

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph.D Examination CSE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
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PAPER-I		
S.No	Subject	Subject Code
1	Advanced Databases	PH2405101
2	Artificial Intelligence	PH2405102
3	Data Mining & Knowledge Discovery	PH2405103
4	Digital Image Processing	PH2405104
5	Distributed Operating System	PH2405105
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PAPER-II		
S.No	Subject	Subject Code
1	Advanced Computer Architecture	PH2405201
2	Advanced Data Structures and Algorithms	PH2405202
3	Computer Communication	PH2405203
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14	Internet of Things(IoT)	PH2405214
15	Block Chain Technologies	PH2405215

(PH2405101)ADVANCED DATABASES

UNIT I: Introduction:

Distributed Data Processing, Distributed Databases System, promises of DDBS, Problem areas.

Overview of Relational DBMS: Relational Databases Concepts, Normalization, Integrity rules, Relational data languages.

UNIT II: Distributed DBMS Architecture:

Architectural Models for Distributed DBMS, DDMBS Architecture.

Distributed Database Design:

Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT III: Query Processing and Decomposition:

Query processing Objectives, Characterization of query processors, layers of query of query processing, query decomposition, Localization of distributed data.

UNIT IV: Distributed query Optimization:

Query optimization, centralized query optimization, Distributed query optimization algorithms.

UNIT V: Distributed object Database Management Systems:

Fundamental object concepts and Models, Object Distributed Design, Architectural Issues, Object Management, Distributed Object storage, Object query Processing.

Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparing ODDBMS and ORDBMS.

REFERENCE BOOKS

1. Principles of Distributed Database Systems, 2/e, OZSU, Valduriez, Sridhar, Pearson, 2001
2. Distributed Databases, Stefan Seri, Pelagatti Willipse, TMH
3. Database System Concepts, 5/e, Korth, Silberschatz, Sudershan, TMH
4. Database Management Systems, 3/e, Raghuramakrishnan, Johhanes Gehrke, TMH
5. Data Base Principles, Programming, and Performance, 2/e, P O' Neil, E O'Neil, Elsevier

(PH2405102)ARTIFICIAL INTELLIGENCE

UNIT- I: Introduction: History, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT -II: Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction. Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT –III: Logic concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

UNIT -IV: Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT–V: Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA

References:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Luger, 5th ed, PEA

E-Resources:

1. <https://nptel.ac.in/courses/106/105/106105077/>
2. <http://aima.cs.berkeley.edu/>

(PH2405103) DATA MINING & KNOWLEDGE DISCOVERY

Unit I: Introduction to Data Mining: Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi-dimensional data Analysis

Unit II: Classification: Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Classification-Alternative techniques: Nearest Neighborhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non-Separable case.

Unit III: Association Analysis: Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns

Unit IV: Clustering: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN Cluster Evaluation: Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms.

Unit V: Web Data mining: Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
2. Introduction to Data Mining with Case Studies, GK Gupta , Prentice Hall.
3. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, PEA, 2008.
4. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
5. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.
6. Data Mining, Concepts and Techniques, 2/e, Jiawei Han , Micheline Kamber , Elsevier, 2006.

(PH2405104)DIGITAL IMAGE PROCESSING

Unit I: Digital Image fundamentals:

Introduction, An image model, sampling & quantization, basic relationships between Pixels, imaging geometry.

Unit II: Image Transforms:

Properties of 2 – D Fourier transform FFT algorithm and other separable image transforms. Walsh transforms. Hadamard, Cosine, Haar, Slant transforms, KL transforms and their properties.

Unit III: Image Enhancement and restoration:

Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, color image processing, Degradation model, Algebraic approach to restoration, inverse filtering, least mean squares and interactive restoration, geometric transformations

Unit IV: Image Representation and compression:

Various schemes for representation, boundary descriptors, and regional descriptors , Fundamentals of image compression modes, error free compression, lossy compression, image compression standards.

Unit V: Image segmentation and reconstruction:

Detection of discontinuities, edge linking and boundary detection thresholding, region – oriented segmentation, Image reconstruction from Projections, Radon Transforms; Convolution/Filter back – Project Algorithms.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing, A.K.JAIN, PHI
2. Fundamentals of Digital Image Processing, Anna durai, shanmuga lakshmi, Pearson
3. Introduction to Digital Image Processing, Alasdair, McAndrew, Cengage
4. Digital Image Processing, 3/e, GONZALEX, WOODS, Addison Wesley
5. Digital Image Processing, Castleman, Pearson
6. Digital Image Processing, S Jayaraman, SEsakkirajan, T Veerakumar, TMH

(PH2405105)DISTRIBUTED OPERATING SYSTEMS

Unit I: Processes

THREADS: Introduction to Threads, Threads in Distributed Systems; **CLIENTS:** User Interfaces, Client-Side Software for Distribution Transparency **SERVERS:** General Design Issues, Object Servers; **CODE MIGRATION:** Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Example: D'Agents
SOFTWARE AGENTS: Software Agents in Distributed Systems, Agent Technology

