CS 440: Introduction to Artificial Intelligence

Spring Semester 2024

Instructor: Andrew Wood **Email:** aewood@bu.edu **Office:** CDS 826

Section A		
Lecture:	Tues/Thurs 9:30-10:45am EST	WED 130
Lab1:	Fri 9:05-9:55am EST	CGS 115
Lab2:	Fri 10:10-11am EST	CGS 115
Lab3:	Fri 11:15-12:05pm EST	PHO 205

Section B		
Lecture:	Mon/Wed 3:30-4:45pm EST	CAS 313
Lab1:	Fri 2:30-3:20pm EST	CAS 204B
Lab2:	Fri 3:30-4:20pm EST	CAS 204A
Lab3:	Fri 4:30-5:20pm EST	CAS 204A

Teaching Fellows:

- Vitali Petsiuk — vpetsiuk@bu.edu
- Gary Kuwanto — gkuwanto@bu.edu

Office Hours:

- Andrew: Tues/Thurs 2-5pm, Wed: 10am-1pm CDS 826
- Vitali: Tues 12:30-2:30pm, Fri: 9am-11am in CDS 362
- Gary: Mon/Wed: 2-3pm Thurs: 1-3pm in CSD 362

Main References: This is a restricted list of various interesting and useful books that will be touched during the course. You need to consult them occasionally.

- Lecture Material (posted online as we go)
- Artificial Intelligence: A Modern Approach (3rd Edition) by Stuart Russell and Peter Norvig (pdf available online)

Course Description Introduction to computer systems that exhibit intelligent behavior. This semester we will be covering the following topics: environment representation, global and local search, tree search and planning, probabilistic decision making, supervised learning, and reinforcement learning.

Course Information

Course Breakdown This course is broken down in sections, each section being a different aspect of AI. We will tackle this material from both a theoretical as well as a practical side. As such, the course is divided into two major categories: the theoretical side which will have written assignments, as the practical side which will involve writing code (in Java 8). The theory will be mostly proofs: we want to understand **why** things work the way they do and the logic that they are built upon. On the other hand, we want to see **what** they can do, which is why we will be writing code to pay a variety of video games (from more popular games to games that I have invented for the course).

As such, there are three types of assignments in this course, *written* assignments (which will ask theoretical questions), *lab* assignments (which cover smaller games), and *programming* assignments (which cover complex games). The goal of all of these assignments is to build a rich understanding of how AI works and how we can leverage it to solve different kinds of problems. Plus, we get to play some games!

Assignment Structure There will be **five** written assignments, each due after two weeks. These assignments will be smaller and will comprise entirely of theoretical questions. There will be four weeks without a written assignment. These "free" weeks will align (to the best of my ability) with midterm season as well as spring break. Each written assignment will be 50 points. I will post a pdf on piazza, and I expect a typeset solution (also a pdf) on gradescope before the due date.

There will be **nine** lab assignments. Lab assignments will be released on a Wednesday and will be due the following Tuesday at 11:59pm EST. There will be five weeks without a lab assignment, these "free" weeks will also align with midterm season, spring break, and the weeks when programming assignments are due. Each lab assignment will be worth 50 points. Labs will be posted as a `.zip` file on piazza, and will contain instructions on what Java files to submit on gradescope where they will be graded via an autograder (more on this later).

There will be **two** programming assignments. Programming assignments are special because not only are they assignments (worth 100 points each), but they also come with a class-wide tournament attached to them. This semester we will be playing two games: battleship (using probability) and tetris (using reinforcement learning). Your goal is not only to produce the best agent that you can to earn credit for the assignment, but also to win the tournament.

Since there are two programming assignments, there will be two tournaments. Our tournaments will take the place of the midterm and the final. To be clear: there is no midterm, and there is no final. Instead, we will compete to determine who made the best agent in the class, and is section A better than section B? The tournaments are for **extra credit** only (more on this later).

Grading Written assignments will be graded by hands by our wonderful TFs, while any code will be graded on gradescope. **BE WARNED: code that does not compile on the autograder will receive no credit**. Be sure to check the status of your submission on gradescope after you submit (you can submit an unlimited amount of times before the submission). Some of the autograders take a decent amount of time to run, so please don't wait until the last minute to submit!

In total, programming assignments will contribute 40% of your final grade. Written assignments will contribute 40% of your final grade, and the remaining 20% will come from your labs. Including extra credit, it is possible to get more than 100% in this course!

Late Policy In general, I am very lenient regarding late work or extensions. Please try to stay in *contact* with me if you need extra time, its ok! I want each and every one of you to have a pleasant, low stress experience in this course. I find that minimal stress is important to the learning process, and I want each of you to learn from this course rather than stress about points. That being said, unless I hear from you, I will not be accepting assignments **two** days after they are due. The first day after an assignment is due will result in a 10% penalty. The next day, there is a 25% penalty (the penalties do **not** stack).

Expectations It is expected for students to have a reasonable grasp on the following concepts:

- probability theory
- linear algebra
- calculus

It is also expected for students to have a firm grasp on the following concepts:

- Runtime and Memory Complexity
- Data Structures

Students lacking these requirements will find this course to be significantly challenging!

We encourage students to work collaboratively in this course, but will not condone cheating as defined in the BU handbook. Specifically for homeworks, you are encouraged to form pairs, although working by yourself is fine. The catch is that you must **stick** with your partner for the entire semester on every homework. If you work with a partner, please only submit one solution per pair per homework with both of your names clearly indicated.

Gradescope Please submit your homework solutions to gradescope. Please add yourself to the course gradescope with the following code: **ZW6DW3**