

Artificial Intelligence Course Modules

Course Overview

This course learning modules provides a comprehensive introduction to the field of Artificial Intelligence (AI), exploring the principles, techniques, and applications that define modern AI systems. Students and professionals will gain a solid foundation in key AI concepts such as intelligent agents, search algorithms, machine learning, knowledge representation, reasoning, and natural language processing.

Through hands-on projects and real-world case studies, students will learn how AI is applied in areas like robotics, computer vision, game playing, and decision-making systems. The course also addresses ethical considerations and the societal impact of AI technologies.

Learning Objectives:

- Understand the history and evolution of AI.
- Design and implement basic search and optimization algorithms.
- Apply fundamental machine learning techniques (supervised, unsupervised, reinforcement learning).
- Develop simple AI models for problem-solving.
- Analyze ethical issues related to AI development and deployment.

Prerequisites

1. Basic programming knowledge (e.g., Python), and familiarity with linear algebra and probability is recommended.

Modules	Titles	Topics
1.	Introduction to AI	<ul style="list-style-type: none">➤ Definition and history of AI➤ Applications of AI in real-world scenarios➤ Goals and challenges of AI➤ Types of AI: Narrow vs General AI
2.	Problem Solving and Search Techniques	<ul style="list-style-type: none">➤ Intelligent agents and environments➤ Uninformed (Blind) search: BFS, DFS➤ Informed (Heuristic) search: A*, Greedy➤ Adversarial search: Minimax, Alpha-Beta pruning

3.	Knowledge Representation and Reasoning	<ul style="list-style-type: none"> ➤ Propositional and First-order logic ➤ Ontologies and semantic networks ➤ Inference mechanisms ➤ Rule-based systems
4.	Machine Learning	<ul style="list-style-type: none"> ➤ Supervised learning: Regression, Classification ➤ Unsupervised learning: Clustering, Dimensionality Reduction ➤ Reinforcement learning and evaluation metrics
5.	Neural Networks and Deep Learning	<ul style="list-style-type: none"> ➤ Introduction to artificial neural networks ➤ Activation functions, backpropagation ➤ Convolutional Neural Networks (CNNs) ➤ Recurrent Neural Networks (RNNs)
6.	Natural Language Processing (NLP)	<ul style="list-style-type: none"> ➤ Text preprocessing and tokenization ➤ Language models ➤ Named Entity Recognition, Sentiment Analysis ➤ Introduction to transformers and LLMs
7.	Computer Vision	<ul style="list-style-type: none"> ➤ Image classification and object detection ➤ Image preprocessing techniques ➤ Face recognition and video analysis
8.	Robotics and AI	<ul style="list-style-type: none"> ➤ Introduction to robotics ➤ Perception, motion planning, and control ➤ Applications in autonomous systems
9.	Expert Systems and Fuzzy Logic	<ul style="list-style-type: none"> ➤ Design of expert systems ➤ Fuzzy logic principles and applications
10.	AI Ethics and Social Implications	<ul style="list-style-type: none"> ➤ Bias in AI systems ➤ Privacy and surveillance concerns ➤ AI and job automation ➤ Ethical frameworks for AI governance
11.	AI Tools and Platforms	<ul style="list-style-type: none"> ➤ Introduction to tools: Python, TensorFlow, Keras, Scikit-learn ➤ Use of APIs and cloud-based AI services ➤ Real-world project development

12.	Capstone Project	<ul style="list-style-type: none">➤ Design and implementation of a complete AI solution➤ Problem selection, model development, evaluation➤ Presentation and report
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