Unit II: Naming Systems

NAMING ENTITIES: Names, Identifiers, and Addresses, Name Resolution, The Implementation of a Name Space, Example: DNS, X.500
LOCATING MOBILE ENTITIES: Naming versus Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches
REMOVING UNREFERENCED ENTITIES: The Problem of Unreferenced Objects, Reference Counting, Reference Listing, Identifying Unreachable Entities

Unit III: Synchronization

Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion, distributed transactions

Unit IV: Consistency and Replication

Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples: Orca and Causally-Consistent Lazy Replication

Unit V: Fault Tolerance

Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery

REFERENCE BOOKS:

1. Distributed Systems, Principles and Paradigms, 2/e, Tanenbaum, Maarten Van Steen, PHI.
2. Advanced concepts in Operating Systems, Mukesh Singhal, Niranjana G. Shivaratri, TMH, 2005.
3. Distributed Operating Systems and Algorithm Analysis, Chow, Johnson, PEA
4. Distributed Systems Concepts and Design, 4/e, George Coulouris, Dollimore, Kindberg, PEA.
5. Distributed Operating Systems, Pradeep K. Sinha, PHI, 2009.
6. Operating Systems, Internals & Design Principles, 6/e, William Stallings, PEA.
7. Distributed Systems Computing over Networks, Joel M. Crichton, PHI.

(PH2405106) INFORMATION RETRIEVAL SYSTEMS

UNIT I Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, Information Retrieval System Capabilities - Search, Browse, Miscellaneous.

UNIT II Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction, **Data Structures:** Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure - **Automatic Indexing:** Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT III Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters - **User Search Techniques:** Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext - **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies.

UNIT IV Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

UNIT V Multimedia Information Retrieval – Models and Languages – Data Modeling, Query Languages, Indexing and Searching - Libraries and Bibliographical Systems – Online IR Systems, OPACs, Digital Libraries.

TEXT BOOKS:

1. Information Storage and Retrieval Systems: Theory and Implementation By Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000.
2. Modern Information Retrieval By Ricardo Baeza-Yates, Pearson Education, 2007.
3. Information Retrieval: Algorithms and Heuristics By David A Grossman and Ophir Frieder, 2nd Edition, Springer International Edition, 2004.

REFERENCES:

1. Information Retrieval Data Structures and Algorithms By William B Frakes, Ricardo Baeza-Yates, Pearson Education, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Introduction to Information Retrieval By Christopher D. Manning and Prabhakar Raghavan, Cambridge University Press, 2008.

(PH2405107)OBJECT ORIENTED SOFTWARE ENGINEERING

Unit I: Introduction to Classical Software Engineering:

Introduction to OO Paradigm. Different phases in structured paradigm and OO Paradigm. Software Process and different life cycle models and corresponding strengths and weaknesses.

Unit II: Planning and Estimation:

Estimation of Duration and Cost – COCOMO components of software. Project Management plan – one case Study.

Unit III: Modules to objects:

Cohesion and Coupling, Data Encapsulation and Information hiding aspects of Objects. Inheritance, polymorphism and Dynamic Binding aspects. Cohesion and coupling of objects. Reusability, Portability and Interoperability aspects.

Unit IV: Requirement phase:

Rapid Prototyping method, Specification phase - Specification Document- Formal methods of developing specification document

Analysis phase:

Use case Modeling - Class Modeling - Dynamic Modeling, Testing during OO Analysis.

Unit V: Design phase:

Data oriented design – Object Oriented design – Formal techniques for detailed design. One case study. Challenges in design phase.

REFERENCE BOOKS

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH
2. Object oriented and classical software Engineering, Timothy Lethbridge, Robert Laganieri, TMH

(PH2405108)SOFT COMPUTING

Unit I: Introduction: Uncertainty and Evidence, Shafer Dumpster belief and possibility Theory, Random sets and mass assignments, Dumpsters Rule, Fuzzy Measures and aggregation operators, Bayesian Networks. Graphical methods.

Unit II: Automated Learning-1 and 2 Automated Learning-1: Supervise vs. unsupervised learning, Decision Tree induction, rule induction algorithms. Automated Learning-2: Bayesian network learning algorithms, Evolutionary algorithms.

Unit III: Neural Networks and Fuzzy Methods: Neural Networks: Adaptive Networks, Supervised Learning NN, Reinforcement Learning, Unsupervised Learning. Fuzzy set theory, fuzzy control (including model based control), and Fuzzy Decision trees.

Unit IV: Hybrid systems: Neuro Fuzzy Systems, Back propagation Network supported by Fuzzy, GA based weight determination applications.

Unit V: Genetic Algorithms and Applications Encoding, Fitness functions, reproduction, Fuzzy Genetic Algorithms. Applications: Practical Examples from areas such as Medical, Management, and control, GA in fuzzy logic controller design.

REFERENCE BOOKS

1. Neuro Fuzzy and Soft Computing, A Computational approach to learning and Machine, Jyh-Shing Roger Jang, Cuen Tsai Sun, Eiji Mizurani, PEA.
2. Machine Learning, Tom Mitchell, MGH, 1997.
3. Soft Computing Techniques and Applications, Robert John, R. Birkenhead, Ralph Birkenhead.
4. Neural Networks, Fuzzy logic and genetic algorithms, S Rakasekharan, GA Vijayalakshmi, PHI.
5. Principles of Soft Computing, Sivanandam, Deepa, Wiley India, 2008. 6. Soft Computing and Intelligent Systems Design, Karry, De Silva, PEA, 2004.

