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Topics in Artificial Intelligence

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**City College of New York
City University of New York**

CSC59974: Topics In Artificial Intelligence

Course Information

Instructor: William Hunter McNichols

Email: wmcnichols@ccny.cuny.edu

Lectures: Mondays 4:50pm - 7:20pm

Location: NAC 7/231

Course Description

The field of Artificial Intelligence (AI) has been the birthplace for many revolutionary industry trends over the last couple decades. High tech startups and big 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. Upon completion of this course, students will obtain a wider scope of understanding about the future of software technology and an intuition for how this software will work.

Prerequisite Courses/Knowledge

Students will need a fundamental understanding of data structures and programming basics. Particular emphasis on understanding of graphs and trees will be relevant. Understanding of the basics of probabilistic and statistical modeling is not necessary but will deepen understanding of course material.

- CSc 10400 Discrete Mathematical Structures
- CSc 22000 Algorithms
- CSc 21700 Probability and Statistics for Computer Science (optional)

Course Objectives & Learning Outcomes

Upon completion of this course, students should have a basic understanding of what AI is, the history of the subject, and some of the 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 how these technologies are used in modern applications. In addition, students will build an understanding of techniques and terminology used in the field of Artificial Intelligence.

To develop a deep fundamental understanding of these techniques students will be able to demonstrate a working knowledge of a handful of key algorithms. These include, but are not limited to, search algorithms (BFS, DFS, A*); clustering and classification algorithms (KNN and SVM); machine learning (Perceptron, Backpropagation); and Natural Language parsing trees.

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.

Artificial Intelligence: A Modern Approach 3rd edition

Grading Breakdown

Assignments and activities: 20%

Quiz 1: 20%

Quiz 2: 20%

Final Exam: 40%

Note: Some assignments will be given in class. Unexcused absence on the day of an assignment or test will result in an automatic 0 for the assignment.

Office Hours

TBA - Will be announced and communicated over blackboard once finalized.

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.cuny.edu/standards>

Attendance

Please **arrive promptly**. Arriving late is better than never at all, but please allow adequate time to get to campus, especially if you are arriving by public transit. If you come into class late, please quietly take your seat in the least disruptive way possible.

I will be taking attendance on each day of class. While class attendance itself is not a direct portion of your grade, we will be doing in-class assignments throughout the semester which will be a part of your grade.

If you have an unavoidable conflict (e.g. job interview, family emergency, etc.) or are ill, please let me know via email, preferably in advance. I will let you know if there are assignments for the coming week and if there is a possibility of making up credit for the assignment.

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.

Other Classroom Policies

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 will not be tolerated in the classroom.

We all come to our classroom with unique backgrounds and perspectives on the world. Sometimes the difference between these perspectives causes discomfort 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. My only request on this matter is that you do so in as a respectful and constructive way as possible. Feel free to talk to me before/after class or via email about anything on your mind related to the dynamics of the classroom or the course in general.

Cell phone usage will **not** be permitted in class. Laptop computers can be used in class for note taking only. Failure to attend a class where a Quiz or Exam is proctored will result in an automatic 0 for that assignment.

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 week 13 discussion on ethics will provide students context to make informed judgements in computing practice based on legal and ethical principles (item 4.).

(Continued on next page)

Weekly Schedule of Topics to be Covered

Please note that the exact material cover 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 on what we will be covering in the upcoming class.

Week	Topics	AI: AMA Reading Chapters
1	What is AI? History and modern trends	Chapter 1 - 2
2	Foundational search algorithms basics	Chapter 3
3	Coding chess grandmasters - Applications of search	Chapter 4 - 5
4	Probabilistic methods - Dealing with uncertainty	Chapter 13 - 14
5	Classifiers - SVMs and KNN Quiz 1 proctored	Chapter 18
6	Machine Learning pt 1- Perceptrons, backpropagation, gradient descent	Chapter 18
7	Machine learning pt 2- Deep learning and machine learning software organizations	
8	Computer Vision - understanding visual data	Chapter 24
9	Robotics - AI problems in the physical world	Chapter 25
10	Natural Language Processing foundation	Chapter 22
11	From chatbots to elections -Applications of NL Quiz 2 proctored	
12	Affective Computing	
13	Data bias and displacement - Ethical considerations in AI	
14	What's Next? - Untapped potential in AI	
15	Final Exam Week	<i>Final exam given</i>