

CS 2510/ Introduction to Artificial Intelligence / 2025 Fall

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Instructor: Clayton Cafiero
Email: cbcafier@uvm.edu
Office: Innovation E309
Office hours:
M 02:30–04:00 PM, Th 09:00–10:30 AM,
F 08:30–09:30 AM, or by appointment
Website: https://www.uvm.edu/~cbcafier

GTA: Tasnim Sakib Apon
Email: tasnim-sakib.apon@uvm.edu
Office hours: T/Th 11:30 AM–01:30 PM
Location: Innovation E446 or via MS Teams

UTA: Bruton Strange
Office hours: T/F 12:30–01:30 PM
Location: Common area Innovation / Discovery, level 2

Class meetings: MWF 09:40–10:30 AM
Location: Lafayette L200

Welcome to the course!

Overview and learning objectives: This course will introduce you to the foundations of artificial intelligence: its history and selected methods. Topics include: logic- and rule-based approaches, knowledge representation, heuristic search, A*, IDA*, Monte Carlo methods, alpha/beta pruning, minimax, Markov models, decision tree, ensemble learning / random forest, the neural model and simple multi-layer perceptrons. Consideration of trends and societal impact. Other topics, if any, TBD.

Prerequisites: CS2240 with grade of C- or better.

Materials including lecture notes will be circulated via Brightspace.

Software: You should have a working installation of Python (Python 3.12 or higher is recommended). We will use Scikit-Learn, TensorFlow 2 or PyTorch, and Matplotlib. All of these are `pip`-installable (instructions will be circulated via Brightspace).[1] With these installed, Keras, Numpy, Scipy, and many other packages will be installed as dependencies. I *strongly* recommend creating a new virtual environment for this course, to isolate requirements.

We will do some programming in Prolog. Installation will vary from machine to machine, from OS to OS, so I cannot provide a universal recipe. See SWI Prolog: https://www.swi-prolog.org/. Your best bet on systems with package managers (Linux, macOS) is to use the package manager (*e.g.*, Apt, Aptitude, dpkg, Homebrew, MacPorts, *etc*.) If installation is problematic, you can run Prolog programs in the SWISH web interface at: https://swish.swi-prolog.org/.

Correspondence: Please use email for electronic correspondence (and not MS Teams). As I teach multiple courses please indicate the course in which you are enrolled in the subject line. Please use your UVM email for all correspondence.

Weekly Schedule of Topics
(Tentative and Subject to Change):

Week	Topic
1	Introduction; history of AI; complexity; logic foundations
2	Logic programming with Prolog
3	Logic programming with Prolog; knowledge representation and ontologies
4	Expert systems; uninformed search
5	Heuristic search, permissible heuristics, A*
6	More on heuristic search, IDDFS and IDA*
7	Adversarial games, minimax and alpha-beta pruning
8	Midterm exam; additional topics in search and adversarial games
9	Non-deterministic games: expectiminimax, quiescence and null move search
10	Markov models and decision processes
11	Decision tree; random forest / ensemble learning
12	The neural model; McCulloch-Pitts
13	Multi-layer perceptron networks
14	Add'l topics TBD; review and discussion

In addition to the above, we'll read a few papers and set aside some class time for (hopefully lively) discussion.

Grading:

Weight	Assessment
10%	in-class discussion and active learning
50%	homework and mini-projects
10%	quizzes (11, drop one)
10%	midterm exam
20%	final exam
100%	TOTAL

[1] You may wish to use Anaconda, but I find this has an unnecessarily large footprint.

Academic integrity: The Department of Computer Science enforces UVM's Code of Academic Integrity. Any suspected violation of this policy will be referred immediately to UVM's Center for Student Conduct (https://www.uvm.edu/sconduct). Sanctions for a violation may include a grade of XF in the course. Additional violations can result in dismissal from the university. In a word: *Don't*. All students should read and understand this policy. See: https://go.uvm.edu/cai.

Collaboration on quizzes and exams is strictly prohibited. Use of online services as a source of solutions is strictly prohibited. Using generative AI such as ChatGPT or Claude, or websites such as Chegg or Course Hero to complete coursework is a form of academic dishonesty. Work you submit for an individual grade must be your own. Any work not produced by you must be cited. For certain assignments, students may collaborate on homework (typically limited to teams of two). If you collaborate with another student on an assignment, be sure to indicate team members as specified. If you have any questions ask!

Any attempt to tamper with or defeat any autograder is a form of academic dishonesty. This applies wherever autograders are in use, for example on Brightspace or Gradescope.

All code submitted by students is subject to code similarity review.

Exams, quizzes, homework assignments, answer keys and solutions, presentations or lecture notes, specifications and rubrics are copyright protected works, unless clearly and explicitly indicated otherwise. Any unauthorized copying or distribution of protected works is a violation of federal law and may result in disciplinary action. This includes submission of protected works as prompts to generative AI. Sharing of course materials without the specific, express approval of the instructor may be a violation of the University's Code of Academic Integrity and an act of academic dishonesty, which could result in disciplinary action. Violations will be handled under UVM's Intellectual Property Policy and Code of Academic Integrity, as appropriate. See: https://go.uvm.edu/ipp and https://go.uvm.edu/cai.

Policy regarding AI: Use of generative AI (ChatGPT, Claude, CoPilot, Llama, DeepSeek, Gemini, *etc.*) is strictly prohibited as a means of researching, producing, or verifying answers in exams and quizzes. No exceptions.