(PH2405109)CLOUD COMPUTING

UNIT-I: Introduction: Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT-II: Cloud Enabling Technologies: Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT-III: Cloud Architecture, Services And Storage: Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT-IV: Resource Management And Security In Cloud: Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V: Cloud Technologies And Advancements: Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan Kaufmann Publishers.
2. Cloud Computing: Implementation, Management and Security, Rittinghouse, John W., and James F. Ransome, CRC Press.

References:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Tata McgrawHill.
2. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGrawHill.
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.

(PH2405110)BIG DATA ANALYTICS

UNIT-I: Introduction: Introduction to big data: Introduction to Big Data platform, Challenges of conventional systems, Intelligent data analysis, Nature of data, Analytic processes and tools, Analysis vs Reporting.

UNIT - II: Stream Processing: Mining data streams: 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.

UNIT - III: Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT - IV: Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT - V: Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear Regressions, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

References:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
2. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

E-resources:

1. <https://www.edx.org/course/big-data-fundamentals>
2. <https://hadoop.apache.org/>
3. <https://pig.apache.org/>
4. <https://hive.apache.org>

(PH2405111)SERVICE ORIENTED ARCHITECTURE

Unit I: SOA and Web Services Fundamentals

Introducing SOA- Fundamental SOA, Common Characteristics of Contemporary SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA. The Evolution of SOA – An SOA timeline, The continuing evolution of SOA, The roots of SOA. Web Services and primitive SOA The Web Services frame work, Services, Service descriptions, Messaging.

Unit II: SOA and WS-* Extensions

Web Services and Contemporary SOA (Part I-Activity management and Composition)- Message exchange patterns, Service Activity Coordination, Atomic transactions, Business Activities, Orchestration, Choreography. Web Services and Contemporary SOA (Part-II- Advanced Messaging , Metadata , and Security) – Addressing , Reliable messaging, Correlation, Policies, Metadata exchange, Security, Notification and eventing.

Unit III: SOA and Services - Orientation

Principles of Service-Oriented – Service – Orientation and the enterprise, Anatomy of SOA, Common Principles of Service – Orientation, interrelation between Principles of Service Orientation, Service Orientation and Object Orientation, Native Web Services support for Principles of Service-Oriented. Service Layers- Service-Oriented and Contemporary SOA , Service Layer abstraction , Application Service Layer , Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

Unit IV: Building SOA (Planning and Analysis)

SOA Delivery Strategies- SOA delivery lifecycle phases, The top-down strategy, The bottom-up strategy, The agile strategy. Service Oriented Analysis (Part I-Introduction)- Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services. Service Oriented Analysis (Part-II-Service Modelling)- Service Modelling, Service Modelling guidelines, Classifying Service model logic, Contrasting Service modelling approaches.

Unit V: Building SOA (Technology and Design)

Service Oriented Design (Part I-Introduction)- Introduction to Service-Oriented design, WSDL related XML Schema language basics, WSDL language basics, Service interface design tools. Service Oriented Design (Part II-SOA Composition Guidelines)- SOA Composing steps, Considerations for choosing service layers, Considerations for positioning core SOA standards, Considerations for choosing SOA extensions. Service Oriented Design (Part III- Service Design)- Service Design overview, Entity-centric business Service Design, Application Service Design, Task-centric business Service Design, Service Design guidelines. Service Oriented Design (Part IV-Business Process Design)- WS-BPEL language basics, WS- Coordination overview, Service Oriented Business process Design. Fundamental WS-* Extensions- WS Addressing language basics, WS-Reliable Messaging language basics, WS-Policy language basics, WS-MetadataExchange language basics, WS-Security language basics. SOA Platforms SOA platform basics, SOA support in J2EE and .NET, Integration considerations.

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TEXT BOOKS:

1. Service-Oriented Architecture-Concepts,Technology,and Design,Thomas Erl,Pearson Education.
2. Understanding SOA with Web Services,Eric Newcomer,Greg Lomow,Pearson Education.

REFERENCE BOOKS:

1. The Definitive guide to SOA,Jeff Davies&others,Apress,Dreamtech.
2. Java SOA Cook book,E.Hewitt,SPD.
3. SOA in Practice,N.M.Josuttis,SPD.
4. Applied SOA,M.Rosen and others,Wiley India pvt. Ltd.
5. Java Web Services Architecture,J.Mc Govern,and others,Morgan Kaufmann Publishers,Elsevier.
6. SOA for Enterprise Applications,Shankar.K,Wiley India Edition.
7. SOA-Based Enterprise Integration,W.Roshen,TMH.
8. SOA Security,K.Rama Rao,C.Prasad,dreamtech press.

(PH2405112)ADVANCED COMPUTER NETWORKS

UNIT I Review Computer Networks and the Internet:

What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, History of Computer Networking and the Internet - Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM - Networking Devices: Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure.

