, Platform as a Service, Software as a Service, Database as a Service , Specialized Cloud Services, Challenges with Cloud Data, Challenges with Data Security, Data Confidentiality and Encryption, Data availability, Data Integrity, Cloud Storage Gateways.

Text Books:

1. Distributed Systems: Principles and Paradigms- Tanenbaum, Steen.
2. Cloud Computing Black Book- Jayaswal, Kallakurchi, Houde, Shah, Dreamtech Press.

Reference Books:

1. Cloud Computing: Principles and Paradigms - Buyya, Broburg, Goscinski.
2. Cloud Computing for Dummies - Judith Hurwitz.

Advanced Database Systems

CS7L03. ADVANCED DATABASE SYSTEMS

Section - I

Unit I: Parallel and Distributed Databases

Database System Architectures: Centralized and Client - Server Architectures - Server System Architectures - Parallel Systems -

Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies.

Unit II: Object And Object Relational Databases

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL – Case Studies.

Unit III : Advanced SQL

PL SQL- A Basic introduction, Functions and Procedure, Packages, Synonyms, Database Links, Embedded SQL and Dynamic SQL. Database Design: systems development life cycle, database life cycle, DBMS Software Selection, top-down versus bottom-up design, centralized versus decentralized design.

Section - II

Unit IV: Database Security and Authorization

Discretionary Access Control, Mandatory Access Control, Audit Trails in Databases, Statistical Databases

Unit V: Databases on the Web and Semi-structured data

Overview of XML, structure of XML data, document schema, querying XML data, storage of XML data, XML applications, the semi-structure data model, implementation issues, indexes for text data.

Unit VI: Business Intelligence and Data Warehouses

The Need for Data Analysis, Business Intelligence, Business Intelligence Architecture, Decision Support Data, Online Analytical Processing, Star Schemas, Implementing a Warehouse, Data Mining, SQL Extension for OLAP.

Text Books:

1. Database System Concepts – Silberschatz, Korth, Sudarshan – 5th Edi (MGH International edition). (Unit No.1,Unit No.5,Unit No.2)
2. Fundamentals of Database Systems - Elmasri and Navathe [4e],

Pearson Education (Unit No.2)

3. Database Systems, Design, Implementation and Management -
Coronel-Morris- Rob (Unit No.3,4,6)

References:

1. Database Management System - Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems[3e], (MGH).
2. Advanced Database Management System - Rini Chakrabarti - Shilbhadra Dasgupta.

Mobile Applications

Unit 1: Introduction

Mobile Development Importance, Survey of mobile based application development, Mobile myths, Third party frameworks, Mobile Web Presence and Applications, Creating consumable web services for mobile, JSON, Debugging Web Services, Mobile Web Sites, Starting with Android mobile Applications.

Unit 2: Mobile Web

Introduction, WAP1, WAP2, Fragmentation Display, Input Methods, Browsers and Web Platforms, Tools for Mobile Web Development.

Unit 3: Application Architectures and Designs

Mobile Strategy, Navigation, Design and User Experience, WML, XHTML Mobile Profile and Basics, Mobile HTML5, CSS for Mobile, WCSS extensions, CSS3, CSS for mobile browsers, HTML5 Compatibility levels, Basics of Mobile HTML5: Document Head, Document Body, HTML5 Mobile Boilerplate, the Content, HTML5 Forms: Design, Elements, Attributes, validation.

Unit 4 : Devices, Images, Multi-Media

Device Detection, Client-side Detection, Server-side Detection, Device Interaction, Images, Video, Audio, Debugging and Performance, Content Delivery, Native and Installed Web Apps.

Unit 5: Advanced Tools, Techniques

J2ME programming basics, HTML5 Script Extensions, Code Execution, Cloud based browsers,

JS Debugging and profiling, Background Execution, Supported Technologies and API, Standard
JavaScript Behavior, Java Libraries, Mobile Libraries, UI Frameworks: Sencha Touch,
jQueryMobile, Enyo, Montage, iUI, jQTouch, JavaScript Mobile UI Patterns.

Unit 6: Advanced Applications

Geolocation and Maps APP, Offline Apps, Storage, and Networks, Distribution and Social Web

2.0

Text Books:

1. Jeff McWherter, Scott Gowell, Professional Mobile Application Development, John Wiley & Sons, Ref: www.it-ebooks.org
2. Maximiliano Firtman, Programming the mobile Web, Oreilly, 2nd Edition, 2013, ISBN: 978-1-449-33497-0

Reference Books:

1. Digital Content: [http://en.wikibooks.org/wiki/Category: J2ME Programming](http://en.wikibooks.org/wiki/Category:J2ME_Programming)
2. Android Studio Development Essentials, ref: <http://www.techotopia.com/>

Management Information System (Elective)

MANAGEMENT INFORMATION SYSTEM

CREDITS - 03

1. Strategic View of Management Information System :

Introduction to MIS : Concept, definition, role, Impact etc., E-business Enterprise : Introduction, E-business, E-commerce, E-communication, e-collaboration, Strategic Management of Business : Corporate Planning, Strategic Planning, Development of Business Strategies, Types of Strategies, Short-Range Planning, MIS : Business Planning, Information Security Challenges in E-enterprises.

2. Basics of Management Information Systems :

Decision Making : Concepts, Process, behavioural concepts, Organisational Decision Making, MIS and Decision Making Concepts, Information : Concepts, Classification, Methods of Collection, Value, Knowledge.

