

SUMMER SCHOOL IN PEKING UNIVERSITY
SUBJECT DESCRIPTION

Subject title: Fundamentals of Artificial Intelligence

Subject code:

Credit value: 2 credits

Pre-requisite: (Subject title and code no, if any)

Nil

Recommended background knowledge:

Data Structures and Algorithm, Discrete Mathematics (logic, probability, counting)

Mutual exclusions: Nil

Learning approach:

Lecture	28 hours
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Assessment:

Examination	100%
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Objectives:

This course introduces the theoretical and computational techniques that serve as a foundation for the study of artificial intelligence (AI). Specific objectives include:

- understanding basic search algorithms
 - understanding algorithms used for logical and probabilistic reasoning
 - acquiring the basics of game theory
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Keyword syllabus:

PART I: SEARCH

Uninformed Search

Problem solving as search, breadth-first search, depth-first search, uniform-cost search, iterative deepening, bidirectional search

Informed Search

Greedy best-first search, admissible heuristics, A*

Local Search

Hill-Climbing search, simulated annealing, Davis-Putnam, satisfiability, genetic algorithms

Constraint Satisfaction

Backtracking, value and variable selection heuristics, forward checking, constraint propagation, problem encoding as CSPs

Adversarial Search

Game playing as search, simple minimax, heuristic minimax, alpha-beta pruning, expectiminimax

PART II: KNOWLEDGE REPRESENTATION AND REASONING

Basics of Knowledge Representation and Reasoning

Knowledge representation, logic, soundness and completeness of proof theory

Propositional Logical Reasoning

Propositional logic, rules of inference, resolution, chaining

First-Order Logical Reasoning

First-order logic, rules of inference, resolution

PART III: PROBABILISTIC REASONING

Review of Probability Theory

Basics of probability theory, uncertainty, the joint probability distribution, conditional independence

Semantics of Bayesian Networks

Bayesian networks, d-separation

Exact Inference

Enumeration, variable elimination

Approximate Inference

Stochastic simulation, likelihood weighting

PART IV: GAME THEORY

Games with Hidden Information

Matrix normal form of games, pure and mixed strategies

Non-Zero Sum Games

Prisoner's dilemma, Nash equilibrium, tragedy of the commons

Indicative reading list and references:

- S. Russell and P. Norvig, 2010. *Artificial Intelligence (3rd edition)*. 1132pp, ISBN 978-0-13-604259-4, Prentice Hall.