UNIT II The Link Layer and Local Area Networks:

Link Layer: Introduction and Services, Error Detection and Error-Correction techniques, Multiple Access Protocols, Link Layer Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Virtualization - Routing and Internetworking: Network-Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intradomain Routing Protocols, Interdomain Routing Protocols, Congestion Control at Network Layer

UNIT III Logical Addressing:

IPv4 Addresses, IPv6 Addresses - Internet Protocol: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6 – Multicasting Techniques and Protocols: Basic Definitions and Techniques, Intradomain Multicast Protocols, Interdomain Multicast Protocols, Node-Level Multicast algorithms - Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control – Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple Web Server

UNIT IV Wireless Networks and Mobile IP:

Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs) - Optical Networks and WDM Systems: Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength Allocation in Networks, Case Study: An All-Optical Switch

UNIT V VPNs, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks – VoIP and Multimedia Networking: Overview of IP Telephony, VoIP Signaling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol - Mobile Ad-Hoc Networks: Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks – Wireless Sensor Networks: Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Third Edition, Pearson Education, 2007
2. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2007

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REFERENCES:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill, 2007
2. Guide to Networking Essentials, Greg Tomsho, Ed Tittel, David Johnson, Fifth Edition, Thomson.
3. An Engineering Approach to Computer Networking , S.Keshav, Pearson Education. 4. Campus Network Design Fundamentals, Diane Teare, Catherine Paquet, Pearson Education (CISCO Press)
5. Computer Networks, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall. 6. The Internet and Its Protocols, A. Farrel, Elsevier.

(PH2405113)NETWORK SECURITY

Unit I: Introduction to Network Security:

Attacks, services, Security. A model of Inter network Security, Principles of Symmetric and public key cryptography, Steganography, One-time PADS.

Unit II: Crypto Graphic Algorithms (Block Cipher):

RC2, GOST, CAST, BLOW FISH, SAFEER, RC5, NEWDES, CRAB, Theory of Block Cipher design.

Unit III: Key Management and digital Signature Algorithms:

Key lengths, Generating Keys, Transferring, Verification, Updating, Storing, Backup, Compromised, Lifetime of, Destroying Keys, key Exchange Protocols, Secure multiparty Communication, Public key Management. Authentication, Formal Analysis of Authentication, Digital Signature, DSA, DSA variants, One – Schnorr – Shamir digital Signatures, Esign,

Unit IV: IP and Web security:

IP Security Architecture, Authentication Header, Encapsulating Security, Pay load Key Management Issues. Web Security Web Security requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction

Unit V: Mail Security:

PGP, SNMP, SMIME, Intruders, Viruses and Related Threats, Firewall Design Principles, Trusted Systems.

REFERENCE BOOKS:

1. Applied Cryptography, 7/e, Bruce SCHNEIER John Wiley & Sons Inc.
2. Cryptography and Network Security, William Stallings, PHI.
3. Introduction to cryptography with coding Theory, 7/e, Wade Trappe, C. Washington, PEA.
4. Cryptography and Information Security, V.K. Pachghare, PHI.
5. Cryptography and Network Security, Forouzan, TMH, 2007.
6. Cryptography and Network Security, 2/e, Kahate , TMH.
7. Modern Cryptography, Wenbo Mao, PEA

(PH2405114)CYBER SECURITY ESSENTIALS

UNIT-I: Introduction to Security:

Challenges of Securing Information, Definition of Information Security, Attackers, Attacks and Defenses. Systems Threats and Risks: Software-Based Attacks, Hardware-Based Attacks, Attacks on Virtualized Systems, Hardening the Operating System, Preventing Attacks that Target the Web Browser, Hardening Web Servers, Protecting Systems from Communications-Based Attacks, Applying Software Security Applications.

UNIT-II: Network Vulnerabilities and Attacks:

Network Vulnerabilities, Categories of Attacks, Methods of Network Attacks. Network Defenses: Crafting a Secure Network, Applying Network Security Devices, Host and Network Intrusion Prevention Systems (HIPS/NIPS), Protocol Analyzers, Internet Content Filters, Integrated Network Security Hardware.

UNIT-III: Access Control: Access Control Models and Practices, Logical Access Control Methods, Physical Access Control. Authentication: Definition of Authentication, Authentication Credentials, Extended Authentication Protocols, Remote Authentication and Security.

UNIT-IV: Vulnerability Assessment: Risk Management, Assessment, and Mitigation, Identifying Vulnerabilities. Security Audit: Privilege Auditing, Usage Auditing, Monitoring Methodologies and Tools.

UNIT-V: Cryptography: Introduction to Cryptography, Cryptographic Algorithms, Using Cryptography on Files and Disks, Digital Certificates, Public Key Infrastructure, Key Management.

Text Book:

Security+ Guide to Network Security Fundamentals, Third Edition, Mark Ciampa, Cengage Learning.

References:

- i. Principles of Information Security, Michael E. Whitman and Herbert J. Mattord, Cengage Learning.
- ii. Information Security: The Complete Reference, Rhodes-Ousley, Mark, Second Edition, McGraw-Hill.
- iii. Information Security: Principles and Practices, Mark S. Merkow, Jim Breithaupt, 2nd Edition, Pearson Education.

