C S-4013/5013-001
Artificial Intelligence
Spring 2024

General Information and Course Schedule

Lecture Time: Tues/Thurs, 10:30-11:45 AM
Lecture Location: Sarkeys Energy Center, Room N0202
Zoom (only provided upon request): https://oklahoma.zoom.us/j/9123772842 (Links to an external site.)
All materials will be posted on Canvas. Announcements and discussions will be shared via Canvas or email or Teams.

Course Staff and Office Hours

Note: Please refer to the appropriate TA for Homework or Project help. See any of the course staff for other questions.

Instructor

Golnaz Habibi (golnaz@ou.edu)
Office Hours: Tuesdays 12 - 1 PM and Fridays 11 - 12 PM, DEH 245
Zoom meeting during office hours for instructor is available upon request:
https://oklahoma.zoom.us/j/9123772842.
For other times, please contact the instructor.

Teaching Assistants

Homework TA: Maisha Maliha (maisha.maliha-1@ou.edu)
Homework Office Hours: DEH 115 (please knock if the door is locked)
Mondays: 1:30 PM- 3:30 PM (discussion sessions)
Wednesdays: 12 PM- 4 PM
Fridays: 10:30 AM - 12:30 PM
Project TA: Matthew Carroll (matthewcarroll@ou.edu)
Projects Office Hours: Carson B12
Monday: 2 - 4 PM
Wednesday: 10 AM - 12 PM
Thursday: 2 - 4 PM

Course Description

This course introduces fundamental knowledge for designing an intelligent agent who lives in an environment with or without adversarial/cooperative agents. The environment would be observable or partially observable. The agent makes decision under uncertainty to reach its goal or accomplish its mission (e.g., maximizing its score). Course covers broad topics in AI such as Markov Decision Process, Reinforcement Learning, Search techniques, Game Theory, and Bayesian Networks. The course also introduces basics topics on computer vision, self-driving cars and game theory. Graduate section of the course includes a final project in which students will have hands-on robotic experience during their final project and racing cars in a miniaturized city environment.

Course Objectives

At the end of the semester, student learns...

- how to design an agent with the ability of searching in a maze environment, with and without adversarial opponent.
- basics on decision making under uncertainty and reinforcement learning
- state estimation using particle filtering
- how to classify handwritten numbers and detect objects in an image using machine learning techniques.
- how to apply basic AI to different problems in planning and perception

Summary

Topics covered in this course:

- Search techniques (A*, DFS, BFS, UCS and Dijkstra)
- Adversarial Search and Game Theory (stochastic and deterministic)
- Constraints Satisfaction Problem (CSP)
- Decision making and planning under uncertainty (Markov Decision Process)
- Reinforcement Learning
- Probability and Bayesian Network for inference
- Hidden Markov Model and Particle Filtering
- Machine learning basics focus on Logistic regression and Naïve Bayes
- Convolutional Neural Networks: basics and applications
- Advanced topics: computer vision, self-driving cars, Robotics, Large Language Models (e.g., ChatGPT)
- Ethical AI and Trustworthy AI

Prerequisites

Courses: (CS2413 or CS 5005) and (CS 2813 or CS 4005 or MATH 2513)

Programming Skills: All the projects are in Python. The students are expected to have skill and experience in Python programming.

Textbook (required): Reading assignments refer to AIMA., 4th edition unless otherwise specified.

Course Communication

Join the course Team by clicking here. Alternatively, use the following Team code to join: 702teel

Students are encouraged to pose their questions in the Canvas discussions section or the class group in Teams. Your discussion may be helpful for other students. Course staff will try to check the Teams and discussion section periodically, but for a quicker response, you should ask your questions during office hours. Answering questions outside of the office hours may be delayed. For any questions regarding the course (HW, projects, grading, material, etc) you can reach out the course staff via email or canvas or during office hours.

Course Assessments

Projects

The course has five main projects (and Project 0 as a warmup) based on Python programming. There will be an extra project for students in section CS5013. Except Project 0 which **must be done individually**, you may work on projects in groups of 1-2. The deadline to finalize your group is **January 26 at 11:59 PM**. Projects are usually due on Fridays unless otherwise specified. If you do not find a partner and would like to work in a group, you need to let the course staff know in advance and they will help you find a project partner. Note that grading standards are the same for all project submissions, even if you decide to do your projects individually. Students may discuss projects across groups, but they MAY NOT COPY the code from each other unless they are in the same group. The course staff will provide the instructions for each project, which is posted in Canvas.

Final Project (5013 section only)

This project involves training a robotic car (JetBotLinks to an external site.) to follow the roads in a miniaturized city. In the last week of the class, the students will demonstrate their work and compete with other teams. This final project for the graduate section will be done in groups of three. The deadline to finalize your Final Project group is **March 29th**. If you cannot find a team, please let the staff know in advance and we find a team for you.

Homework

There are 7 Homework assignments. Homework should be done and submitted individually. Students may discuss in groups but they should submit only their own work.

Midterm and Final Exams

Exams are closed book and closed notes*, closed phone and any other electronic devices (laptop, tablet, etc) excepting accommodations.

▪ For the midterm exam, you may bring one double-sided cheat sheet (2 US Letter pages).
▪ For the final exam, you may bring two double-sided cheat sheets (4 US Letter pages).

Quizzes

There are set of quizzes during the class. Please make sure you attend the class consistently to take quizzes. You need to bring your laptop to take your quiz on canvas.

