Artificial Intelligence

——A Programming-Oriented Course ——

Instructor

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Instructor's Information

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Outline

- Course's Objectives
- References
- Course's Outcomes
- Course's Outline
- Grading Policy

Course's Objectives

- Introduce the development of Artificial Intelligence
  - <Time, Research Interests, Results>
- Train the students with general techniques, principals, and strategies for solving problems
- Side-effect:
  - Analyze, design, code, and debug a given problem

References

[1] Stuart Russell & Peter Norvig (2003). **Artificial Intelligence - A Modern Approach**, Prentice Hall, 2nd edition.

Web resources: http://aima.cs.berkeley.edu/

[2] Elaine Rich & Kevin Knight (1991), **Artificial Intelligence**, McGraw-Hill, 2nd edition.

[3] George Klir & Bo Yuan (1995), **Fuzzy Sets and Fuzzy Logic: Theory and Applications**. Prentice Hall

[4] Tom Mitchell (1997), **Machine Learning**, McGraw-Hill.

[5] Ivan Bratko (1990), **Prolog Programming for Artificial Intelligence**, Addison-Wesley.

Course's Outcomes

- Are able to explain techniques in knowledge representation and reasoning, in problem solving, and in machine learning.
- Are able to select suitable AI's techniques for solving any given problem.
- Are able to use and to select right tools and programming languages for solving problems in AI.
- Are able to develop basic intelligent systems.

Course's Outline

- Chapter 1: Introduction
  - Artificial Intelligence (AI): What, Why, and How?
  - History and The State of The Art
  - Typical Problems
  - Tools and Programming Languages for AI
- Chapter 2: Intelligent Agent
  - Agent and Behavior
  - Environment
  - The Structure of Agents

Course's Outline

- Chapter 3: State Space Search
  - Modeling State Spaces
  - Searching for Solutions
  - Uninformed Search Strategies
  - Problem Characteristics
- Chapter 4: Informed Search
  - Path-based Search
  - Heuristic Functions
  - Local Search
  - Online Search

Course's Outline

- Chapter 5: Constraint Satisfaction Problem (CSP)
  - CSP: What? Applications?
  - Backtracking Search
  - Local Search + CSP
  - Simplifying CSP
- Chapter 6: Game Playing
  - Minimax Procedure
  - Alpha-beta Cutoffs
  - Additional Refinements

Course's Outline

- Chapter 7: Knowledge Representation and Reasoning
  - What is Knowledge Representation?
  - Using Proportional Logic
  - Using Predicate Logic
  - Rule-based Systems
- Chapter 8: Structured Knowledge
  - Semantic Networks
  - Frames
  - Conceptual Graphs
  - Ontology: RDF, DAML, and OIL

Course's Outline

- Chapter 9: Planning
  - The Planning Problem
  - Planning with State-Space Search
  - Partial-Order Planning
  - Planning Graphs
  - Planning with Propositional Logic
  - Analysis of Planning Approaches

- Chapter 10: Uncertain Knowledge and Reasoning
  - Review of Probabilistic Theory
  - Bayesian Network
  - Fuzzy Reasoning
  - Hidden Markov Model (HMM)

Course's Outline

- Chapter 11: Machine Learning
  - Learning Problem
  - Concept Learning
  - Candidate-Elimination Algorithm
  - Maximum-Likelihood, EM, and GMM
  - Neural Network

Grading Policy

- Midterm examination: 30%
  - Method: Grade writing exam.
  - Time: Week 8-9 (April 04-April 17)
- Final examination: 50%
  - Method: Grade writing exam.
  - Time: Week 18-20 (June 13-July 03)
- Assignments: 10%
  - Method: Grade the result of a mini-project.
  - Time: final report on week 14
- Labs: 10%
  - Method:
    - ✓ Grade the students' attendance
    - ✓ Grade the capability of coding artificial problems
  - Time: the whole semester