EECS 492: Introduction to Artificial Intelligence, Winter 2023

Welcome to 492! We're glad you're here, and we're looking forward to a great semester learning more about AI.

Quick Links

- TBD - The first week of class, we will post links here and on Canvas to the class calendar, the OH queue, and OH zoom links (for virtual office hours).

Basic Information

Lecture time: Tuesday & Thursday 3-4:30pm
Lecture location: 1571 GGBL

Faculty Instructor: Laura Burdick, BBB 3824, lburdick@umich.edu

- Dr. Burdick typically responds to most e-mails within a day, though usually doesn't respond during evenings and weekends.

Faculty Office Hours: Tuesday 1-2pm (conference room, BBB 2733) & Thursday 1-2pm (Dr. Burdick's office, BBB 3824)

- Please note that the Tuesday and Thursday office hours are in different locations.
- Office hours begin Tuesday, January 10.
- If these times don't work for you (or you'd prefer to meet remotely), please send an e-mail, and we can find another time to meet, either remotely or in-person.

GSIs:
Alex Li, xelail@umich.edu, Tuesday & Thursday 11:30-1:30pm (remote, logistics TBD)

- Office hours begin Tuesday, January 10.

Won Park, wonpark@umich.edu, Tuesday & Wednesday, 9:30-11:30am (remote, logistics TBD)

- Office hours begin Tuesday, January 10.

Discussion times and locations:

Friday 11:30am-12:30pm	2166 DOW	Won Park
Friday 12:30pm-1:30pm	107 GFL	Alex Li

Friday 1:30pm-2:30pm	1005 DOW	Alex Li
Monday 4:30pm-5:30pm	185 EWRE	Won Park

Course Description

This course is an introductory course to artificial intelligence. We will cover the following topics:

- **Agents.** Agents give us a broad framework for understanding all kinds of AI systems, from robots operating in a disaster zone to social media chatbots. We will look at different kinds of agents and the environments they operate in.

- **Search.** Search allows us to plan a path from a starting state to a goal state. Almost any problem in AI can fit into a search framework! You've already seen some search algorithms (breadth-first search, depth-first search), but we will study more advanced search algorithms, including algorithms that use external information (informed search) and algorithms that let you search for a goal state when you have an opponent (adversarial search, with some game theory).

- **Problem Solving.** We will look at more complex problem solving frameworks, such as constraint satisfaction and planning.

- **Logic.** We will study propositional logic and first-order logic to understand how AI systems can store knowledge internally and make decisions based on the knowledge they have.

- **Uncertainty.** In the real world, uncertainty is everywhere. We will look at how AI systems handle this uncertainty. We will cover basic probability, and then apply this to AI by looking at Bayesian networks and MDPs/POMDPs.

- **Learning.** We want our AI systems to learn from their previous observations and actions. In this unit, we will introduce algorithms that allow agents to learn. We will focus on a subset of machine learning algorithms, including llinear regression, decision trees, neural networks, and reinforcement learning.

Broadly speaking, this course will contain the following components (more details in the rest of the syllabus):

- **Lectures**. In-person attendance will be required for 20 of the 27 lectures. Lectures will be recorded.
- **Discussion sections.** Attendance will not be required for most discussion sections (with a few exceptions discussed below). Discussion sections will be recorded.

- **Assignments.** There will be three kinds of assignments - problem sets, coding assignments, and ethics assignments.
- **Exams.** There will be an in-person midterm exam, and an in-person final exam.

Prerequisites

Students must have completed EECS 281 with a grade of C or better; exceptions will not be granted. CSE graduate students should enroll in EECS 592.

Textbook and Course Materials

The **optional** textbook for the course is Artificial Intelligence: A Modern Approach (4th Edition), by Stuart Russell and Peter Norvig (ISBN 9780134610993).

Additional course materials will be posted on Canvas.

Lecture

Lectures in this class are interactive, with time for discussion and in-class exercises. Because of this, attending lectures in-person is an important part of the learning experience in this class. Attending lectures will allow you to learn the material better and remember it longer after the class has ended. This is why you will be required to attend a certain number of lectures in-person.

