

1. Introduction

Objective: To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements. To have an appreciation for the engineering issues underlying the design of AI systems. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.

Course Description: This course will introduce the basic principles in artificial intelligence research. It will cover simple representation schemes, problem solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing, expert systems, vision and robotics will be explored.

Credits: 3-0-0

2. Course Outline

UNIT - I: Introduction

What is AI, Foundations of AI, History of AI.

UNIT - II: Intelligent Agents

Agents and Environments, Structure of Agents.

UNIT - III: Problem Solving by Searching

Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening Depth-first Search, Comparison of Uninformed Search Strategies.

UNIT - IV: Informed Search and Exploration

Informed (Heuristic) Search Strategies: Greedy Best-first Search, A* Search, Heuristic Functions, Local Search Algorithms and Optimization Problems.

UNIT - V : Constraint Satisfaction Problems

Backtracking Search for CSPs, Local Search for CSPs.

UNIT - VI : Adversarial Search

Games, Minimax Algorithm, Alpha-Beta Pruning

UNIT - VII : Reasoning and Knowledge Representation

Introduction to Reasoning and Knowledge Representation, Propositional Logic, First-order Logic, Semantic Nets, Other Knowledge Representation Schemes.

UNIT - VIII : Automated Planning

Planning with state-space search, partial-order planning, planning graphs, planning with propositional logic

UNIT - IX : Reasoning with Uncertainty & Probabilistic Reasoning

Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

UNIT - X : Making simple & complex decisions

Hidden Markov Models, Utility and decision theory, Markov Decision Processes (MDP), Partially Observable Markov Decision Processes (POMDP)

3. Reading Material

Text Books

1. Artificial Intelligence: A Modern Approach, 2nd edition, by Russell and Norvig, Prentice Hall

References

1. What is AI? (by John McCarthy)
2. History and Promise of AI (by David Waltz)
3. The Human Intelligence Enterprise. Why I am Optimist (by Patrick Winston)