Artificial Intelligence Curriculum

35 Hours

Syllabus:

Introduction (1hr)

- What Is AI?
- The Foundations of Artificial Intelligence

Intelligent Agents (1hr)

- Agents and Environments
- Good Behavior: The Concept of Rationality
- The Nature of Environments
- The Structure of Agents

Searching (4hrs)

- Solving Problems by Searching
- Beyond Classical Search
- Adversarial Search

Constraint Satisfaction (3hrs)

- Defining Constraint Satisfaction Problems
- Constraint Propagation: Inference in CSPs
- Backtracking Search for CSPs
- Local Search for CSPs
- The Structure of Problems

Logical Agents (3hrs)

- Knowledge-Based Agents
- The Wumpus World
- Logic
- Propositional Logic: A Very Simple Logic
- Propositional Theorem Proving
- Effective Propositional Model Checking
- Agents Based on Propositional Logic

First Order Logic (4hrs)

- Representation Revisited
- Syntax and Semantics of First-OrderLogic
- Using First-Orde rLogic
- Knowledge Engineering in First-OrderLogic.
- Propositional vs. First-Order Inference

- Unification and Lifting
- Forward Chaining
- Backward Chaining
- Resolution

Planning (2hrs)

- Classical Planning
- Planning and Acting in the Real World

Knowledge Representation (2hrs)

- Ontological Engineering
- Categories and Objects
- Events
- Mental Events and Mental Objects
- Reasoning Systems for Categories
- Reasoning with Default Information
- The Internet Shopping World

Uncertainty (2hrs)

- Acting under Uncertainty
- Basic Probability Notation
- Inference Using Full Joint Distributions
- Independence
- Bayes' Rule and Its Use
- The Wumpus World Revisited

Probabilistic Reasoning (5hrs)

- Representing Knowledge in an Uncertain Domain
- The Semantics of Bayesian Networks
- Efficient Representation of Conditional Distributions
- Exact Inference in Bayesian Networks
- Approximate Inference in Bayesian Networks
- Relational and First-Order Probability Models
- Other Approaches to Uncertain Reasoning
- Inference in TemporalModels
- Hidden Markov Models
- Kalman Filters
- Dynamic Bayesian Networks
- Keeping Track of Many Objects

Decision Making (3hrs)

- Combining Beliefs and Desires under Uncertainty
- The Basis of Utility Theory
- Utility Functions

- Multiattribute Utility Functions
- Decision Networks
- The Value of Information
- Decision-Theoretic Expert Systems
- Sequential Decision Problems
- Value Iteration
- Policy Iteration.
- Partially Observable MDPs
- Decisions with Multiple Agents: Game Theory
- Mechanism Design

Learning (5hrs)

- Introduction
- Passive Reinforcement Learning
- Active Reinforcement Learning
- Generalization in Reinforcement Learning
- Policy Search
- Applications of Reinforcement Learning