Artificial Intelligence

Spring 2019

Course description:

Artificial Intelligence

The objective of this course is to introduce the basic concepts of artificially intelligent systems. Topics covered include knowledge representation, search strategies and machine learning. An emphasis is placed on developing intelligent agents that can interact with their environment using machine learning techniques. Modern machine learning techniques for supervised, unsupervised, and reinforcement learning are introduced. The role of AI in engineering and computing systems is presented. Students complete exercises that allow them to apply AI in diverse problem settings including search, constraint satisfaction, game play, navigation, and natural language processing.

Prerequisites: MA-262 Probability and Statistics; programming maturity, and the ability to program in Python.

Helpful: CS3851 Algorithms, MA-383 Linear Algebra.

ABET: Math/Science, Engineering Topics.

2-2-3 (class hours/week, laboratory hours/week, credits)

Lectures are augmented with hands-on tutorials using Jupyter Notebooks. Laboratory assignments will be completed using Python and related data science and machine learning libraries: NumPy, Pandas, Scikit-learn, Matplotlib, TensorFlow, Keras, PyTorch.

Outcomes:

- Understand the concepts of an intelligent agent and their environment.
- Be able to address problems related to search, and its application to intelligent systems, including: game playing, decision making, and adversarial search.
- Demonstrate an understanding of the principles of formal logic including propositional calculus, and first order logic.
- Conduct proofs of correctness in reasoning systems using the methods of Unification and Resolution.
- Understand the techniques involved with reasoning in the presence of uncertainty.

- Understand and apply modern machine learning techniques for supervised, unsupervised, and reinforcement learning.
- Understand the limitations and future challenges of AI.

References:

Artificial Intelligence, A Modern Approach. Stuart Russell and Peter Norvig. Third Edition. Pearson Education. Resources:http://aima.cs.berkeley.edu/

Reinforcement Learning: An Introduction Richard S. Sutton and Andrew G. Barto. Second Edition, in progress. MIT Press, Cambridge, MA, 2017. https://drive.google.com/file/d/1xeUDVGWGUUv1-ccUMAZHJLej2C7aAFWY/view

Deep Learning with Python, François Chollet. Manning, 2017.

Python Data Science Handbook, Jake VanderPlas, O'Reilly.

See GitHub repository for current course description, prerequisites, outcomes, References, course outline and course materials.
https://github.com/jayurbain/artificial-intelligence

- Grading
  - Midterm - 20%
  - Final - 30%
  - Labs and Quizes– 50% (A full 2-week lab is weighted 2x)

- Assignments
  - Submit to Blackboard.
  - Follow submission instructions for each assignment.
  - Reports, lab feedback in PDF, zip multiple artifacts.
  - Individual or group (permission for groups)

- If anything is unclear - ask!
- Through your feedback course topics and assignments will be adjusted to improve the course.
- If there is a topic that you are especially interested in, please let me know.

Guidelines

Class attentiveness and participation is required. Laptop or cell phone use that is not related to the class activities is not allowed.

Completing lab assignments in timely fashion is vital to success in the course. Lab assignments reinforce topics covered in class and prepare students for exams.

- Assignments submitted within 1-week of due date – 20% penalty.
- Assignments submitted >= 1-week of date – zero credit.

Unless stated otherwise, labs are due prior to the start of the following week's lab.

Quizzes will be announced at least 1-day in advance and may *or* may not be graded. The goal here is to test knowledge of basic concepts from lecture and lab.

You are expected to attend class. *Questions* in-person and online are used to provide a quick assessment of your understanding *and* to assess attendance.

You are responsible for assignments and announcements made in class or lab. In addition, you should regularly the course outline, your MSOE email, and Blackboard for course materials, assignments, grades and feedback.

It is your responsibility to be present for all exams. Please contact me **in advance** if you have a valid conflict with a scheduled exam. Final exams will be comprehensive.

Academic integrity is expected. Sharing ideas and asking questions is strongly encouraged, however cheating on an exam, or submitting programming assignments that is not your own work will result in a grade of zero.

If you have any special needs, please let me know.

I'm interested in your feedback on how I can make this course better. Feel free to stop by my office, send me email, or drop an anonymous note in my department mailbox with suggestions on how I can make this a better class for you. Please don't wait until evaluation time because I won't see those comments until the quarter is over.

Good Luck.