(PH2405115)INTRODUCTION TO DATA SCIENCE

UNIT – I: INTRODUCTION: Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT – II: DATA COLLECTION AND DATA PRE-PROCESSING Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT – III: EXPLORATORY DATA ANALYTICS Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT – IV: MODEL DEVELOPMENT Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

UNIT – V: MODEL EVALUATION Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

Text Books:

1. Data Science for Beginners, by Andrew Park
2. The Art of Data Science — A Guide for Anyone Who Works With Data, by Roger D. Peng and Elizabeth Matsui.

References:

1. JojoMoolayil, “Smarter Decisions : The Intersection of IoT and Data Science”,PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”,EMC 2013
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big DataAnalytics”, IGI Global.

PART- II

(PH2405201)ADVANCED COMPUTER ARCHITECTURE

Unit I: Parallel Computer Models, Program and Network Properties:

Parallel Computer Models: Multiprocessors and Multicomputers, Multivector and SIMD Computers,

Program and Network Properties: Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures

Unit II: Principles of Scalable Performance:

Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches

Unit III: Processors and Memory Hierarchy:

Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology

Unit IV: Bus, Cache, and Shared Memory:

Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Unit V: Pipelining and Superscalar Techniques:

Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design

Multiprocessors and Multicomputers:

Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms

REFERENCE BOOKS

1. Kai Hwang, Advanced computer Architecture: Parallelism, Scalability, Programmability, TMH, 2000.
2. Computer Architecture – A quantitative approach, 4/e, John L. Hennessey, David A. Patterson, Morgan Kaufmann / Elsevier, 2007.
3. Parallel Computing Architecture: A hardware/ software approach, David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
4. Computer Organization and Architecture – Designing for Performance, 7/e, William Stallings, PEa, 2006.
5. Computer Organization and Design, 4/e, Patterson, Elsevier, 2008.
6. Computer Architecture & Parallel Processing, Kai Hwang, Faye A. Briggs, TMH

(PH2405202)ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit I: Lists, Stacks, Queues and Trees:

Lists, Stacks and Queues: Abstract Data Types (ADTs), The List ADT, vector and list in the STL, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT. Trees: The Search Tree ADT - Binary Search Trees, AVL Trees, Splay Trees, B-Trees.

Unit II: Hashing and Priority Queues:

Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Extendible Hashing

Priority Queues: Implementations, Binary Heap, Applications of Priority Queues, *d*-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues.

Unit III: Sorting:

Sorting: A Lower Bound for Simple Sorting Algorithms, Shellsort, Heapsort, Mergesort, Quicksort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting.

The Disjoint Set Class: Equivalence Relations, the Dynamic Equivalence Problem, Basic Data Structure, Smart Union Algorithms, Path Compression, Worst Case for Union-by-Rank and Path Compression, an Application.

Unit IV: Graph Algorithms:

Definitions, Topological Sort, Shortest-Path Algorithms, Network Flow Problems, Minimum Spanning Tree, Applications of Depth-First Search, Introduction to NP-Completeness.

Algorithm Design Techniques: Greedy Algorithms, Divide and Conquer, Dynamic Programming, Randomized Algorithms, Backtracking Algorithms.

Unit V: Amortized Analysis:

An Unrelated Puzzle, Binomial Queues, Skew Heaps, Fibonacci Heaps, Splay Trees. Advanced Data Structures and Implementation: Top-Down Splay Trees, Red-Black Trees, Deterministic Skip Lists, AA-Trees, Treaps, *k*-d Trees, Pairing Heaps.

REFERENCE BOOKS

1. C & Data structures, N.B. Venkateswarulu, EV Prasad, S.Chand.
2. Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, PEA, 2007.
3. Data Structures Algorithms and Applications, 2/e, Sartaj Sahni, Universities Press, 2007.
4. Fundamentals of computer Algorithms, 2/e, Ellis Horowitz, Sartaj Sahni, Rajasekharan, Universities Press, 2008.
5. Data Structures and Algorithms, Aho, Ullman, PEA.
6. Data Structures and Algorithms in JAVA, Adam drozdek, Cengage.
7. Data Structures with JAVA™, Hubbard, Huray, PHI, 2009.
8. Data Structures, Gilberg, Forouzan, Thomson.
9. Fundamentals of Data structures algorithms and application Sartaj Sahni, University Press.

(PH2405203)COMPUTER COMMUNICATIONS

Unit I: Introduction:

Network Hardware reference model – Transmission media – Narrowband ISDN – Broad band ISDN – ATM.

Unit II: Data Link Layer and Channel allocation Methods:

The data Link layer – Design Issues – Error detection and correction – Elementary Data Link Protocols – Sliding window protocols – Data link layer in HDLC, Internet and ATM. Channel allocation methods – TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard 802 for LANs – Ethernet, Token Bus, Token ring – Bridges.

Unit III: Network Layer and internetworking:

NETWORK LAYER Routing Algorithms – Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention policies, Choke packets and Load shedding.