Homework Assignment Grading Policy

The homework with lowest grade will be dropped. Please see the tables in the next page for reviewing the weights for grading

Late Policy (Homework and Projects)

There are the total of five grace days that you can use for your homework and projects (up 2 days for each HW/project). After consuming your grace limit for each assignment, your grade is penalized by 15% for each day late. HW/Projects submitted 5 days after deadline will not be accepted. Use your grace days wisely and try to finish your assignments on time.

Grading Weights: Section 4013

Midterms and Quizzes	25%
Projects	20%
Homework	20%
Final Exam	35%

Grading Weights: Section 5013

Midterms and Quizzes	25%
Projects	20%
Homework	20%
Final Exam	30%
Final Project	5%

Score-Grade Conversion

Score	Grade
≥90	A
[80,90)	B
[70,80)	C
[60,70)	D
<60	F

Foods and drinks in the class

Food /drink are not permitted in the classroom or lab, with the exception of covered water bottles, which may be used sparingly in these locations and the cap immediately returned to the bottle after each drink.

OU's Academic Integrity

Copying another's work for homework and project assignments, or possession of unauthorized electronic computing or communication devices in the testing area, is the course violation and grounds for penalties in accordance with school policies.

Please see OU's academic integrity website.

Accommodations

Any student with a disability should contact the instructor so that reasonable accommodations may be made for that student.

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see http://www.ou.edu/eoo/faqs/pregnancy-faqs.html for commonly asked questions.

Title IX Resources

For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24.7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office 405-325-2215 (8-5) or the Sexual Assault Response Team 405-615-0013 (24.7) to learn more or to report an incident.

Holidays

It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.

Emergency Protocol

During an emergency, there are official university procedures that will maximize your safety.

- **Severe Weather:** If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather 1. LOOK for severe weather refuge location maps located inside most OU buildings near the entrances 2. SEEK refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building. 3. GO to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows. 4. GET IN, GET DOWN, COVER UP. 5. WAIT for official notice to resume normal activities. Links: Severe Weather Refuge Areas, Severe Weather Preparedness

- **Armed Subject/Campus Intruder:** If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots: 1. GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. 2. HIDE OUT: If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. 3. TAKE OUT: As a last resort fight to defend yourself. Links: Responding to Gunshots

- **Fire Alarm/General Emergency:** If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: 1. LEAVE the building. Do not use the elevators. 2. KNOW at least two building exits 3. ASSIST those that may need help 4. PROCEED to

the emergency assembly area 5. ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues. 6. WAIT for official notice before attempting to re-enter the building. Links: OU Fire Safety on Campus

Course Schedule (Tentative)

This schedule is subject to change

Week	Date	Lecture	Readings	Homework	Project
1	1/18	1 – Introduction Intelligent Agent and rationality	Ch. 1, 2 (AIMA 4th)		Project 0 (warm-up)
2	1/23	2 – Reflex/Planning Agent, Uninformed Search	Ch. 2,3	HW0 - math diagnostic (1/22)	P0 due (1/24) P1 out
	1/25	3 – Informed Search	Ch. 3, 4	HW1 out	
3	1/30	4 – Adversarial Search and introduction to game theory, minimax, alpha-beta pruning	Ch. 5	HW 1 due (1/30) Search	P1 due (Fri 2/2) P2 out
	2/1	5 – Expectimax, stochastic games	Ch. 5, & Ch. 16 (optional)	HW2 out	
4	2/6	6 – CSP I	Ch. 6	HW 2 due (2/9) Adversarial search	
	2/8	7 – CSP II	Ch. 6		
5	2/13	8 – MDP I	Ch. 17	HW3 out	P2 due (Fri 2/16) P3 out
	2/15	10 – MDP II	Ch. 17		
6	2/20	11 – RL I	Ch. 22	HW3 due (2/23) CSP,MDP	
	2/22	12 – RL II	Ch. 22		
7	2/27	13- RL III	Ch. 22	HW4 out	P3 due (3/1) P4 out
	2/29	14 – Probability	Ch. 12		
8	3/5	15 – Bayesian Net I	Ch. 13		
	3/7	Midterm I – Search , Adversarial search, CSP, MDP			
9	3/12	16 – Bayesian Net II	Ch. 13	HW4 due (3/11) RL HW5 out	P4 due (3/15) P5 out
	3/14	17 – Bayesian Net III	Ch. 13		
10	3/19	Spring Break (no class)			
	3/21	Spring Break (no class)			
11	3/26	18 – HMM	Ch. 14	HW5 due(3/29) Bayesian HW6 out	
	3/28	19 – Particle Filtering	Ch. 14		
12	4/2	20 – Decision Network VPI	Ch. 16	HW6 due (4/11) HMM, PF	

Week	Date	Lecture	Readings	Homework	Project
	4/4	21 – ML I	Ch. 19	HW7 out	P5 due (4/5)
13	4/9	22 – ML II	Ch. 21		
	4/11	23 – MLIII	Ch. 21		
14	4/16	24 – ML and Computer Vision and Robotics	Ch. 25, 26		
	4/18	Midterm II – RL, HMM, particle filtering, VPI, Bayesian Net			
15	4/23	25 – Advanced topics: LLM (e.g., ChatGPT)	Ch. 27	HW7 due (4/26) VPI, ML	
	4/25	26 – Ethical AI			
16	4/30	27 – Guest Lecturer	Ch. 28		Final project presentation
	5/2	28 – Class Conclusion, Future of AI			

*The exams may be open book/notes (we will have survey on it in the class), but the exam difficulty would be higher than closed book/notes option.