New Jersey Institute of Technology

Digital Commons @ NJIT

Spring 2024

CS 670-002: Artificial Intelligence

Arashdeep Kaur

Follow this and additional works at: https://digitalcommons.njit.edu/cs-syllabi

CS670 - Artificial Intelligence – Spring-2024

Instructor Details: Arashdeep Kaur, Ph.D., Email: ak3257@njit.edu,

Office Hours: Friday-11:30 a.m.-12:30 p.m. or anytime by appointment, Office: GITC-4321B

Course Description

This course introduces the fundamentals of artificial intelligence. It contains a theory component about the concepts and principles that underlie modern AI algorithms, and a practice component to relate theoretical principles with practical implementation.

Course Objective

The objective of this course is to gain understanding of artificial intelligence, formalization of knowledge, reasoning under uncertainty and without it, machine learning, and its applications. The focus will be to learn about major disciplines in artificial intelligence, their fundamental differences and applicability.

Student Learning Outcomes

1	Identify the foundational concepts, theories, and historical developments in artificial intelligence.
2	Apply various search algorithms and heuristic design techniques independently to solve complex AI problems.
3	Analyze, design, and implement probabilistic models, such as Bayesian networks, for effective decision-making in uncertain environments.
4	Demonstrate proficiency in data preparation and visualization skills while effectively developing practical AI solutions to address real-world problems.
5	Apply machine learning algorithms effectively to analyze and derive insights from real-world datasets.
6	Evaluate ethical considerations and societal impacts associated with the deployment of AI technologies.
7	Critically assess emerging trends and advancements in AI research.
8	Effectively address complex AI-related problems by integrating insights from different disciplines.

Course Contents

Introduction: What is AI, agent, environment and its applications.

Problem solving by Search: principles of search, uninformed ("blind") search, informed ("heuristic") search, constraint satisfaction problems, adversarial search and games.

Knowledge representation and reasoning: rule-based representations, declarative or logical formalisms, Logic Programing and logic network.

Reasoning with Uncertainty: Uncertainty, Probabilistic Models.

Learning: Supervised learning, unsupervised learning, reinforcement learning. Generative discriminative models.

Security: AI Content Authentication

Applications: Discussion of practical cases from various domains.

Conclusions & Review: Final opinion and inference of methods discussed.

Textbook & References

- S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th edition, Prentice Hall, 2020.
- V. N. Vapnik, The Nature of Statistical Learning Theory, 2nd edition, Springer, 2000.
- Selected papers and handouts.

Grading Policy

- Assignments 30%
- Midterm exam 15%
- Project 30%
- Class participation 5%
- Final exam/ Research Paper 20%

Assignments: Assignments in this course are meticulously designed to assess various dimensions of AI knowledge. They challenge students to demonstrate theoretical understanding, critical thinking, and problem-solving skills. While assignments may involve programming tasks, the emphasis is on applying a broad range of AI concepts to real-world scenarios. Students will showcase their ability to analyze and address complex challenges, fostering a deeper understanding of both theoretical principles and practical applications.

Mid-Term Exam: The midterm exam serves as a midpoint assessment, focusing on evaluating students' grasp of theoretical understanding and problem-solving skills. It provides insights into individual understanding.

Project: The project component plays a crucial role in assessing individual proficiency in applying AI concepts to real-world scenarios. Each student will independently contribute to addressing significant AI challenges. This showcases their ability to apply learned concepts in practical contexts and highlights their individual skills in problem-solving, critical thinking, and the effective application of AI knowledge.

Class participation: Actively participating in class discussions, asking questions, and contributing insights demonstrate engagement and a deeper understanding of the material.

Final Exam/ Research paper: The **final exam** serves as a comprehensive evaluation encompassing the breadth of the course. It is meticulously crafted to assess students across multiple dimensions of artificial intelligence, ensuring a thorough examination of their knowledge, skills, and critical thinking abilities. **Research Paper** assess students ability to conduct in-depth research, critically analyze AI-related topics, and communicate findings effectively through a research paper. the final submission or publication of research paper is subject to the instructor's approval, ensuring alignment with the desired standards for scholarly work. A student have the flexibility to choose between two assessment options: a Final Exam or a Research Paper..

Guidelines & Policies

Attendance: Students are expected to attend the lectures in the section that they are registered in. Lectures are a sequence. If you skip one you will not be able to understand the lecture that follows, if you don't catch up with the one you missed. Catching up lectures is your responsibility and is done in your own time. Instructor has the right to modify the grading criteria to include attendance and class participation when necessary.

Email: Use of your NJIT email or Canvas inbox is strongly encouraged.

Grade Corrections: Check the grades in course work and report errors promptly. Please try and resolve any issue within one week of the grade notification.

Late submission: No late submissions will be allowed for homework assignments or projects or any other course related work assigned.

Exam and Proctoring Policy: See the [NJIT Online Course Exam Proctoring page](#) for information on proctoring tools and requirements.

Final Exam/ Research Paper: The final exam will cover a range of topics discussed throughout the course. Alternatively, you have the option to submit a research paper on a relevant AI topic of your choice after approval of the instructor. The research paper should demonstrate in-depth research, critical analysis, and effective communication of findings. If you choose to submit a Research Paper, you are required to be part of weekly meetings other than lectures, contact your instructor for scheduling. These meetings will provide an opportunity for guidance, feedback, and progress updates. Ensure that your research paper is submitted to a conference or journal before April 19, 2024. This is a crucial component of the assessment, and adherence to the deadline is mandatory.

- You will be graded based on the assessment option you choose. The grading criteria for the Final Exam and the Research Paper will be equivalent, ensuring fairness and equity.
- The assessment you choose (either the Final Exam or the Research Paper) will contribute to your final course grade.

Collaboration and External Resources for Assignments: Some homework problems will be challenging. You are advised to first try and solve all the problems **on your own**. For problems that persist you are welcome to talk to the course assistant or the instructor. You are also allowed to collaborate with your classmates and search for solutions online. But you should use such solutions only if you understand them completely (admitting that you don't understand something is way better than copying things you don't understand). Also make sure to give the appropriate credit and citation.

Requesting Accommodations: If you need an accommodation due to a disability please contact Scott Janz, Associate Director of the [Office of Accessibility Resources and Services](#), Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodation is required.

NJIT Services for Students, Including Technical Support: Please follow this [link](#).

Canvas Accessibility Statement: Please follow this [link](#).

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy. Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu