Syllabus of Record

Program: CET Siena
Course Code / Title: (SN/CS4710) Artificial Intelligence
Total Hours: 45
Recommended Credits: 3
Primary Discipline / Suggested Cross Listings: Computer Science / Data Science
Language of Instruction: English
Prerequisites / Requirements: For UVA students: CS 2150 Program and Data Representation or CS 3100 Data Structures and Algorithms 2. Equivalent courses for students from another institution.

Description

This course is an introduction to artificial intelligence, covering the fundamental concepts and techniques, and surveys selected application areas. Core material includes state space search, logic, and resolution theorem proving.

Application areas may include expert systems, natural language understanding, planning, machine learning, or machine perception. The course provides exposure to artificial intelligence implementation methods, emphasizing programming in Common LISP.

Objectives

At the end of this course students will be able to:

- Choose the appropriate representation for an AI problem or domain model, and construct domain models in that representation
- Choose the appropriate algorithm for reasoning within an AI problem domain
- Implement and debug core AI algorithms in a clean and structured manner
- Design and analyze the performance of an AI system or component
- Describe AI algorithms and representations and explain their performance
- Critically read papers on AI systems

Course Requirements

Active participation is essential in this course. Students are expected to attend each class and field-based course component, as outlined in the CET Attendance Policy. Students are expected to read all assigned materials before the relevant class session and come prepared to participate thoughtfully in class discussions. Graded assignments include:

- Problem sets: 5 problem sets (optionally done in pairs); each has a programming part and written/analytic part
- Midterm exam

- Final exam
- Project: done in groups of 2-4, with the goal of using techniques learned to solve an AI problem of interest.

Grading

The final grade is determined as follows:

- Participation: 20%
- Problem sets: 20% (each problem set worth 4% of total grade)
- Midterm exam: 20%
- Final exam: 20%
- Project: 20%

Readings

Russell, Stuart and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Hoboken: Pearson Education, 2020.

Shoham, Yoav and Kevin Leyton-Brown. *Multi-Agent Systems. Algorithmic, Game-Theoretic, and Logical Foundations*. Cambridge: Cambridge University Press. 2008.

Sutton, Richard and Andrew Barto. *Reinforcement Learning: An Introduction*. Cambridge: The MIT Press, 2015.

Outline of Course Content

Topic 1: Introduction to Artificial Intelligence

Topic 2: Planning and search algorithms

- Uniformed Search
- A* and Heuristics
- Adversarial Search and Games
- Constraint Satisfaction Problems
- Local Search

Topic 3: Probabilistic reasoning and representation

- Markov Decision Processes
- Bayes Nets

Topic 4: Machine learning

- Reinforcement Learning
- Hidden Markov Models
- Ethics in AI
- Classification
- Regression
- Clustering

Topic 5: Multi-agent systems

- Game Theory
- Optimization