Cleveland State University  
Department of Electrical Engineering and Computer Science

CIS 467: Introduction to Artificial Intelligence

Catalog Description:  
CIS 467 Introduction to Artificial Intelligence  
Pre-requisite: None  
This course provides an introduction to the field of artificial intelligence. The major topics covered will include reasoning and representation, search, constraint satisfaction problems, planning, logic, reasoning under uncertainty, and planning under uncertainty.

Textbook:  
Artificial Intelligence: Foundations of Computational Agents by David L. Poole and Alan K. Mackworth.

Coordinator:  
Dr. Pooyan Fazli  
Assistant Professor of Electrical Engineering and Computer Science  
Email: pooyan.fazli@gmail.com

Expected Outcomes:  
At the end of this course, students will have a thorough understanding of several topics in Artificial Intelligence, including:  
- Intelligent Agents and knowledge representation  
- Search: how can a computer solve problems when it is told what to do, and not how to do it?  
- Constraint Satisfaction Problems: Finding solutions which satisfy constraints  
- Planning: Determining actions required to achieve a goal  
- Logic: How to reason logically  
- Uncertainty: How to reason when there is uncertainty  
- Decision making under uncertainty

Fulfillment of EE, CE and CIS Program Objectives and Outcomes:

Objectives:  
1. Graduates will apply the concepts of the discipline including analysis, design, and implementation of information and computing systems.  
2. Graduates will be employed in the computing profession, and will be engaged in life-long learning, understanding, and applying new ideas and technologies as the field evolves.

Outcomes:  
1. An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline  
2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution  
5. An ability to translate fundamental computing concepts to a variety of emerging technologies  
6. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based
Student Characteristics:

(a) An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
(e) An understanding of professional, ethical, legal, security and social issues and responsibilities
(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society
(i) An ability to use current techniques, skills, and tools necessary for computing practice.
(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Prerequisites by Topic: Math (Probability and Statistics), Data Structures and algorithms, and Programming

Topics:

1. Introduction
   - What is AI?
   - Intelligent Agents

2. Search Framework
   - Search Framework
   - BFS and DFS
   - Search with Costs & Heuristic Search
   - Heuristic Search: A*
   - A* optimality, cycle checking
   - Iterative Deepening (IDS) and IDA*
   - Multiple Path Pruning, Branch & Bound

3. CSP
   - CSP Introduction
   - Solving CSP using search
   - Arc Consistency
   - Domain splitting
   - Local search
   - Stochastic local search

4. Planning
   - Representation and Forward Planning
   - CSP Planning

5. Logic
   - Intro & Propositional Definite Clause Logic
   - Proof procedures, soundness and completeness
   - Bottom-up and Top-down Proof Procedures

6. Uncertainty
   - Probability Theory: Intro
- Conditional Probability, Bayes Rule, Chain Rule
- Independence
- Bayesian networks intro
- Independence and Inference
- Variable Elimination

7. Decision Theory
   - Single Decisions
   - Sequential Decisions
   - Optimal Policies for Sequential Decisions