There will be 27 lectures over the course of the semester (this doesn't include the in-class midterm). In order to earn full credit, you will be required to attend 20 lectures. Attendance will be taken using a Google form. Each class, you will be given a Google form with several in-class exercises. We will complete the exercises together in class, and if you attend class, you must submit the form before 4:45pm on the day of lecture (class will end at 4:20pm, so this gives you a little buffer time to submit the form). The form will be graded for completion, not for correctness. If you successfully complete and submit the form before 4:45pm, you will be given attendance credit for that day. ***It is considered an Honor Code violation to submit this form if you don't attend class in-person.***

Because you are only required to attend around 75% of the lectures, please stay home if you are sick. This also gives you some flexibility for job interviews, travel, etc. Because of this built-in flexibility, ***exceptions to the attendance policy will not be granted except in extenuating circumstances***. If you have extenuating circumstances that cause you to miss more than seven lectures, please contact Dr. Burdick.

Lectures will be recorded. The recordings should be used to review the material (and can be used if you miss a particular lecture). The recordings will not be posted until after 4:45pm the day of the lecture.

Discussion Sections

Discussion sections serve several purposes in this course:

- Many weeks, discussion sections will talk about current events in AI, and show how the material we are learning connects to real-world problems and solutions.
- Many weeks, discussion sections will give you an opportunity to work through exercises to deepen your understanding of the material. These will be new, interesting exercises not covered in lecture, so it will be worth your time to attend discussion section!
- Some weeks, discussion sections will review material that you have learned in other classes that we will use in EECS 492 (e.g., probability). If a topic you have previously learned is covered in discussion sections, you will be expected to come to lectures prepared to use that material.
- Some weeks, discussion sections will facilitate discussions about ethical issues in artificial intelligence (see more under “Assignments”).

For most discussion sections, attendance is not required (the exception to this is the ethics discussion - please see the next section for more details). However, we think that attending discussion section is a valuable thing! To help you decide whether you should attend discussion section each week, we will announce the material that will be covered in discussion section ahead of time. Because discussion sections are smaller than lecture, they are a great opportunity to interact with the GSIs. We would encourage you to attend the same section every week, so that you can get to know your classmates and your instructor.

Discussion sections will be recorded (except for the ethics discussions), though we strongly encourage you to attend in-person. If you are feeling sick, please watch the recording rather than coming to discussion section.

Assignments

There will be three different kinds of assignments in this class:

- **Problem sets** - These will be conceptual and mathematical problems designed to help you learn the material better. You must work alone for these assignments, though you may discuss ideas and high-level concepts with classmates.

- **Coding assignments** - These assignments will involve programming algorithms in Python. You may optionally work with a partner for these assignments, though you can work alone if you want.

- **Ethics assignments** - There will be four ethics assignments throughout the semester. For each assignment, you will be given an assigned reading. After you do the reading, you have two options: (1) you can write a paper reflecting on the reading, or (2) you can attend a discussion section and participate in a discussion about the reading. If you are unable to attend a discussion section due to illness or other circumstances, you must complete the paper instead.

Homework must be turned in on the date that it is due, by 11:59PM Ann Arbor time. The homework must be submitted electronically using Canvas and Gradescope and we will use the later timestamp to validate turn-in time. Late homework will be penalized 10% per day (where each day starts at 11:55pm on the due day). Homework turned in after three days will not be accepted. Certain homework assignments may be associated with a single late day, to facilitate exam study. This will be noted when the assignment is released.

If you are unable to complete the homework assignment on time due to illness or a personal emergency, please contact Dr. Burdick.

Note that the only method of submission is Canvas/Gradescope. It is your responsibility to ensure that the homework has been uploaded successfully by the due date. This may include checking a box to verify accordance with the honor code policy. Homework that is incorrectly uploaded will be subject to the associated late penalty. Homework not successfully uploaded by the due date will not be accepted.

Also note that any changes you make to the homework already submitted on Canvas/Gradescope counts as a resubmission. If you make any changes to the assignment after the due date has passed you will be assigned a late penalty based on the number of days that have passed. For example, if you edit an assignment on February 5 and it was due on February 2 you will be assigned a 30% penalty (10% per day) as explained above. This is non-negotiable.

Exams

The midterm will take place on Thursday, February 23 during classtime (please note that this is the Thursday before spring break). The midterm will take place in-person - there will be ***no exceptions*** to this policy for spring break travel. Please plan your travel accordingly.

The final exam will take place on Tuesday, April 25, from 8-10am. The final will take place in-person - there will be ***no exceptions*** to this policy for travel. Please plan your travel accordingly.

Office Hours

The instructors will have regularly scheduled office hours each week. You are encouraged to make use of these to discuss aspects of the course including lecture material and the homework problems. In cases where you cannot make office hours, contact the course staff to arrange an appointment; don't wait until the last minute though!

