CS 383: Artificial Intelligence

Course Info

Semester: Spring 2023
Time: 4:00-5:30 Mon / Wed
Location: Hasbrouck Lab Add, room 20
Website: https://people.cs.umass.edu/~sniekum/classes/383-S23/desc.php

Instructor: Scott Niekum
Email: sniekum@cs.umass.edu
Prof. Office Hours: By appointment (CS 374 or Zoom)
TAs: Sylee Dandekar (sdandekar@umass.edu); Shuwa Miura (smiura@umass.edu); Aleksandra Burushkina (aburushkina@umass.edu
Matthew Weiner (mweiner@umass.edu)
TA Office Hours: Monday 11-12 (LGRT 220); Tuesday 9:30-10:30 (LGRT 220); Wednesday 2-4 (LGRT 222); Thursday 1-3 (LGRT 220)

Piazza: https://piazza.com/class/lcidwzp0i8v2ra

Course Objectives

This course will introduce the basic ideas and techniques underlying the design of intelligent computer systems. A specific emphasis w
be on the statistical and decision-theoretic modeling paradigm. By the end of this course, you will have built autonomous agents that
efficiently make decisions in fully informed, partially observable and adversarial settings. Your agents will draw inferences in uncertain
environments and optimize actions for arbitrary reward structures. Your machine learning algorithms will classify handwritten digits and
photographs. The techniques you learn in this course apply to a wide variety of artificial intelligence problems and will serve as the
foundation for further study in any application area you choose to pursue.

Textbook: The course textbook is **the 3rd edition** of Artificial Intelligence: A Modern Approach by Russell and Norvig. Be sure to get th
3rd edition, as other editions will not match up to the reading assignments, nor contain all the necessary content.

Language: Course programming assignments will be in Python. We do not assume that students have previous experience with the
language, but we do expect you to learn the basics very rapidly. Project 0 is designed to teach you the basics of Python if you are not
already familiar.

Coursework

There are three types of assignments that you will be expected to complete:

1. Reading assignments: These will primarily be readings from the textbook, but may occasionally come from other provided sources. **A
reading assignments should be completed before the class period for which they are assigned**.

2. Homework exercises: Throughout the semester, problem sets will be assigned and automatically graded through Gradescope. You w
receive instant feedback from the autograder and can retry each problem as many times as necessary. The goal of these problems is to
get you comfortable with the material and prepared for the midterm and final. To access these assignments, you must sign up for a
Gradescope account using the email address that is listed for you in Spire. After creating an account, you'll enroll using a course code t
will sent to all enrolled students.

3. Programming projects: There will be a series of Python programming projects in which you will implement various AI algorithms. An
autograder script will be provided for each project so that you can check your progress along the way and fix errors in your code. **The fi
of these projects (P0: Tutorial) must be completed individually. All other projects may be completed in pairs or alone.**

Schedule

Day	Topic	Readings	Slides	Assignments

Mon 2/6	Introduction		PDF	P0: Tutorial Due: 2/12 11:59 pm	
Wed 2/8	AI Basics and Ethics	Ch. 1.1, 2.1-2.3; AI-100 report	PDF		
Mon 2/13	Uninformed Search	Ch. 3.1-3.4	PDF	HW1 Due: 2/26 11:59 pm	
Wed 2/15	A* Search and Heuristics	Ch. 3.5-3.6	PDF	P1: Search Due: 2/28 11:59 pm	
Mon 2/20	President's Day				
Wed 2/22	Constraint Satisfaction Problems	Ch. 6.1-6.3	PDF	HW2 Due: 3/7 11:59 pm	
Mon 2/27	CSPs II; Local Search	Ch. 6.4-6.5, 4.1-4.2	PDF		
Wed 3/1	Game Trees: Minimax	Ch. 5.1-5.3	PDF	HW3 Due: 3/21 11:59 pm	
Mon 3/6	Game Trees: Expectimax; Utilities	Ch. 5.4-5.5, 16.1-16.3	PDF	P2: Multi-Agent Pacman Due: 3/26 11:59 pm	
Wed 3/8	Markov Decision Processes	Ch. 17.1-3	PDF	HW4 Due: 3/28 11:59 pm	
Mon 3/13	Spring Break				
Wed 3/15	Spring Break				
Mon 3/20	Markov Decision Processes II	Sutton and Barto Ch. 3-4	PDF		
Wed 3/22	Reinforcement Learning	S&B Ch. 6.1, 6.2, 6.5	PDF	HW5 Due: 4/9 11:59 pm	
Mon 3/27	Reinforcement Learning II	Ch. 21	PDF	P3: Reinforcement Learning Due: 4/16 11:59 pm	Practice Midterms
Wed 3/29	Probability	Ch. 13.1-13.5	PDF		
Mon 4/3	Midterm Exam				
Wed 4/5	Intro to ML and Bayes Nets: Representation	Ch. 14.1-14.3	PDF		
Mon 4/10	Bayes Nets: Independence	Ch. 14.3	PDF		

