

24CSH301: MACHINE INTELLIGENCE

Hours/Week: 4
Credits: 4

I.A. Marks: 30
Exam. Marks: 70

Course Learning Objectives:

- The basic exposition to the goals and methods of Artificial Intelligence.
 - The student to apply these techniques in applications which involve perception, reasoning and learning.
 - To have an understanding of the basic issues of knowledge representation and blind and heuristic search.
 - The basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.
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Course Outcomes: After completing the course, the students will be able to,

- Recognize concept of knowledge representation and predicate logic and transform the real life information in different representation.
- Realize the state space and its searching strategies.
- Understand machine learning concepts and range of problems that can be handled by machine learning.
- Apply the machine learning concepts in real life problems.
- Compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems.
- Discuss the core concepts and algorithms of advanced AI, including informed searching Algorithm, Different Types of Machine Learning Approaches
- Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.

UNIT-I: 12 Hrs.

Introduction to Artificial Intelligence and Problem-Solving Agent: Problems of AI, Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, Strategies for state space search, Using the State Space to Represent Reasoning with the **Predicate calculus** (State space description of a logical system, AND/OR Graph).

UNIT-II: 12 Hrs.

Heuristic Search: Introduction, Hill-Climbing and Dynamic Programming, The Best-first Search Algorithm, Introduction to Machine Learning: Different Types of Machine Learning Approaches, Examples of Machine Learning Applications, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Semi-supervised learning. Training, Validation and Testing, Over-Fitting and Under-Fitting, Different Types of Error Calculation,

UNIT-III: 12 Hrs.

Classification Algorithms: Simple Linear regression, Multiple linear regression, Polynomial regression, Ridge regression, Lasso Regression (L1 Regularization); Decision trees: Gini impurity, entropy, and information gain, and mean squared error, Decision Tree Algorithms: ID3, C4.5; Naïve Bayes Classifier, Basics of Support Vector Machine

UNIT-IV: 12 Hrs.

Clustering: Distance measures, Different clustering methods -Distance, Density, Hierarchical, Iterative distance-based clustering, Dealing with continuous, categorical values in K-Means, Constructing a hierarchical cluster, K-Medoids, k-Mode and density-based clustering, Measures of quality of clustering
Feature Reduction/Dimensionality reduction: Principal components analysis (Eigen values, Eigen vectors, Orthogonality), **Linear discriminant analysis;**

REFERENCE BOOKS:

1. George F Luger, Artificial Intelligence – Structures and Strategies for Complex problem solving, 5thEdn, pearson.
2. E. Rich, K. Knight, S B Nair, Artificial intelligence, 3rdEdn, McGraw Hill.
3. S. Russel and P. Norvig, Artificial intelligence – A Modern Approach, 3rdEdn, Pearson
4. D W Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI, 1990.
5. EthemAlpaydin, Introduction to Machine Learning- 3rd Edition, PHI.
6. Tom M. Mitchell, Machine Learning, McGraw-Hill.
7. Ian Goodfellow and YoshuaBengio and Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning), MIT Press, 2016.