Piazza

We will be using Piazza to host a course forum and asynchronous Q&A. You are encouraged to read this regularly and post technical questions. Please search before posting to avoid re-asking questions that have already been answered.

It is important that you do NOT post your own code or homework solutions to the forum. If you have a question about any of these things, use a **private** post (visible only to instructors).

Course staff will answer questions on Piazza throughout the day, but do not expect an immediate response (particularly on evenings and weekends). We will try to answer questions within 24 hours when possible. Of course, students are encouraged to answer each others' questions!

Email Policy

We do not answer technical questions via email. In order to save everyone time, we want all students to have the benefit of seeing each question and its answer, so please use Piazza instead.

Grading

Attendance	5%
Problem sets	20%
Coding assignments	20%
Ethics assignments	20%
Midterm	15%
Final	20%

The values are subject to slight adjustments based on the discretion of the instructor. If you have a problem with the grading on a particular assignment or exam, write a brief (one paragraph) description of the problem, and e-mail it, along with a copy of the assignment/exam, to Dr. Burdick for a regrade. **Regrade requests must be submitted within one week of when the graded assignment is made available to the student.** Later regrade requests will not be accepted.

The midterm exam and final exam grades will most likely be curved. Final letter grades will be calculated according to the following table:

A+	98 ≤ % ≤ 100
A	93 ≤ % < 98
A-	90 ≤ % < 93
B+	87 ≤ % < 90
B	83 ≤ % < 87
B-	80 ≤ % < 83
C+	77 ≤ % < 80
C	73 ≤ % < 77
C-	70 ≤ % < 73
D+	67 ≤ % < 70
D	63 ≤ % < 67
D-	60 ≤ % < 63
E	% < 60

Honor Code

We encourage collaboration in EECS 492, especially on concepts, tools, specifications, and strategies. In this class, you are expected to follow the College of Engineering Honor Code. Suspected violations will be referred to the Engineering Honor Council.

In particular, here are some ways that the Honor Code applies to this class:

- **Attendance.** Attendance will be taken using a Google form submitted each class period. It is an Honor Code violation to submit this form if you did not attend the class in-person. It is an Honor Code violation to share the link to this form with a student who is not attending the class in-person.
- **Problem sets.** Problem sets must be completed individually. You are free to discuss high-level ideas with other students, but all solutions must be your own. It is an Honor Code violation to work out the details of the problems with someone else. It is an Honor Code violation to compare your solutions, whether in scrap paper form or your final work product, to other students (and vice versa).
- **Coding assignments.** You may collaborate with one other student for coding assignments. It is an Honor Code violation to collaborate with more than one other student.

- **Code publishing.** You may not make your code publicly available in any form, for example in a public GitHub repository or personal website. You are still responsible for following these rules even after finishing the course.
- **Exams.** Exams must be completed individually. It is an Honor Code violation to discuss exams with other students before the exam is completed.
- **Previous semesters.** It is an Honor Code violation to possess, look at, use, or in anyway derive advantage from the existence of solutions prepared in prior years, whether these solutions were former students' work product or copies of solutions that had been made available by instructors.

If you are at all unsure whether your collaboration is allowed, please contact the course staff via Piazza, office hours, or email before you do anything. We will help you determine if what you're thinking of doing is in the spirit of collaboration for this class.

Wellness

If for any reason you are having difficulty in this course, please come talk to Dr. Burdick; we want to help. Any member of our community may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, finances, etc.

If you are facing challenges, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact Dr. Burdick so that we can find solutions together.

Accomodations for Students with Disabilities

The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact Services for Students with Disabilities (https://ssd.umich.edu/; 734-763-3000 or ssdoffice@umich.edu). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience.

Recordings

Course lectures may be audio/video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact Dr. Burdick the first week of class to discuss alternative arrangements.

Students may not record or distribute any class activity without written permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.

