

CSC44800: Introduction To Artificial Intelligence

Course Information

Instructor: William Hunter McNichols

Lectures: Tuesday/Thursday 9:30-10:45am

Location: Remote

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. Experience 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 and linear algebra is not strictly necessary but will deepen understanding of course material.

- CSC 10400 Discrete Mathematical Structures
- CSC 22000 Algorithms
- CSC 21700 Probability and Statistics for Computer Science (recommended)
- MATH 34600 Elements of Linear Algebra (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 the 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, Backpropagation).

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 knowledgeable about how to further deepen their skills and knowledge of Artificial Intelligence.

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

Grading Breakdown

Assignments and activities: 30%

Quiz 1: 20%

Quiz 2: 20%

Final Exam: 30%

Assignment Schedule*

	Date Available	Date Due
Assignment 0	8/26/21	9/2/21
Assignment 1	9/3/21	9/15/21
Assignment 2	9/15/21	9/24/21
Assignment 3	9/30/21	10/13/21
Assignment 4	10/14/21	10/26/21
Assignment 5	11/4/21	11/26/21

*Exact dates of assignments may change slightly, depending on our pace in the lecture material. Please check Slack for latest course announcements on assignment due dates.

Office Hours

Office hours will be held virtually via Zoom on Wednesdays from 10-11am. Please notify me know beforehand if you plan on attending.

Academic Integrity/Honesty Policy

Academic integrity is an essential part of the pursuit of truth, and of your education. We are all responsible for maintaining academic integrity at City College – it is the rock on which the value of your degree is built.

If you cheat on a test or plagiarize by using someone else's work or ideas, you defeat the purpose of your education. In addition, academic dishonesty is prohibited in the City University of New York, and is punishable by failing grades, suspension and expulsion.

For full details of the academic policy visit: <https://www.ccnycuny.edu/standards> Attendance Lectures for this course will be held synchronously via Zoom and your attendance in these sessions will be to your benefit as well as mine. 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 if you're confused.

Most lecture material will be recorded and uploaded to Blackboard with the notable exception of exam reviews and our AI ethics discussion.

Your feedback

I welcome your feedback at all points in the course. If something is unclear, please speak up. If you find an error in my lectures, code examples, assignments, or in anything else, please reach out to me.

Your feedback is particularly insightful for online course administration. At this point you have much more experience as a virtual student than myself and I value your perspective greatly!

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 the my behavior or the behavior 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.ccnycuny.edu/affirmativeaction>.

Course Relation to Student Outcomes

Through understanding core algorithms and seeing industrial applications of AI, students should be able to, analyze complex computing problems and apply principles of computing and other relevant disciplines to identify solutions (item 1). This understanding and viewpoint on the state of the industry in particular will be useful in their ability to communicate effectively in a variety of professional contexts (item 3). Our discussion on ethics will provide students context to make informed judgements in computing practice based on legal and ethical principles (item 4.).

Weekly Schedule of Topics to be Covered

Please note that the exact material covered on a particular lecture day will vary. While we will be sure to cover all the material, we will likely end up going faster on some topics and slower on others. Please stay up to date on Blackboard and Slack on 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	8/26/21
	AI History and Modern Trends			8/31/21
2	Rational Agents	Chapter 2	Chapter 2	9/2/21
	Labor Day - No Class			9/7/21
3	Search Foundations, Uninformed Search	Chapter 3	Chapter 3	9/9/21
	Informed Search, Relaxed Search	Chapter 4	Chapter 4	9/14/21
4	No Class			9/16/21
	Adversarial Search and Game AIs	Chapter 5	Chapter 5	9/21/21
5	Quiz 1 Review			9/23/21
	Quiz 1 Proctored			9/28/21
6	Introduction to Machine Learning	Chapter 18.1-18.2	Chapter 19.1-19.2	9/30/21
	Linear Regression and Gradient Descent	Chapter 18.4-18.6	Chapter 19.6	10/5/21
7	Multiple Linear Regression, Jobs in AI/ML	Chapter 18.6	Chapter 19.9	10/7/21
	Classification with Logistic Regression			10/12/21
8	Intro to Deep Learning - Perceptron Networks		Chapter 21	10/14/21
	Perceptron Learning	Chapter 18.7		10/19/21
9	Backpropagation Algorithm			10/21/21
	Beyond Supervised Learning	Chapter 18.8-18.9		10/26/21
10	Quiz 2 Review			11/2/21
	Quiz 2 Proctored			11/4/21
11	Intro to Natural Language Processing (NLP)	Chapter 22	Chapter 23	11/9/21
	Advanced NLP, Grammar Modeling			11/11/21
12	Dialog Agents (Personal Assistants)			11/16/21
	Computer Vision	Chapter 24	Chapter 25	11/18/21
13	Robotics	Chapter 25	Chapter 26	11/23/21
	Affective Computing		Chapter 26.8	11/25/21
14	Thanksgiving Break - No class			11/30/21
	Ethics and AI day 1	Chapter 26	Chapter 27	12/2/21
15	Ethics and AI Day 2	Chapter 26	Chapter 27	12/7/21
	Course Review, What's next in AI?	Chapter 27	Chapter 28	12/9/21
	Final Exam			12/21/21