Tunneling, internetworking, Fragmentation, network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP. Network layer in the ATM Networks – cell formats, connection setup, routing and switching, service categories, and quality of service, ATM LANs.

Unit IV: Transport Layer: The Transport Layer Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, END TO END PROTOCOLS – UDP, reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – BLAST, CHAN, SELECT, DCE.

Unit V: Application Layer: Application Layer – Network Security – Cryptographic Algorithms – DES, RSA. Security Mechanisms – Authentication Protocols, Firewalls, Name service (DNS) Domains Hierarchy, Name servers. Traditional Applications – SMTP, MIME, World Wide Web – HTTP, Network Management – SNMP.

REFERENCE BOOKS

1. COMPUTER NETWORKS, Andrew Tanenbaum, 3/e, PHI.
2. COMPUTER NETWORKS – A SYSTEM APPROACH – Larry L. Peterson, Bruce S. Davie, 2/e, Harcourt Asia PTE LTD.
3. Data Communication and Networking, 4/e, Forouzan, TMH
4. An engineering approach to computer networking, Kesav, PEA
5. Data and Computer Communications, 8/e, Stallings, PHI
6. Computer communication and networking technologies, Gallo, Hancock, Cengage
7. Understanding data communications, 7/e, Held, PEA
8. Communication Networks, 2/e, Leon-Garcia, TMH

(PH2405204) MACHINE LEARNING

UNIT I: Introduction:

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Decision Tree learning:

Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Issues in decision tree learning

UNIT III: Artificial Neural Networks:

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition
Advanced topics in artificial neural networks

Evaluation Hypotheses : Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT IV: Bayesian learning:

Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

UNIT V: Computational learning theory :

Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces - **Instance- Based Learning**- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning **Genetic Algorithms :**

Motivation, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

REFERENCE BOOK:

1. Machine Learning ,Tom M. Mitchell, MGH
2. Machine Learning, An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC)
3. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

(PH2405205) PARALLEL COMPUTING & ALGORITHMS

UNIT I: Introduction:

Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law. Basic parallel random-access Machine Algorithms-definitions of P, NP and NP-Hard, NP-complete classes of sequential algorithms-NC –class for parallel algorithms.

UNIT II:

Organizational features of Processor Arrays, Multi processors and multicomputer. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm

UNIT III:

Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms.

UNIT IV:

Matrix Multiplication algorithms on SIMD and MIMD models
Fast Fourier Transform algorithms. Implementation on Hyper cube architectures

UNIT V:

Parallel sorting methods---Odd-even transposition Sorting on processor arrays. Biontic – merge sort on shuffle –exchange ID –Array processor, 2D-Mesh processor and Hypercube Processor Array
Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations.

REFERENCE BOOKS:

1. Parallel computing theory and practice, MICHAEL J. QUINN
2. Programming Parallel Algorithms, Guy E. Blelloch, Communications of the ACM
3. Algorithms for Parallel processing, Michael T Heath, Abhiram Ranade, Schreiber (Ed), Springer.
4. Handbook of Parallel Computing Models, algorithms and applications, Samgithevar Rajasekharan, John Reif(Ed), Taylor and Francis group.
5. Parallel Processing and Parallel Algorithms: Theory and Computation, Seyed H. Roosta, Springer

(PH2405206)PATTERN RECOGNITION

UNIT I: Introduction:

Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Simple pattern recognition model.

Decisions and Distance Functions:

Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

Probability - Probability of events:

Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples.

UNIT - II: DECISION MAKING - Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

Non-Parametric Decision Making:

histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

UNIT III: Clustering and Partitioning:

Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV: Pattern Preprocessing and Feature selection:

distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: Syntactic Pattern Recognition and Application of Pattern Recognition: Concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints, etc.,

REFERENCES BOOKS:

1. Pattern recognition and Image Analysis, Gose. Johnsonbaugh Jost, PHI.
2. Pattern Recognition Principle, Tou. Rafael. Gonzalez, Pea.
3. Pattern Classification, Richard duda, Hart., David Strok, Wiley.

(PH2405207) NATURAL LANGUAGE PROCESSING

UNIT I

Introduction and Overview: What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. **Regular Expressions** Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools. **Programming in Python** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit) **String Edit Distance and Alignment** Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT II Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Earley parser. Designing a little grammar, and parsing with it on some test data. **Probability** Introduction to probability theory Joint and conditional probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language. **Information Theory** The "Shannon game"--motivated by language! Entropy, cross-entropy, information gain. Its application to some language phenomena.

UNIT III Language modeling and Naive Bayes Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path, Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

UNIT IV Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search.

Parsing with PCFGs A treebank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

Maximum Entropy Classifiers The maximum entropy principle, and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V Maximum Entropy Markov Models & Conditional Random Fields

Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.

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Lexical Semantics Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial.

Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for coreference.

Text Books:

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall
2. "Statistical Natural Language Processing" - Manning and Schutze, MIT Press
3. "Natural Language Understanding". James Allen. The Benajmins/Cummings Publishing Company

References Books:

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

(PH2405208)MALWARE ANALYSIS

UNIT–I: Malware Basics- General Aspect of Computer infection program, Non Self Reproducing Malware, How does Virus Operate, Virus Nomenclature, Worm Nomenclature, Recent Malware Case Studies.