Most IDEs have some kind of AI assistant built-in or available as a plug-in (*e.g.*, GitHub CoPilot in VS Code, JetBrains AI Assistant, *etc*.) and there are many other tools for assisted coding (Replit, Cursor, *etc*.). These have their uses, but for your own learning, it's often best to disable them when writing code to avoid cognitive off-loading. Please avoid the use of Replit, Cursor, and other such tools. It's OK if you use built-in IDE assistants but use them wisely, and you must indicate whether or not you've used them by including a comment in your code. *You should be able to read, understand, and explain in detail the workings of any code you may submit for this course. Do not submit anything you don't completely understand.* I reserve the right to ask you questions about code you submit and you should be prepared to answer on the spot.

Use of generative AI for producing prose—reflections, essays, or similar writing—is prohibited. Feel free to use spell checkers and grammar checkers. UVM has a site license for CoPilot, which is integrated into UVM-supplied instances of Microsoft Word. This is very much preferred to outside, third-party tools. If you do use something other than UVM's CoPilot instance you must make a note of it in a comment, footnote, or end note.

If you have a documented disability (*e.g.*, dysgraphia) or English is not your native tongue, please contact me about an accommodation if you think certain AI tools would be of legitimate benefit in your writing.

Any unauthorized use of generative AI, or uncited use where permitted, constitutes a violation of UVM's Code of Academic Integrity and Code of Student Conduct. Violations or suspected violations will be referred to the Office of Student Conduct.

There are many ethical issues surrounding the use of generative AI. If you are uncomfortable about using generative AI, you are in no way obliged to use it.

If you have questions about generative AI or this policy, please do not hesitate to ask.

Late policy / extensions: Each homework assignment has a specific due date / time. You may submit work up to 24 hours after the due date / time, however, late submissions will be penalized 20%. Submissions that are more than 24 hours late will not be accepted unless an extension has been granted. We will consider reasonable requests for extensions when extenuating circumstances arise. (It can't hurt to ask.) However, extensions will not be granted if the request for extension is made within 24 hours of the time an assignment is due, except in the most extraordinary circumstances. So if you wish to request an extension, *do so early*! If an extension is granted, you must submit your work by the agreed-upon extension date.

Student course evaluations: Students are warmly encouraged to complete an evaluation of the course at its conclusion. Evaluations are anonymous and confidential, and the information gained, including constructive criticisms, will be used to improve the course.

The secret word is "bromeliad."

Accommodations: In keeping with UVM policy, if you have a documented disability and are interested in utilizing ADA accommodations, you should contact Student Accessibility Services (SAS), the office of Disability Services on campus for students. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter.

Contact SAS: A170 Living/Learning Center; +1 802 656 7753; access@uvm.edu; or visit https://www.uvm.edu/access.

If you are entitled to use the Exam Proctoring Center, please book reservations at least four days in advance.

Class participation: You are expected to be an active participant in class. The more engaged you are, the more you will learn—and the more fun you'll have. This includes being prepared and attentive, responding when called on, participating in group discussion, and asking questions as appropriate. When it comes to asking questions, *please don't be shy!* There's no such thing as a "dumb" or "silly" question. If there's something you don't understand—*ask*! Asking questions helps you understand the material presented in the course. Asking questions is good for your classmates. It's almost certain that if you need clarification on some point, that there's at least one other student in the class with the same question. So help each other out—*ask*! Finally, when you ask a question you help the instructor to do a better job of explaining. If someone explains something, and you still don't quite grasp it, it's not unlikely that the explanation could be improved or clarified.

Diversity, equity, and inclusion: UVM is a place where you should be treated with respect and kindness. We welcome individuals of all ages, backgrounds, beliefs, interests, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All students are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the community. If you ever feel that you have been unfairly treated or judged by an instructor, a mentor, another student, or another member of the community, please let someone know. Your instructors and advisors in the CEMS Office of Student Services are available to discuss any concerns, or you can report an incident of bias through the bias report program (https://go.uvm.edu/brp).

Conduct: Be kind to one another and to yourself. Be respectful of yourself, others, and the institution. Please arrive on time. Please, no food in class. Please, no cell phones in class. You may use a laptop or tablet, but only for active learning sessions, pair programming, taking notes, or assistive technologies.

For other policies on classroom conduct, please see: https://go.uvm.edu/srr and https://go.uvm.edu/csc.

Promoting health and safety: If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (+1 802 656 3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at https://www.uvm.edu/deanofstudents.

Wellbeing resources:

- Center for Health and Wellbeing: https://www.uvm.edu/health/services
- Counseling and Psychiatry Services (CAPS): +1 802 656 3340
- Food Insecurity Assistance: https://www.uvm.edu/health/food-insecurity-uvm

Student advocacy: https://www.uvm.edu/deanofstudents/student_advocacy

Your identity at UVM: Students at UVM can specify the first name and pronoun they want used on campus. For information on how to update your preferred name and personal pronouns as well as keeping your legal name private, and UVM policy on lived name and pronouns, see: https://go.uvm.edu/lnpr.

Religious holidays: Students have the right to practice the religion of their choice. In order to receive extensions or excused absences, you should submit via email your documented religious holiday schedule for within the first week of the course. Reasonable extensions will be granted where assignment deadlines conflict with religious holidays.

Student athletes: In order to receive extensions or excused absences, you should submit via email appropriate documentation as soon as possible, preferably within the first week of the course. Reasonable extensions will be granted where assignment deadlines conflict with team events or team travel.

Statement on alcohol and other drugs: We want you to get the most you can out of this course. Therefore, you are expected to familiarize yourself and abide by the University's policies with regard to alcohol, cannabis, tobacco, and other drug use. See: https://go.uvm.edu/actd. Please do everything you can to optimize your learning and to participate fully in this course.

Class format changes: The University of Vermont reserves the right to make changes in the course offerings, mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

Changes to this document: This document is subject to change. Any such change will be communicated via an announcement on Brightspace. The latest version of the syllabus will always be available on Brightspace.