

Introduction to Artificial Intelligence¹

CSCI 3202, Fall 2019

Monday and Wednesday 3:00 pm to 4:15 pm in ECCR 245

Course Team

Instructor

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Course Content

Description

Artificial Intelligence is a fascinating topic that integrates the basic scientific goal of understanding how minds work with the engineering goal of creating intelligent machines to solve real-world problems. It encompasses a number of fields including computer science, engineering, cognitive psychology, neuroscience, and philosophy. In this course, you will obtain a broad overview of the field of Artificial Intelligence (AI), including its historical, philosophical, classical and contemporary approaches, and recent trends and applications. *Some*

¹ Subject to change at instructor's discretion. The most updated copy will always be posted on Canvas.

(out of the many) things you will learn include how to design computers to solve complex problems, recognize patterns, to make difficult decisions with imperfect information, to plan for the future, to store and retrieve memories like humans, to sense the world like humans, and to learn from experience.

Core Topics

The course will be structured around the following core topics.

- 1 Theoretical Foundations: The meaning of intelligence along with an overview and history of AI
- 2 Classical (or symbolic) AI: Solving problems by search. *Topics include uninformed search, heuristic search, adversarial search, local search*
- 3 Multiagent systems (behavior-based) AI: How simple agents can solve very complex problems. *Topics include subsumption architecture, swarm intelligence, genetic algorithms.*
- 4 Machine learning: How computers can learn from experience. *Topics include support vector machines, Bayesian classifiers, decision trees, clustering, validation methods*
- 5 Artificial Neural Networks (connectionism): How to use models of human brains to solve complex problems. *Topics include perceptrons, Hopfield Networks, Self-Organizing Maps, Backpropagation*
- 6 Deep Neural Learning: Advanced topics in neural networks. *Topics include Long Short-term Memory Recurrent Neural Networks, Autoencoders, Convolutional Neural Networks*
- 7 AI Ethics: Ethical and social considerations of AI in everyday life. *Topics include privacy, transparency, fairness, and automation.*

Intended Outcomes (Learning Objectives)

Upon successful completion of this course you will be able to:

- (General Goal) Demonstrate a broad overview of the field of AI including its history, goals, accomplishments, challenges, future directions. Develop a general appreciation for the science of intelligence, both natural and synthetic.
- (LO1) Demonstrate a conceptual understanding of the core AI topics listed above.
- (LO2) Apply conceptual knowledge of core AI concepts by implementing AI algorithms, analyzing intelligent systems, and using existing AI tools to solve problems.
- (LO3) Learn about exciting trends, paradigms, and major advances of AI, while considering its philosophical roots, ethical, and societal implications.

Prerequisites

(CSCI 2270 or CSCI 2275) and (APPM 3170 or CSCI 2824 or ECEN 2703 or MATH 2001) and APPM 3570 or STAT 4520 or APPM 4570 or CHEN 3010 or CSCI 3022 or CVEN 3227 or ECEN 3810 or ECON 3818 or MATH 3510 or MATH 4510 (all min grade C-).

Course Resources

Textbook

There is no official textbook for this course. Copies of book chapters and articles will be distributed over the course of the semester.

Schedule

Posted on Canvas and available at <https://tinyurl.com/AIF19Schedule>. Please note that the schedule will constantly be changing and the most recent version will be available at this link.

Office Hours

These will be posted on the following Google Calendar (<https://tinyurl.com/AIF19OfficeHours>) . If you can't make the official office hours, let us know and we will be happy to schedule alternate times.

Getting Help

We want the course to be rewarding and instructional, not frustrating and demoralizing. But, we don't know when or how to help unless you ask. If you find yourself stuck on something or have a question, please post it to Piazza either as a public post so other students can see and reply or privately to the TAs and instructor. We prefer this form of communication rather than email since you will get a quick reply and we will have a record of the post. Of course, please feel free to email me if you have a sensitive topic to discuss or something to share. I love hearing from my students.

Learning Management System

We will use Canvas in this course. <https://canvas.colorado.edu/courses/54792>. This is where I will post readings, class notes, assignments, the syllabus, and so on. Please be sure to check the web page on a regular basis.

Questions & Discussions

We will use Piazza for class discussion. The system is highly catered to getting you help efficiently from classmates, the TAs, and the instructors. *Rather than emailing me questions, I request that you to post your questions on Piazza.* If your question is of a private nature, Piazza allows you to send private messages to the instructors. You can access Piazza through the canvas link above or at <https://piazza.com/colorado/fall2019/csci3202/home>.

Assignments

We will use Gradescope (<https://www.gradescope.com/>) for assignment submissions, including programming assignments.

Python

All programming assignments will be done in Python (<https://www.python.org/>). If you are not familiar with Python, embrace this as an opportunity to learn a new language. This language and tools connected to it are ubiquitous in the fields of AI/ML/data science.

Course Assessments

A brief description of the various assessment components are listed below. I will add specific details to each component over the course of the semester.

