CSE 482/682: Artificial Intelligence

Richard Kelley

Fall 2014

Instructor information

- Your instructor is **Richard Kelley**
- His email address is `richard.kelley@gmail.com`
- Office hours by appointment, unless we come up with something better.

Course description and prerequisites

Official Course Description: Problem solving, search, and game trees. Knowledge representation, inference, and rule-based systems. Semantic networks, frames, and planning. Introduction to machine learning, neural-nets, and genetic algorithms. (Formerly CS 476; implemented Spring 2005.)

Prerequisite(s): CS 365.

Richard's Description: This course will cover the fundamental principles that allow intelligent systems to operate in the world. We will look at classical (but still relevant) approaches to artificial intelligence and then move on the ideas (probabilistic modeling and learning) that have enabled AI to become an essential and ubiquitous part of modern civilization.

List of required course materials

Required Textbook: *Artificial Intelligence: A Modern Approach* by Stuart Russell and Peter Norvig. The course website is `http://aima.cs.berkeley.edu/`. This is actually one of the best textbooks in Computer Science. It gives a great introduction to the field, and is a great reference.

Topics outline

The topics below correspond sections in Russell and Norvig, but you should only consider them a guide to what we'll go over. Broadly, the three areas we're going to look at are classical AI, the modeling of uncertainty, and machine learning.

Tentatively, here's what we're going to cover:

- **Introduction**
  - What is AI?
- **Intelligent Agents**
  - Agents and Environments

  - Good Behavior: The Concept of Rationality
  - The Nature of Environments
  - The Structure of Agents
- **Solving Problems by Searching**
  - Problem-Solving Agents
  - Example Problems
  - Searching for Solutions
  - Uninformed Search Strategies
  - Informed (Heuristic) Search Strategies
  - Heuristic Functions
- **Beyond Classical Search**
  - Local Search Algorithms and Optimization Problems
  - Local Search in Continuous Spaces
  - Online Search Agents and Unknown Environments
- **Quantifying Uncertainty**
  - Acting under Uncertainty
  - Basic Probability Notation
  - Inference Using Full Joint Distribution
  - Independence
  - Bayes' Rule and Its Use
- **Probabilistic Reasoning**
  - 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
- **Probabilistic Reasoning Over Time**
  - Time and Uncertainty
  - Inference in Temporal Models
  - Hidden Markov Models
  - Kalman Filters
- **Learning from Examples**
  - Forms of Learning
  - Supervised Learning
  - The Theory of Learning
  - Regression and Classification with Linear Models
  - Artificial Neural Networks
  - Nonparametric Models

  - Support Vector Machines
- **Applications**
  - Natural Language Processing
  - Robotics
  - Computer Vision
- **The Future of AI**

Approximate schedule of exams

There will be three exams and a comprehensive final. The first exam will cover classical AI (Introduction, Intelligent Agents, Solving Problems by Searching, Beyond Classical Search). The second exam will cover probabilistic reasoning (quantifying uncertainty, probabilistic reasoning, probabilistic reasoning over time). The third exam will cover machine learning and applications. The final exam will be comprehensive. The exact dates will depend on our progress through the material.

There will also be weekly quizzes, on Mondays.

Grading

Your grade will be determined by your performance on the quizzes and exams. The percentage breakdown is:

- 20% quizzes
- 10% exam 1
- 20% exam 2
- 20% exam 3
- 30% final exam

Additionally, graduate students will be required to complete a small (but nontrivial) project related to their intended area of research. They will have to present their work before the end of the semester. The items listed above will constitute 70% of the graduate section grade. The project will constitute 30%.

Statement on Academic Dishonesty

Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. For more details, see the University of Nevada, Reno General Catalog.

Statement of Disability Services

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

Statement on Audio and Video Recording

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Statement for Academic Success Services

Your student fees cover usage of the Math Center (775) 784-4422, Tutoring Center (775) 784-6801, and University Writing Center (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.