Biju Patnaik University of Technology, Odisha B.E./B.Tech CSE Sem 5 syllabus

Artificial Intelligence and Machine Learning

Artificial Intelligence & Machine Learning

Module-I:
INTRODUCTION –The Foundations of Artificial Intelligence; - INTELLIGENT AGENTS – Agents and Environments, Good Behaviour: The Concept of Rationality, the Nature of Environments, the Structure of Agents, SOLVING PROBLEMS BY SEARCH – Problem-Solving Agents, Formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information, Informed (Heuristic) Search Strategies, Greedy best-first
search, A* Search, CSP, Means-End-Analysis.

Module-II:
ADVERSARIAL SEARCH – Games, The Mini-Max algorithm, optimal decisions in multiplayer games, Alpha-Beta Pruning, Evaluation functions, Cutting off search, LOGICAL AGENTS – Knowledge-Based agents, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, Resolution, Forward and Backward chaining - FIRST ORDER LOGIC – Syntax and Semantics of First-Order Logic, Using First-Order Logic , Knowledge Engineering in First-Order Logic - INFERENCE IN FIRST ORDER LOGIC – Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

Module-III:
UNCERTAINTY – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its Use, PROBABILISTIC REASONING – Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks

Module-IV:
LEARNING METHODS – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, Rote Learning, Learning by Taking Advice, Learning in Problem-solving, learningfrom Examples: Induction, Explanation-based Learning, Discovery, Analogy, FormalLearning Theory, Neural Net Learning and Genetic Learning. Expert Systems: Representingand Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Books:
[1] Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed.,2009
[2] Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 4/e, Pearson, 2003.
[3] Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications,2000

[4] Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
[5] S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

Database Management Systems

Database Management Systems

Module I
Introduction: Purpose of Database System -– Views of data – data models, database management
system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data
modelling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram
notation, examples.

Module II
Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys,
referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition

in SQL, table, key and foreign key definitions, update behaviours. Querying in SQL, notion of
aggregation, aggregation functions group by and having clauses, embedded SQL.

Module III

Database Design: Dependencies and Normal forms, dependency theory - functional dependencies,
Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF
and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF
normalization, 4NF, and 5NF.

Module IV

Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID
properties, concurrency control, locking based protocols for CC, error recovery and logging, undo,
redo, undo-redo logging and recovery methods.

Module V

Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary
index structures, various index structures - hash-based, dynamic hashing techniques, multi-level
indexes, B+ trees.

Operating Systems

Operating Systems

Module I

Operating Systems –Definition- Types- Functions -Abstract view of OS- System Structures –System Calls- Virtual Machines –Process Concepts –Threads Multithreading

Module II

Process Scheduling- Process Co-ordination –Synchronization – Semaphores –Monitors Hardware Synchronization –Deadlocks –

Methods for Handling Deadlocks

Module III
Memory Management Strategies –Contiguous and Non-Contiguous allocation –Virtual memory Management –Demand Paging- Page Placement and Replacement Policies

Module IV
File System –Basic concepts - File System design and Implementation –Case Study: Linux File Systems - Mass Storage Structure –Disk Scheduling –Disk Management –I/O Systems-System Protection and Security

Module V
Distributed Systems –Distributed operating systems –Distributed file systems –Distributed Synchronization

Formal Languages and Automata Theory

Formal Languages and Automata Theory

Module I: Introduction
Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

Module II: Regular Expression (RE)
Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular
expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and

Limitation of FA.

Module III: Context Free Grammar (CFG) and Context Free Languages (CFL)
Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Module IV: Push Down Automata (PDA)
Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of
PDA and CFG, CFG to PDA and PDA to CFG.

Module V: Turing machines (TM)
Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.