UNIT– II: Basic Analysis- Antivirus Scanning, x86 Disassembly, Hashing, Finding Strings, Packed Malware, PE File Format, Linked Libraries & Functions, PE Header File &Section.

UNIT–III: Advanced Static & Dynamic Analysis-IDA Pro, Recognizing C code constructs, analyzing malicious windows program, Debugging, OllyDbg, Kernel Debugging with WinDbg, Malware Focused Network Signatures.

UNIT–IV: Malware Functionalities-Malware Behavior, Covert Malware Launch, Data Encoding, Shell code Analysis.

UNIT–V: Reverse Engineering Malware (REM): REM Methodology, Resources for Reverse Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV-Signatures.

Text books:

1. Michael Sikorski, Andrew Honig “Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software” publisher William pollock

References:

1. ErciFiliol, “Computer Viruses: from theory to applications”, Springer, 1st edition, 2005.

(PH2405209)ADHOC AND SENSOR NETWORKS

UNIT I Introduction to Ad Hoc Networks:

Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT II Data Transmission:

Broadcast storm problem, Broadcasting, Multicasting and Geocasting - TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT III Basics of Wireless, Sensors and Applications:

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV Data Retrieval in Sensor Networks:

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots - Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT V Sensor Network Platforms and Tools:

Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms - Operating System: TinyOS - Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor network extension, TOSSIM

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

(PH2405210)COMPUTER VISION

UNIT – I: Introduction to Deep Learning, Tensor flow and Keras: What is Deep learning? Why Deep learning, Advantages, and limitations of Deep learning. Tensor flow basics, how to build Deep learning models with Keras and Tensor flow as back end. Tensor board for visualizations.

UNIT - II: CNN for Vision Tasks: Introduction to CNN, Deep Convolutional networks, LeNet, VGG16Net, Classification of MNIST hand written digits by CNN and FCNN models.

UNIT - III: Generative Adversal Networks (GAN's): What is GAN? DGAN, Some interesting GAN structures, SRGAN, Cycle GAN, info GAN. MNIST using GAN in Tensorflow.

UNIT - IV: Recurrent Neural Networks: The basic RNN, RNN Cell, RNN variants, RNN topologies, Example applications of RNN. Image captioning and Annotation.

UNIT - V: Deep Dream and Neural Style Transfer: How the Deep dream algorithm works, Deepdream implementation in keras and tensor flow. Neural Style Transfer: Content loss, Style loss, Total variation loss, network training.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems by Aurélien Géron, O'Reilly.
2. Deep Learning with Python 1st Edition by François Chollet, Manning Publications.
3. Mastering Computer Vision with TensorFlow 2.x: Build advanced computer vision applications using machine learning and deep learning techniques by Krishnendu Kar, Packt Publications.
4. Deep Learning with TensorFlow 2 and Keras: Regression, ConvNets, GANs, RNNs, NLP, and more with TensorFlow 2 and the Keras API, 2nd Edition

References:

1. Richard Szeliski "Computer Vision: Algorithms and Applications" (<http://szeliski.org/Book/>)
2. Haralick & Shapiro, "Computer and Robot Vision", Vol II
3. Gerard Medioni and Sing Bing Kang "Emerging topics in computer vision"
4. Emanuele Trucco and Alessandro Verri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
5. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993

(PH2405211) SPEECH PROCESSING

UNIT - I

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform Lossless Tube Model, Effect of Losses In Vocal Tract, Effect of Radiation at Lips, Digital Models for Speech Signals.

UNIT - II

Time Domain Models for Speech Processing: Introduction, Window Considerations, Short-Time Energy and Average Magnitude Short Time Average Zero Crossing Rate, Speech Vs Silence Discrimination Using Energy and Zero Crossing, Pitch Period Estimation using a Parallel Processing Approach, The Short Time Autocorrelation Function, The Short Time Average Magnitude Difference Function, Pitch Period Estimation using The Autocorrelation Function.

UNIT - III

Linear Predictive Coding (LPC) Analysis: Basic Principles of Linear Predictive Analysis, The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection Using LPC Parameters, Formant Analysis Using LPC Parameters.

UNIT - IV

Automatic Speech & Speaker Recognition: Basic Pattern Recognition Approaches, Parametric Representation of Speech, Evaluating the Similarity of Speech Patterns, Isolated Digit Recognition System, Continuous Digit Recognition System Hidden Markov Model (HMM) For Speech: Hidden Markov Model (HMM) for Speech Recognition, Viterbi algorithm, Training and Testing using HMMS.

UNIT - V

Speaker Recognition: Recognition techniques, Features that Distinguish Speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System. Overview of speech Enhancement, speech synthesis.

Textbooks:

1. Digital Processing of Speech Signals: L.R Rabinar and R W Jhaung, Pearson Education.
2. Digital Processing of Speech Signals: L.R. Rabiner and S. W. Schafer, Pearson Education.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., WileyIndia.