Systems : Concepts, Control, Types, handling Complexity, Classes, General Model of MIS, Implementation Problems, MIS and System Concept. System Analysis & Design : Introduction, Need, System Development Model, Structured System Analysis & Design, Computer System Design, MIS and System Analysis. Development of MIS : Long Range Plans, Class of Information, Information Requirement, Implementation of MIS, Quality in the MIS, Organisation for development of the MIS, MIS : Development Process Model Business Process Re-Engineering : Business Process, Process Model, Value Stream Model, Relevance of IT, MIS and BPR.

3. Applications of Management Information System to E-Business.

4. Application of MIS : Application in Manufacturing Sector. Applications in Service Sector, Decision Support Systems, Enterprise Management Systems.

5. Case Studies : Tata Home Finance Ltd. and Engineering Product Limited.

Reference Books :

1. Management Information Systems, Managing the digital firm by Laudon & Laudon, Pearson.
2. Management Information System by s. Sadagopan, PHI.

Data Analytics

Unit 1: Components of Decision-making process

Business intelligence, Decision Support Systems, Data ware-housing.

Unit 2: Data analysis and exploration

Mathematical models for decision making, data mining, data preparation, data exploration.

Unit 3: Introduction of Big data and Hadoop Ecosystem

Big data definition, Elements of Big data, Big data analytics, Big Data Stack, Virtualization and

Big data, virtualization approaches, Hadoop Ecosystem, Hadoop Distributed file system(HDFS,

MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.

Unit 4: Data mining tasks

Regression and association rules- structure of regression model, single linear regression, and multiple linear regression.

Classification - classification problems, Classification models, classification trees, Bayesian methods.

Unit 5: Association rules and clustering

Structure of association rules, Single dimension association rules, Apriori algorithm, General association rules. Clustering - clustering methods, partition methods, Hierarchical methods.

Unit 6: Exploring R

Basic Features of R, Exploring RGui, Working with vectors, Handling data in R workspace.

Reading datasets and exporting data from R, Manipulating and processing data in R.

Image Processing

IMAGE PROCESSING

DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image

Processing - Components -

Elements of Visual Perception - Image Sensing and Acquisition -

Image Sampling and

Quantization - Relationships between pixels - Color image

fundamentals - RGB, HSI models,

Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

IMAGE ENHANCEMENT :

Spatial Domain: Gray level transformations - Histogram processing -

Basics of Spatial Filtering-

Smoothing and Sharpening Spatial Filtering, Frequency Domain:

Introduction to Fourier

Transform- Smoothing and Sharpening frequency domain filters -

Ideal, Butterworth and Gaussian

filters, Homomorphic filtering, Color image enhancement.

IMAGE RESTORATION :

Image Restoration - degradation model, Properties, Noise models -

Mean Filters - Order Statistics

- Adaptive filters - Band reject Filters - Band pass Filters - Notch

Filters - Optimum Notch

Filtering - Inverse Filtering - Wiener filtering

IMAGE SEGMENTATION:

Edge detection, Edge linking via Hough transform - Thresholding - Region based segmentation -

Region growing - Region splitting and merging - Morphological processing- erosion and dilation,

Segmentation by morphological watersheds - basic concepts - Dam construction - Watershed segmentation algorithm.

IMAGE COMPRESSION AND RECOGNITION:

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG

standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional

Descriptors - Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Speech Natural language processing

UNIT-1

INTRODUCTION :

Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM -

Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and

rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes,

Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS

tagging - Hidden Markov and Maximum Entropy models.

UNIT-2 SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar -

Dependency Grammar - Syntactic Parsing, Ambiguity, Dynamic Programming parsing - Shallow

parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT-3 SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-4 BASIC CONCEPTS of Speech Processing :

Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter-Bank And LPC Methods.

UNIT-5 SPEECH ANALYSIS:

Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths. Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.

Real-time Operating System

CS8C03. REAL TIME OPERATING SYSTEM

Section - I

Unit 1. Basic Real Time Concepts & Hardware Considerations

Terminology, Real Time System Design issues, Examples of Real-Time Systems

Unit 2. Hardware Considerations

Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, Input / Output, Other special devices

Unit 3. Real-Time Operating System

Real-Time Kernels, Theoretical Foundation of Real-Time Operating System, Scheduling, Inter Task Communication and synchronization, System Services for Application Programs, Memory Management, Selecting Real Time Operating Systems, Case study : POSIX .

Section - II

Unit 4. Software Requirements Engineering

Requirements - Engineering process, Types of Requirements, Requirements Specification for Real-Time Systems, Formal Methods in Software Specification, Structured Analysis and Design, Object-Oriented Analysis and the Unified Modeling, Organizing the Requirements Document, Organizing and Writing Requirements, Requirements Validation and Review.

UNIT 4. Programming Language and the Software Production Process

Coding of Real Time Software, Assembly Language, Procedural Language, Object-Oriented Language,. Overview of programming languages for real time systems. Real time features of JAVA, C# languages, Special Real Time Languages, Compiler Optimization of code.

UNIT 5 Metrics & Cost Estimation

Lines of Code, McCabe's Metric, Halstead's Metric, Function points, Feature Points, Metric for Object -Oriented Software. Fault Tolerance, Cost Estimation using COCOMO, Basic COCOMO, Detailed COCOMO, COCOMO II model .

Unit 6. Study of Commercial RTOS

Architecture of RT Linux, Initialization Task Management in RT Linux, Scheduling, Memory Management, Task Synchronization.

Text Books:

1. Real- Time Systems Design and Analysis.. Tools for the Practitioner by Phillip A Laplante, Seppo J.Ovaska, Wiley - 4th Edition (For Units

1, 2, 3, 4,5)

2. Embedded Real Time Systems: Concepts, Design and Programming
- Dr. K.V.K. Prasad - Black Book, Edition: 2014 (Unit 6)

References :

1 . Real Time Systems Theory and Practice , Rajib Mall , Pearson Education .

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