University of Massachusetts Amherst

CSC383: Artificial Intelligence

Course Information

Instructor: William Hunter McNichols

Lectures: Tuesday/Thursday 11:30am-12:45pm

Location: SOM 137

Course Description

The field of Artificial Intelligence (AI) has been the birthplace for many revolutionary industry trends over the last couple decades. Tech startups and large technology companies alike are constantly using new techniques from this field in order to create more sophisticated software and products. As this trend continues it is becoming increasingly important for computer scientists to understand the fundamentals of AI and the techniques that have spawned from it.

This course aims to give students a high level understanding of the prominent AI topics that are being employed in industry today. It will provide an introduction to each topic, an overview of its supporting algorithms, and examples of products powered by the technology. Particular emphasis will be had on Machine Learning and developing hands-on practical skills with this technology. Upon completion of this course, students will obtain a wider scope of understanding about modern AI trends in software technology and develop an intuition for how this software works.

Prerequisite Courses/Knowledge

Students will need a fundamental understanding of data structures and programming fundamentals. Graph and tree data structures will be used in particular. Programming assignments in this class will be done using Python. Strong programming background in at least one programming language is required and it's strongly recommended you have some Python experience before starting.

A mathematical foundation in statistics is expected through completion of COMPSCI 240, although we will review key concepts as needed. Knowledge of linear algebra and multi-variable calculus is not strictly necessary but will deepen understanding of course material.

- COMPSCI 210 Data Structures

- COMPSCI 240 Reasoning Under Uncertainty

- MATH 235 Introduction to Linear Algebra (recommended)

- MATH 233 Multivariate Calculus (recommended)

Course Objectives & Learning Outcomes

Upon completion of this course, students will have a foundational understanding of AI and an understanding of modern technologies that have spawned from this field. They will understand a wide range of topics that are under the umbrella category of AI and develop an intuition about the inner-workings of these topics.

To develop a deep fundamental understanding of these techniques students will be able to demonstrate a working knowledge of a handful of key algorithms. Examples include (but are not limited to), search algorithms (BFS, DFS, A*, Minimax); machine learning regression and classification algorithms (SVM, KNN); and neural network training algorithms (Perceptrons, Backpropogation).

Students will also gain hand-on experience in implementing these concepts in a programming language to build 'intelligent' software. With both theoretical and practical exposure to these wide-ranging concepts, students will be informed and knowledgable about how to further deepen their skills and knowledge of Artificial Intelligence.

Generative AI Policy

Generative AI text tools such as ChatGPT are rapidly changing the way software is built today and learning how to "prompt engineer" such tools properly will undoubtedly be an essential part of any modern technical career. However, when students use such external tools to complete their coursework, the teaching staff cannot see how much of the programs written are your creation vs that of an AI system. This situation makes it difficult to assess the progress of your learning and engagement in the course.

To address this situation we have developed an internal tool, called "383GPT," which will allow you to prompt a generative language model so that you can learn to leverage these tools in your programming, while recording your prompts for the teaching staff to review. You can use the resulting code produced by 383GPT as a part of your assignment submission without attribution. However, the use of additional external generative AI tools (Claude, ChatGPT, etc.) are prohibited unless specified otherwise in the assignment.

Grading Breakdown

Assignments: 40%

Group Project: 10%

Quiz 1: 15%

Quiz 2: 15%

Final Exam: 20%

Assignment Schedule*

	Date Available	Date Due
Assignment 1	9/6/24	9/13/24
Assignment 2	9/9/24	9/23/24
Assignment 3	9/23/24	10/4/24
Assignment 4	10/7/24	10/18/24
Assignment 5	10/21/24	11/1/24
Assignment 6	11/4/24	11/15/24
Assignment 7	11/15/24	11/26/24

*Exact dates of assignments may change slightly, depending on our pace in the lecture material. Please check Canvas/CampusWire for latest course announcements and up-to-date assignment due dates.

Office Hours

See CampusWire for detailed schedule

Late Policy

Assignments are due at 11:59pm on the assigned due date. Any assignment submitted after the due date will be marked late. Late assignments will not be graded and receive a score of 0, however…

You are allocated **5 late days** to use over the course of the semester that can be used on the assignments (not the group project). Outside of these late days only approved late submissions will be accepted. I will grant late submissions only for series circumstances (medical emergency, family crisis, etc.). Please send a private note to the instructor in such event as soon as possible.

Grading Scale

Letter	Percent
A	> 93
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	60-66
F	< 60

Any decimal above .5 is rounded up to the next number: 92.5 is an A, 92.49 is an A-.