Quizzes (37.5%)

You will demonstrate your conceptual understanding of core AI topics covered in the classes and readings with *five quizzes (7.5% of your grade each)*. The quizzes will include open ended and (occasionally) multiple-choice questions. The quizzes will focus on conceptual understanding instead of rote memorization of information. *Your scores on the highest quiz will count 1.5 times towards your total quiz score and the score on your lowest quiz will count 0.5 towards the quiz total. Thus, although you need to complete all quizzes, the quiz total will be weighed towards your best performing quizzes.*

Assignments (50%)

You will apply the conceptual information learned in the class to solve real-world problems via *five assignments*, several of which will involve programming components. There will be one assignment for each of core topics 2-6 and *each assignment will count for 10% of your grade.*

Pre-class Preparation & In-Class Activities (12.5%)

We will engage in constructive and interactive learning methods in the class. This means that you will not passively listen to lectures, but actively participate by preparing before class and engaging in individual and group work during class. Some of the classes will be discussion based. For these, you will be asked to complete a reading and submit a thoughtful discussion question the day before the class. Others will require you to prepare to debate a given topic in class. These *pre-class activities will count for 5% of your grade* (points assigned to each item will vary). We will also have an individual or group-based learning activity in almost every class. These *in-class activities will count for 7.5% of your grade* (each item will count for the same number of points).

Late Submissions

Late pre-class activities will not be accepted past the deadline. There will be no make-ups for in-class activities. Late assignments will be accepted as follows:

- 10% deduction if less than 24 hours late
- 25% deduction if greater than 24 hours but less than 48 hours late
- 50% deduction if greater than 48 hours but less than 72 hours late
- Submissions will not be accepted beyond 72 hours (3-days past the deadline)

Please note that submissions will be posted two weeks or more before the deadline. Hence, waiting until the last minute to complete your assignments puts you at risk for the deductions listed above even though you might have a valid reason to miss the deadline.

Submission Difficulties

You are to notify *the instructor* via email as well as *include a copy of the submission* by the deadline if you are having difficulties with the submission system.

Missed Quizzes

You will not be able to make up a missed quiz. However, if you have to miss a quiz for extraneous circumstances out of your control, you will be allowed to reschedule if we are notified (ideally in advance) and appropriate documentation is provided. You may be asked to complete a different version of the quiz if taken outside of the regular schedule.

Grades

Individual scores will be computed using two decimal precision and final scores will be rounded up (e.g., 93.50 = 94 but 93.49 = 93). *Curving of grades is not anticipated.*

A	(94-100)	A-	(90-93)		
B+	(87-89)	B	(84-86)	B-	(80-83)
C+	(77-79)	C	(74-76)	C-	(70-73)
D+	(67-69)	D	(64-66)	D-	(60-63)
F	(0-59)				

Posting Grades

Your scores on the various quizzes and assignments will be posted within 1-2 weeks of completion.

Workload

You will be required to spend a reasonable [but not excessive] amount of time on out-of-class work including pre-class preparation, studying for the quizzes, and completing the assignments. The time spent on each of these activities should roughly correspond to the assessment scheme discussed above.

Attendance

You are expected to attend *all the scheduled classes*. Remember that a sizable portion of your course grade (7.5%) will depend on successful completion of in-class activities.

Course Policies

Plagiarism/Cheating

Plagiarism or cheating in any form is unethical and detrimental to education and *will not be tolerated*. With the exception of group projects, all work submitted by a student is expected to be a student's own work. You may discuss assignments with your classmates, but all work must be your own. Copying text, solutions, or code snippets from the internet/others constitutes academic dishonesty and is unacceptable, even with proper citation (that work is not your own). Please refer to the Collaboration Policy below. *Any discovered incidents of violation of the Plagiarism/Cheating and Collaboration policies will be treated as violations of the University's Academic Integrity Policy and will lead to an automatic academic sanction in the course and a report to both the College of Engineering and Applied Science and the Honor Code Council.*

Collaboration Policy

You are permitted to work together on assignments. But all work you submit must be your own. The internet is a useful resource in many ways. Looking things up is okay! But copy-pasting anything is not okay since that work is not your own. This includes even just snippets of code. Copying codes/solutions from sites like StackExchange and Chegg is unacceptable. That seems simple, but it is worth unpacking what this means. Here are some examples.

Oh no! Grace forgot how to slice arrays in Python! She looks this up on the internet, and incorporates it into her code for a programming assignment. Does this violate the Collaboration Policy? *No, Grace only looked to fill gaps in her basic programming knowledge. This differs from searching for a full solution online in that Grace is still tackling the problem-solving aspects of the assignment on her own.*

Chris and Rhonda are working together on their assignment, where they sketch out a solution on a whiteboard. Later, they each code up the solution on their own. Does this violate the Collaboration Policy? *No, they each did their own work, so they are collaborating correctly.*

Maciej later walks in and sees still on the whiteboard the solution to this problem that Chris and Rhonda worked out. He snaps a photo of it with his phone, and later codes it up with some modification. *This violates the Collaboration Policy because Maciej did not contribute in any meaningful way to that solution; it is not his work. Renaming variables and changing a for loop to a while loop does not change the fact that Maciej has violated the policy.*

Collaboration boundaries are hard to define crisply, and may differ from class to class. If you are in any doubt about where they lie for a particular course, it is your responsibility to ask the course instructor.

Accommodation

I am committed to providing everyone the support and services needed to participate in this course. If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with me.

Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with

scheduled exams, assignments or required assignments/attendance. If this applies to you, please speak with me directly as soon as possible at the beginning of the term.

Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, ability, and nationality. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on class behavior and the student code.

Discrimination and Harassment

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. The full policy on discrimination and harassment has more information.

Honor Code

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). The Honor Code Office has more information.