Wed 4/12	Bayes Nets: Inference	Ch. 14.4	PDF	
Mon 4/17	Holiday: No Class			
Wed 4/19	Bayes Nets: Sampling	Ch. 14.5	PDF	HW6 Due: 5/2 11:59 pm
Mon 4/24	Hidden Markov Models	Ch. 15.1-15.3	PDF	
Wed 4/26	Particle Filters and HMM Applications	Ch. 15.5	PDF	P4: Ghostbusters Due: 5/9 11:59 pm
Mon 5/1	Decision Diagrams / VPI	Ch. 16.5-16.6	PDF	HW7 Due: 5/11 11:59 pm
Wed 5/3	ML: Naive Bayes	Ch. 18.1-18.2, 20.1-20.2.2	PDF	
Mon 5/8	ML: Perceptrons	Ch. 18.6.1, 18.6.3	PDF	HW8 Due: 5/17 11:59 pm
Wed 5/10	ML: Kernels and Clustering	Ch. 18.8, 18.9	PDF	
Mon 5/15	ML: Deep Learning		PDF	
Wed 5/17	Advanced Applications		PDF	Practice Finals
Final Exam: Wed 5/24 at 3:30-5:30 pm	Hasbrouck Add room 20			

Grading

Attendance: Class attendance is strongly encouraged, but is not a component of grading.

Project grading: Projects will by default be graded automatically for correctness, though we will review projects individually as necessa to ensure that they receive the credit they deserve if there is an issue.

Slip days: Programming projects must be turned in electronically by 11:59pm on the listed due date. You will have **10 slip days total** t use for these projects throughout the semester. They will be applied automatically in the order of assignments. After you've run out of sli days, 30% of the total possible points will be deducted from any late assignment (able to be submitted until the final day of classes), sc reserve them for when they are absolutely necessary. Note that slip days are counted at the granularity of days, rounded up to the neare day, meaning that 1 minute past the deadline counts as a full day. No other extensions will be provided, except under highly exceptiona circumstances. The Gradescope exercises do not have late days (i.e. you will be given a zero if late), as solutions are automatically posted after the due date and may be discussed in the next class.

Overall grades will be determined from:

- Gradescope Exercises (20%)
- Programming Assignments (30%)
- Midterm Exam (20%)
- Final Exam (30%)

Grades will be assigned using both plus and minus grades.

Academic honesty policy

You are encouraged to discuss the readings and concepts with classmates, but all work must be your own. Programming assignments must be your own, except for 2-person teams when teams are authorized. You may **NOT** look online for existing implementations of algorithms related to the programming assignments, even as a reference. Your code will be analyzed by automatic tools that detect plagiarism to ensure that it is original.

Students caught cheating will automatically fail the course and will be reported to the university. If in doubt about the ethics o any particular action, look at the university guidelines and/or ask—ignorance of the rules will not shield you from potential consequence

Notice about students with disabilities

The University of Massachusetts Amherst provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact Disability Services at 413-545-0892 (TTY) or disability@umass.edu.

Notice about missed work due to religious holidays

University policy states that: Students have the right to make up examinations, study, or work requirements that they miss because of religious observance without any adverse or prejudicial effects. No fees may be charged to the student for the makeup exercise. The law also provides that such makeup work may not create an unreasonable burden upon the University. Therefore, students have an obligatio to inform their course instructors, in advance, of the days on which they may be absent for religious reasons. Students should inform th course instructors in writing of the days they will be absent as early in the semester as possible and always prior to the day(s) on which they will be absent for religious reasons. Instructors, if they feel that it is important for course planning, have the right to require students provide a written list of such days within one full calendar week after students' enrollment in the course, provided that the instructors list this requirement and deadline on the course outline or other handouts. In the event of a dispute between an instructor and a student in a course, either party should contact the Department Head or the Ombuds Office (413-545-0867).