

# Syllabus



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**Description and Objective:** In this course, students will learn a range of fundamental mathematical and computational techniques used for the creation of what are sometimes called "intelligent agents" in AI. By studying these techniques, we will learn how to put them to work to solve a variety of problems, and come to better understand fundamental current and future technologies. Topics include:

- the concept of an AI agent, search-based AI techniques
- problem-solving as search
- constraint satisfaction techniques
- logic-based methods and models
- probability-based methods and models
- decision-theoretic methods and models
- machine learning approaches

## Objectives for the Course

By the end of the semester, a successful student will be able to do all of the following things:

- Understand and explain the basic concept of an AI agent.
- Understand and explain the differences between classical and non-classical search techniques.
- Understand and explain heuristic search and adversarial search techniques for solving AI problems.
- Analyze and implement search algorithms to solve problems.
- Understand and explain logic-based approaches, including how to use logic for knowledge representation, and how to automate logical inference.
- Use elementary probability theory to represent uncertainty in knowledge and action.
- Employ Bayesian techniques to represent and reason about uncertain domains.
- Use basic decision theory to reason about rational action.
- Understand and explain the differences between classical planning and planning under uncertainty.
- Analyze and implement a variety of planning algorithms to solve planning problems.
- Understand and explain the differences between planning and learning in AI.

## Course Materials

1. **Textbook:** [Artificial Intelligence: A modern approach](https://tufts.bncollege.com/c/Artificial-Intelligence-A-Modern-Approach/p/MBS_2096310_new) ↗ ([https://tufts.bncollege.com/c/Artificial-Intelligence-A-Modern-Approach/p/MBS\\_2096310\\_new](https://tufts.bncollege.com/c/Artificial-Intelligence-A-Modern-Approach/p/MBS_2096310_new)), Stuart Russell & Peter Norvig  
ISBN: 9780134610993 (4th Edition)  
**Author's website for the book, with resources:** <http://aima.cs.berkeley.edu/> ↗ (<http://aima.cs.berkeley.edu/>)
2. **Lecture notes:** A version of the slides used in the recorded lectures will be posted along with each lecture recording on Canvas; they will also be posted to the [notes section of this site](https://canvas.tufts.edu/courses/38632/pages/lecture-notes-and-other-materials) (<https://canvas.tufts.edu/courses/38632/pages/lecture-notes-and-other-materials>).

## Prerequisites and Expected Competencies

**Programming:** Students should be able to comfortably write substantial programs (i.e., at the level expected by the end of COMP 15 or an equivalent course). C++ or Python are preferred; however, you can write code in other languages. It is expected that you submit code that we can compile/run for testing purposes; your assignment submissions will include README files explaining how to run it, along with sample output from successful runs.

**Note:** students can expect assistance from TA's and the instructor in understanding the requirements of a particular assignment, and in working out conceptual issues. This is not a course meant to teach you to program, however (although you will get good practice at it along the way); debugging and code questions will be considered, but please don't expect course staff to spend substantial time working through your code itself. If you write in a language other than C++ or Python, we may not be able to answer such questions in more than general terms.

**Mathematics:** AI, as many areas of CS, is based in mathematics. While nothing beyond basic discrete mathematics and logic (something equivalent to the Tufts CS 61 course) is presumed, students should still be prepared to learn further details of logic, probability, and decision theory. Examinations will focus on the conceptual material and you will be expected to be able to do some elementary mathematical and other formal calculations by hand.

## Requirements & Grading

Grades will be based on the following:

1. 70% Homework (5 assignments)
2. 30% Examinations (2 exams; 15% each)

**Letter Grades:** The class uses the following breakdown of letter grades and percentages:

98–100%	A+	87–89%	B+	77–79%	C+	67–69%	D+
93–97%	A	83–86%	B	73–76%	C	63–66%	D
90–92%	A–	80–82%	B–	70–72%	C–	60–62%	D–

## Homework

Homework will be assigned regularly in the course. The homework release and due dates are listed on the schedule page. In general, students will have about two weeks for an assignment. Homework will be submitted using the Gradescope system, information about which will be provided as necessary.

Each assignment will consist of a number of deliverables, generally including code, basic documentation, and sample runs.

**Regrade requests for all homework assignments must be submitted within a week of the grades being released.**

## **Exams**

The exams will be in written format, and will be open-book and open-notes. Each will be released for a period of 72 hours, and will be accessible via Gradescope. Students can complete the exam at a time of their choosing during the 72-hour period. Once a student chooses to start the exam, they will have a fixed amount of time in which to complete their work, and upload the results, which can be converted to digital form using a camera or scanner. Example exams, to show the format and type of question, will be distributed before each exam occurs.

Course staff will monitor the class Piazza page during set times during the 72-hour period of exam availability, (posted at the time each exam is made available) to answer questions of clarification. By necessity, staff can not be available at all times of the day or night, and so if students expect to want to ask questions, they should choose to write during these pre-set times.

Students with extreme special circumstances and only with prior approval by their academic dean must meet with the professor to make other arrangements to the scheduled homework and exams. Emails regarding the situation must be initiated by the academic dean.