Course Schedule - subject to change

	Date	Lecture (with optional textbook reading)	Discussion	Assignments
Week 1	Thursday, Jan. 5	Lecture 1: Class Introduction, Agents (Ch. 1)		
	Friday, Jan. 6 / Monday, Jan. 9		Discussion 1: Get to know you, review of depth-first search and breadth-first search	
Week 2	Tuesday, Jan. 10	Lecture 2: Agents, Search (Ch. 2)		
	Wednesday, Jan. 11			*No assignments due*
	Thursday, Jan. 12	Lecture 3: Search (Ch. 3)		
	Friday, Jan. 13 / Monday, Jan. 16		*No discussion on either Friday or Monday - Happy MLK Day!*	
Week 3	TBD		Python help session	
	Tuesday, Jan. 17	Lecture 4: Search		
	Wednesday, Jan. 18			Problem Set 1 due
	Thursday, Jan. 19	Lecture 5: Search (Ch. 4)		
	Friday, Jan. 20 / Monday, Jan. 23		Discussion 3: Ethics discussion 1 - not recorded	
Week 4	Tuesday, Jan. 24	Lecture 6: Adversarial search / game theory (Ch. 5)		
	Wednesday, Jan. 25			Coding Assignment 1 due, Ethics Assignment 1 due
	Thursday, Jan. 26	Lecture 7: Adversarial search / game theory		
	Friday, Jan. 27 / Monday, Jan. 30		Discussion 4: TBD	
Week 5	Tuesday, Jan. 31	Lecture 8: Adversarial search / game theory		

	Wednesday, Feb. 1			Problem Set 2 due
	Thursday, Feb. 2	Lecture 9: Constraint satisfaction (Ch. 6)		
	Friday, Feb. 3 / Monday, Feb. 6		Discussion 5: Review of logic	
Week 6	Tuesday, Feb. 7	Lecture 10: Constraint satisfaction, Planning (Ch. 11)		
	Wednesday, Feb. 8			Coding Assignment 2 due
	Thursday, Feb. 9	Lecture 11: Logic (Ch. 7)		
	Friday, Feb. 10 / Monday, Feb. 13		Discussion 6: Ethics discussion 2 - not recorded	
Week 7	Tuesday, Feb. 14	Lecture 12: Logic (Ch. 8)		
	Wednesday, Feb. 15			Problem Set 3 due, Ethics Assignment 2 due
	Thursday, Feb. 16	Lecture 13: Logic (Ch. 9)		
	Friday, Feb. 17 / Monday, Feb. 20		Discussion 7: Review of probability	
Week 8	TBD		Midterm review session	
	Tuesday, Feb. 21	Lecture 14: Logic	Tuesday, Feb. 21	
	Wednesday, Feb 22			*No assignments due*
	Thursday, Feb. 23	In-person midterm		
	Friday, Feb. 24 / Monday, Mar. 6		*No discussion on either Friday, Feb. 24 or Monday, Mar. 6 - Happy Spring Break!*	
Week 10	Tuesday, Mar. 7	Lecture 15: Logic		
				No assignments due
	Thursday, Mar. 9	Lecture 16: Probability (Ch. 12)		
	Friday, Mar. 10 / Monday, Mar. 13		Discussion 8: More probability practice	
Week 11	Tuesday, Mar. 14	Lecture 17: Bayesian networks (Ch. 13)		
	Wednesday, Mar. 15			Problem Set 4 due

	Thursday, Mar. 16	Lecture 18: Bayesian networks		
	Friday, Mar. 17 / Monday, Mar. 20		Discussion 9: Ethics discussion 3 - not recorded	
Week 12	Tuesday, Mar. 21	Lecture 19: MDPs and POMDPs (Ch. 17)		
	Wednesday, Mar. 22			Coding Assignment 3 due, Ethics Assignment 3 due
	Thursday, Mar. 23	Lecture 20: MDPs and POMDPs, introduction to learning (Ch. 19)		
	Friday, Mar. 24 / Monday, Mar. 27		Discussion 10: TBD	
Week 13	Tuesday, Mar. 28	Lecture 21: Introduction to learning		
	Wednesday, Mar. 29			Problem Set 5 due
	Thursday, Mar. 30	Lecture 22: Machine learning (Ch. 21)		
	Friday, Mar. 31 / Monday, Apr. 3		Discussion 11: Review of linear algebra	
Week 14	Tuesday, Apr. 4	Lecture 23: Machine learning		
	Wednesday, Apr. 5			Coding Assignment 4 due
	Thursday, Apr. 6	Lecture 24: Machine learning (Ch. 22)		
	Friday, Apr. 7 / Monday, Apr. 10		Discussion 12: Ethics discussion 4 - not recorded	
Week 15	Tuesday, Apr. 11	Lecture 25: Machine learning		
	Wednesday, Apr. 12			Problem Set 6 due, Ethics Assignment 4 due
	Thursday, Apr. 13	Lecture 26: Machine learning		
	Friday, Apr. 14 / Monday, Apr. 17		Discussion 13: TBD	
Week 16	Tuesday, Apr. 18	Lecture 27: Machine learning		
Finals	TBD		Final review session	

Week				
	Tuesday, Apr. 25, 8-10am	In-person final		