Textbooks/Materials/Resources

The following textbook is not required, but a helpful resource for deepening the understanding of in-class lectures and for continued learning on the subject matter. Either the 4th or 3rd edition of the book is sufficient

Artificial Intelligence: A Modern Approach 4th edition

ISBN-13: 978-0-13-461099-3

ISBN-10: 0-13-461099-7

Artificial Intelligence: A Modern Approach 3rd edition

ISBN-13: 978-0-13-604259-4

ISBN-10: 0-13-604259-7

Academic Honesty Policy

Intellectual honesty requires that students demonstrate their own learning during examinations and other academic exercises, and that other sources of information or knowledge be appropriately credited. Scholarship depends upon the reliability of information and reference in the work of others. Student work at the University may be analyzed for originality of content. Such analysis may be done electronically or by other means. Student work may also be included in a database for the purpose of checking for possible plagiarized content in future student submissions. No form of cheating, plagiarism, fabrication, or facilitating of dishonesty will be condoned in the University community.

For more details see the official honor code: https://www.umass.edu/senate/book/academic-regulations-academic-honesty-policy

Attendance

Lectures for this course will be held in person. My intention is that they will be recorded and available afterwards but the quality of the recordings are not my priority. I encourage you to attend lecture in person and use the recordings primarily for review or if you miss class due to extenuating circumstance. Many of the concepts of this course will quickly build upon each other so please be sure you are following along with the content as it is presented and ask questions and clarifications as needed.

Accommodation

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course.

If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements. If you require accommodations related to the final exam (e.g., extended time, a distraction-free setting) please let me know at least one week in advance.

Equity and Inclusion

Our classroom is an _inclusive environment_. I will promise to treat each and every one of you with respect and my expectation is that you do the same in return. Harassment of any form will not be tolerated in the classroom.

We all come to our classroom with unique backgrounds and perspectives on the world. At times, the difference between these perspectives cause friction when we interact with one another. If at any point you feel like my behavior, the behavior of a course staff member, or that of another student is making you feel unwelcome, offended, or uncomfortable please let me know as soon as possible. Do not be afraid to speak up during class and feel free to reach out to me at any point after class if something is on your mind. You have a right to a fair education and I encourage you to speak up.

I understand if you do not feel comfortable reaching out to me directly about an equity issue. There are resources available to you through the university to aid you in these situations. You can learn more about them here: https://www.umass.edu/diversity/oei-resources.

Your feedback

I welcome your feedback at all points in the course. If something is unclear, please speak up for your sake and for the rest of the class. If you find an error in my lectures, code examples, assignments, or in anything else, please reach out to the course staff and myself. If you have suggestions for how the course could be improved, please do let me know, I truly value your perspective.

Weekly Schedule of Topics to be Covered

Please note that the exact material covered on a particular lecture will vary. While we will cover all the material, we will likely end up going faster on some topics and slower on others. Please stay up to date on Canvas as to what we will be covering in the upcoming class.

Week	Topics	AIAMA 3rd	AIAMA 4th	Date
1	What is AI? - Course Overview	Chapter 1	Chapter 1	9/3/24
	AI History and Modern Trends			9/5/24
2	Rational Agents	Chapter 2	Chapter 2	9/10/24
	Search Foundations, Uninformed Search	Chapter 3	Chapter 3	9/12/24
3	Informed Search, Relaxed Search	Chapter 4	Chapter 4	9/17/24
	Adversarial Search and Game AIs	Chapter 5	Chapter 5	9/19/24
4	Probability Review - Naive Bayes Classification	Chapter 13	Chapter 12	9/24/24
	Quiz 1 Proctored			9/26/24
5	Introduction to Machine Learning	Chapter 18.1-18.2	Chapter 19.1-19.2	10/1/24
	Linear Regression and Gradient Descent	Chapter 18.4-18.6	Chapter 19.6	10/3/24
6	Multiple Linear Regression, Jobs in AI/ML	Chapter 18.6	Chapter 19.9	10/8/24
	Classification with Logistic Regression			10/10/24
7	**No Class - "Monday Schedule"**			10/15/24
	Intro to Deep Learning - Perceptron Networks		Chapter 21	10/17/24
8	Perceptron Learning	Chapter 18.7		10/22/24
	Backpropogation Algorithm			10/24/24
9	Beyond Supervised Learning	Chapter 18.8-18.9		10/29/24
	Quiz 2 Proctored			10/31/24
10	**No Class - Veteran's Day**			11/5/24
	Natural Language Processing (NLP) pt 1			11/7/24
11	Natural Language Processing (NLP) pt 2	Chapter 22	Chapter 23	11/12/24
	Personal Assistants and Chatbots			11/14/24
12	Computer Vision pt. 1	Chapter 24	Chapter 25	11/19/24
	Computer Vision pt. 2	Chapter 24	Chapter 25	11/21/24
13	Robotics and Reinforcement Learning	Chapter 25	Chapter 26	11/26/24
	No Class - Thanksgiving Break		Chapter 26.8	11/28/24
14	Additional Topics - TBA			12/3/24
	Additional Topics - TBA			12/5/24
15	Course Review, What's next in AI?	Chapter 27	Chapter 28	12/10/24
E	Final Exam			TBA