**Students must submit an attempt at all exams in order to pass CS 131.**

**Regrade requests for all exams must be submitted within a week of the grades being released.**

## **Class Participation**

Much of the content of the course will be delivered via pre-recorded video lectures that students can view at their own pace. Live sessions will also be held on Zoom (and recorded for later reference), during which the instructor will answer questions about material from the videos, and there will be the opportunity to work through exercises and demos that will prepare students to complete course work like homework and exams.

Live attendance is encouraged. While sessions will be recorded, missing a large number of live sessions is likely not the best way to keep up with the course.

## **Policy on Late and Missing Work**

For late assignments, handed in **within 24 hours after** the time at which it was due, a reduction of 10% will occur; if handed in **within 48 hours** of the expected time, a reduction of 20% will occur; **within 72 hours** the reduction will be 40%. No credit is given for assignments submitted after that point, without a documented reason.

Students with extreme special circumstances and only with prior approval by their academic dean must meet with the professor to make other arrangements to the scheduled homework and exams. Emails regarding the situation must be initiated by the academic dean.

## Policy on Collaboration

I encourage you to work together on the material. This is a great way to learn, and to share ideas. However, in order to actually learn something, it is important that you complete the real work of programming and analysis on your own, unless specifically directed otherwise. It is perfectly fine for you to discuss the general approach to a problem with one another, work out how to understand an algorithm or model, and to help one another with things like getting the software we will use to work properly on your computer. However, it is **not okay** to copy code and other materials from anyone inside or outside of the class. While you can of course use online references to explain key concepts, and to learn programming techniques, you must not simply copy answers or code you find online, and you should cite any such materials you consulted. This is the only way to actually learn the material.


## Piazza & Collaboration

When using the Piazza forum, the same sorts of considerations about collaboration are in play when posting questions and providing answers.

Questions may be posted as either **private** (viewable only by yourself and course staff) or **public** (additionally viewable by all students for the course registered on Piazza). Some issues warrant public questions and responses, such as: misconceptions or clarifications about the instructions, conceptual questions, errors in documentation, etc. Some issues are better with private posts, including: debugging questions that include extensive amounts of code, questions that reveal a portion of your solution, etc.

Please use your best judgment when selecting private vs. public. If in doubt, make it private.

## Academic Misconduct

Students should read the Tufts handbook on academic integrity located on the [judicial affairs website](https://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy)  [\\_ \(https://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy\)\\_](https://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy). If a student does not understand these terms or any of the material listed on this page, it is his/her responsibility to talk to the professor. To be brief: do your own work, cite any sources from which you take ideas, and give credit where credit is due.


## **Inclusivity**

Respect is demanded at all times throughout the course. In the classroom, not only is participation required, it is expected that everyone is treated with dignity and respect. We realize everyone comes from a different background with different experiences and abilities. Our knowledge will always be used to better everyone in the class. As an instructor, I have my own specific background and perspective on life, along with my own history of mental and physical challenges. I don't presume that my experience is the same as anyone else's, but will always do my best to meet all of my students where they live, to the best that I can. I'll probably make some mistakes, but I will be trying.


## **Policy on Sharing**

This course is designed for everyone to feel comfortable participating in discussion, asking questions, learning, and facilitating the learning of others. In order for that atmosphere to be maintained, the recordings of our conversations will only be shared with the enrolled students in the class (not posted publicly), and it is prohibited for any of us who have access to the video to share it outside the course. Additionally, some readings are provided on a fair-use basis while taking this course, and are not to be distributed otherwise. This especially includes any posting or sharing of readings, videos, or other recordings on publicly accessible websites or forums. Any such sharing or posting could violate copyright law or law that protects the privacy of student educational records.


## **Writing Support**

The StAAR Center for accessibility and academic resources offers friendly, experienced, non-judgmental [writing support](https://students.tufts.edu/staar-center/writing-support)  (<https://students.tufts.edu/staar-center/writing-support>) to writers at all levels of expertise through any stage in the writing process (for free!), and I highly recommend that you take advantage of this excellent opportunity.

## **Accessibility**

Tufts University values the diversity of our students, staff, and faculty, recognizing the important contribution each student makes to our unique community. We are committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations you can contact the [StAAR Center](https://students.tufts.edu/staar-center)  (<https://students.tufts.edu/staar-center>) (617-627-4539) to make an appointment to determine appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

## **Counseling & Wellness**

As a student, there may be times when personal stressors or emotional difficulties interfere with your academic performance or well-being. Counseling and Mental Health Services (CMHS) provides confidential consultation, brief counseling, and urgent care at no cost for all Tufts undergraduates as well as for graduate students who have paid the student health fee. To make an appointment, call 617-627-3360. Please visit the [CMHS website](https://students.tufts.edu/health-and-wellness/counseling-and-mental-health)  [\\_\(https://students.tufts.edu/health-and-wellness/counseling-and-mental-health\)\\_](https://students.tufts.edu/health-and-wellness/counseling-and-mental-health) to learn more about their services and resources.