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References:

1. Discrete Time Speech Signal Processing: Principles and Practice, Thomas F. Quateri,
1st Edition, Pearson Education.
2. Speech & Audio Signal Processing: Ben Gold & Nelson Morgan, 1st Edition, Wiley.

(PH2405212) GRID COMPUTING

UNIT-I INTRODUCTION

Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids

UNIT-II TYPES OF GRIDS Desktop Grids:

Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

UNIT-III ARCHITECTURE AND MANAGEMENT The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI)

UNIT-IV NATIVE PROGRAMMING AND SOFTWARE APPLICATIONS: Desktop supercomputing – parallel computing – parallel programming paradigms – problems of current parallel programming paradigms – Desktop supercomputing programming paradigms – parallelizing existing applications – Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software applications.

UNIT-V APPLICATIONS, SERVICES AND ENVIRONMENTS

Application integration – application classification – Grid requirements – Integrating applications with Middleware platforms – Grid enabling Network services – managing Grid environments – Managing Grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Different application areas of Grid computing.

Text Books:

1. Ahmar Abbas, “ Grid Computing , A Practical Guide to Technology and Applications”, Firewall media , 2004.
2. Joshy Joseph , Craig Fellenstein , “Grid Computing”, Pearson Education , 2004.
3. Fran Berman, Geoffrey Fox, Tony Hey, “Grid Computing-Making -The Global Infrastructure A Reality”, John Wiley & Sons Ltd, 2003.
4. Rajkumar Buyya, High Performance Cluster Computing: Architectures and Systems, Vol. 1, PHI, 1999.

(PH2405213)SOFTWARE PROCESS AND PROJECT MANAGEMENT

UNIT I: Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models Capability Maturity Model (CMM), CMMi, PCMM, PSP, TSP.

UNIT II: Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

UNIT III: Life-Cycle Phases and Process artifacts

Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures. Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

UNIT IV: Process Planning and Project Organizations

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning, line-of- business organizations, project organizations, evolution of organizations, process automation.

UNIT V: Project Control and process instrumentation

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation. CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education, 1999
2. Software Project Management, Walker Royce, Pearson Education, 1998

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata McGraw Hill, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, second edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.
8. Quality Software Project Management, R.F. Futrell, D.F. Shafer, L.I. Shafer, Pearson

(PH2405214)INTERNET OF THINGS (IoT)

UNIT - I: Introduction to IOT

Understanding IoT fundamentals, IOT Architecture and protocols, Various Platforms for IoT, Real time Examples of IoT , Overview of IoT components and IoT Communication Technologies ,Challenges in IOT.

UNIT - II: Arduino Simulation Environment Arduino Uno Architecture

Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD. Sensor & Actuators with Arduino Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino. Interfacing of Relay Switch and Servo Motor with Arduino.

UNIT - III: Raspberry Pi Programming

Installing and Configuring the Raspberry Pi,Getting Started with the Raspberry Pi,Using the Pi as a Media Centre, Productivity Machine and Web Server,Remote access to the Raspberry Pi. Preparing

Raspberry Pi for IoT Projects. Creating the Sensor Projects,Creating the actuator Projects, Creating a IoT controller, creating a camera and working with HTTP protocol.

UNIT - IV: Basic Networking with ESP8266 WiFi module

Basics of Wireless Networking ,Introduction to ESP8266 Wi-Fi Module ,Various Wi-Fi library , Web server- introduction, installation, configuration ,Posting sensor(s) data to web server .IoT Protocols ,M2M vs. IOT Communication Protocols.

UNIT - V: Cloud Platforms for IOT Virtualization

Concepts and Cloud Architecture , Cloud computing, benefits ,Cloud services -- SaaS, PaaS, IaaS , Cloud providers & offerings ,Study of IOT Cloud platforms , ThingSpeak API and MQTT , interfacing ESP8266 with Web services

Text Books:

- i. Simon Monk, Programming Arduino: Getting Started with Sketches, Second Edition McGraw- Hill Education
- ii. Peter Waher, Learning Internet of Things, Packt publishing.
- iii. Ovidiu Vermesan, Peter Friess, IoT-From Research and Innovation to Market deployment, River Publishers

Reference Books:

- i. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
- ii. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
- iii. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer.

(PH2405215)BLOCK CHAIN TECHNOLOGY

UNIT-I: Introduction:

History and basics, Types of Blockchain, Consensus, CAP Theorem. Cryptographic Hash Functions: Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

UNIT-II: Decentralization: Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

UNIT-III: Bitcoin: Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

UNIT-IV: Ethereum: Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.

UNIT-V: Hyperledger: Introduction, Hyperledger Projects, Protocol, Architecture, Hyperledger Fabric, Sawtooth Lake, Corda. Challenges and Opportunities: Scalability, Privacy, Blockchain for IoT, Emerging trends

Text Book:

- i. Mastering Blockchain, Imran Bashir, Second Edition, Packt Publishing.

References:

- i. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andrea Antonopoulos, and O'Reilly.
- ii. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.
- iii. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, Andreas M. O'Reilly.
- iv. Blockchain Technology: Cryptocurrency and Applications, S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press.