ADM01 ARTIFICIAL INTELLIGENCE

Prerequisite : NIL

Course Objectives

The course on Artificial Intelligence aims to provide the students with the following:

1. Understand different types of AI agents and know various AI search algorithms (uninformed, informed, heuristic)

2. Understand genetic algorithms, constraint satisfaction and adversarial search

3. Know the fundamentals of knowledge representation (logic-based), inference and theorem proving and ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

4. Learn and understand the different types of learning methods.

5. Study about planning and artificial neural networks

Course Outcomes

On successful completion of the course, the student will be able to:

1. Formulate problems so that exploratory search can be applied and implement optimal, heuristic and memory bounded search techniques

2. Implement different Searching algorithms such as optimal search methods, game search

3. Represent knowledge using formal logic and design algorithms to work in a semi-observable environment using logical reasoning

4. Develop and implement various learning algorithms

5. Design and develop practical algorithms for solving real-life planning problems

UNIT I UNINFORMED AND INFORMED SEARCH

What is AI? – History – Overview - Intelligent Agents - Performance Measure – Rationality - Structure of Agents - Problem-solving agents - Problem Formulation - Uninformed Search Strategies - Informed (Heuristic) Search - Greedy best first search - A* search - Memory bounded heuristic search - Heuristic functions.

UNIT II LOCAL AND ADVERSARIAL SEARCH

Local Search algorithms - Hill-climbing - Simulated Annealing - Genetic Algorithms - Online search - Constraint Satisfaction Problems - Backtracking Search - variable and value ordering - constraint propagation - intelligent backtracking - local search for CSPs, Adversarial Search - Games - The minimax algorithm - Alpha-Beta pruning - Imperfect Real-Time Decisions - Games Element of Chance.

UNIT III KNOWLEDGE REPRESENTATION AND REASONING

Knowledge Based Agents - The Wumpus world – Logic - Propositional Logic - Inference - Equivalence - Validity and Satisfiability - Resolution - Forward and Backward Chaining - First Order Logic - Models for first order logic - Symbols and Interpretations - Terms - Atomic sentences - complex sentences - Quantifiers - Inference in FOL - Unification and Lifting - Forward Chaining - Backward Chaining - Resolution.

UNIT IV LEARNING

Quantifying uncertainty - Acting under uncertainty - Probability basics - Bayes' Rule and its use - Probabilistic reasoning - Representing knowledge in uncertain domain - The semantics of Bayesian networks - Learning from observations - Forms of Learning - Inductive Learning - Learning decision trees - Learning in Neural and Belief networks - Reinforcement Learning - Passive Learning - Active Learning - Learning an Action - Value function using Q Learning.

UNIT V PLANNING AND ANN

Planning with state space search - Partial-Order Planning - Planning Graphs - Planning with Propositional Logic - hierarchical task network planning - non-deterministic domains - conditional planning - continuous planning - multi-agent planning - Introduction to artificial neural networks – Perceptrons - Multi-layer feed forward network - Application of ANN

TEXT BOOKS

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2015

2. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition

REFERENCES

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000

2. George F. Luger, "Artificial Intelligence-Structures and Strategies For Complex Problem Solving", Pearson Education / PHI, 2002

3. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

4. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata Mc Graw Hill, Third Edition , 2009