THE CATHOLIC UNIVERSITY OF AMERICA

College of Engineering, Physics, and Computing
Computer Science Department
AI109
Enter the World of Artificial Intelligence
3 Credits
Spring 2026

COURSE SPECIFICS

Course Description

Have you ever wondered how a computer program could beat grandmasters at chess? How can voice assistants understand your commands and even carry on conversations with you? How can cars drive themselves? What powers Facebook to predict what you will like or dislike, or decide what is fake news? How can a computer program play the stock market or diagnose diseases?

Enter the world of AI. This course will help you understand the computing principles that drive AI so that you can answer these and many other questions.

What's next? Advances in AI could soon place our society at a turning point as we entrust the management of our infrastructure, security, economy, healthcare, and social activities to AI. Such advances raise complex philosophical, ethical, and legal questions. What is AI? How does it relate to the human mind? How can we ensure that AI respects ethical principles? Who is responsible when decisions made by AI have a negative impact or cause physical harm? What can we do to reap the benefits of AI while minimizing its risks?

The course is open to all students and does not require any computational background. The expected outcome is that students will be equipped with the intellectual tools to understand the computing principles that drive AI as well as its ethical, philosophical, and legal ramifications, and overall impact on society, so that they can successfully navigate and shape the coming age of superintelligent AI.

Instructor Information

- Richard Kelley, Ph.D.
- kelleyrc@cua.edu

- Course announcements will be posted to Brightspace and may also be sent via email to your CUA email address. Questions for the instructor should be posted on Brightspace for discussion or sent directly to the instructor, as appropriate. Additional details can be found on the course webpage: https://richardkelley.io/AI109.

Class Meetings

- Wednesday, Friday
- 11:10AM - 12:25PM
- Hannan 108

Office Hours

- Pangborn 324
- Wednesday, 10am

COURSE GOALS

Objectives

In this course, students will:

- Develop a coherent mental model of what artificial intelligence is, how it differs from traditional software, and where its current capabilities and limits lie.
- Analyze classical AI approaches (search, logic, decision theory) and contrast them with modern data-driven methods.
- Gain conceptual fluency with machine learning, reinforcement learning, and large language models without assuming advanced mathematics.
- Evaluate how AI systems are trained, deployed, and aligned with human values and social constraints.
- Build literacy in AI-assisted programming as both a productivity tool and a source of new risks.

Outcomes

Successful completion of this course will enable students to:

- Explain what artificial intelligence is, how it differs from traditional software, and how its definitions have evolved across historical and technical contexts.
- Describe and analyze core computational ideas underlying AI systems, including programs, algorithms, representation, search, and decision-making.
- Compare and evaluate classical symbolic AI approaches and modern learning-based methods, identifying their strengths, limitations, and appropriate use cases.
- Explain how machine learning systems—including reinforcement learning and large language models—are trained, how they generalize, and where their failures arise.
- Apply AI-assisted programming tools to construct and modify simple programs while critically assessing their reliability, bias, and limitations.
- Critically assess the societal, ethical, and human implications of AI in domains such as robotics, warfare, labor, and human cognition, grounding arguments in technical understanding.

INSTRUCTIONAL DELIVERY

Location and Instruction Mode list and definitions are available at Enrollment Service webpage

- **Course Location:** MAIN
- **Instructional Modes:** Synchronous (S)

CONTINGENCY PLANNING

In the event that the university as a whole, or this course in particular, must shift to entirely online course delivery, the following adjustments will be made to the mode of instruction, assignments, and assessments in this course: assignments and exams will be submitted electronically and lecture and discussion will be conducted online as needed.

INSTRUCTIONAL METHODS AND COURSE REQUIREMENTS

Required Materials

There is no required textbook for the course. Readings for each week will be posted on the course website.

Recommended Materials

Recommended reading will be posted to the course website.

Class Policies

- Attendance
    - Instruction will be provided in-person in class. Attendance is required for exams and expected for lectures. If extenuating circumstances arise that prevent you from attending a lecture, let the instructor know in advance if possible.

- Technology
    - Laptops are permitted for taking notes in class. Student recording of lectures is not permitted. The instructor may record lecture audio and may make a transcription of the recording available.

- Late Assignments and Make-Up Exams

    - Late assignments will be accepted with a reduction in the maximum number of points possible for the assignment. The maximum number of points possible will be reduced by 10% of the original total per day late.
    - Barring truly exceptional circumstances, make-up exams must be scheduled with the instructor in advance. The reason for the make-up exam must be documented in order to receive credit for the exam.

- AI Use
    - Use of AI is essential in computing, but can impair learning if not used wisely. AI use will be permitted or prohibited on a per-assignment basis. All AI use should be documented by the student for each assignment. Students will be graded based on how well they use AI for assignments that permit AI use.

Grades

- Final grade will be computed based on performance on in-class quizzes, assignments, projects, and exams. These components will contribute to your final grade according to the following weights:

Component	**Weight**
Quizzes	20%
Assignments	5%
Projects	30%
Midterm Exam	20%
Final Exam	25%

- Point totals will convert to letter grades according to the following table. These intervals are closed on the left and open on the right (so earning 95% of the total possible points in the class will get an A, but (95-x)% will earn an A- for any positive value of x).

Score	**Grade**
95%	A
90%-95%	A-
87%-90%	B+
83%-87%	B

80%-83%	B-
77%-80%	C+
73%-77%	C
70%-73%	C-
66%-70%	D
0%-66%	F

- Remember: *grades in Brightspace do not necessarily forecast the final course grade, as they may not reflect outstanding assignments.*

The University grading system is available:

- Undergraduate policies on grades and academic standing
- Graduate policies on grades and academic standing

Reports of grades in courses are available at the end of each term in Cardinal Students

Assessment of Learning

List major course assignments/assessments:

- Major assignments
    - Small assignments will be given regularly to reinforce course material.
- Major projects
    - There will be 3 major projects.
- Major assessments (Mid-term)
    - There will be one midterm exam, in Week 8.
- Major assessments (Final)
    - There will be one final exam, on our university scheduled exam date of Saturday, May 9th 10:15 a.m.-12:15 p.m.

COURSE SCHEDULE AND BIBLIOGRAPHY

Course Schedule

- Week 1: Overview of AI
- Week 2: What is a Computer Program?
- Week 3: AI-Assisted Programming
- Week 4: Search Algorithms
- Week 5: Knowledge Representation
- Week 6: Optimal Decision Making
- Week 7: Reasoning and Theorem Proving
- Week 8: Midterm
- Week 9: Spring Break
- Week 10: Machine Learning
- Week 11: Large Language Model
- Week 12: Language Model Alignment
- Week 13: Computer Vision
- Week 14: Robots and Industrial AI
- Week 15: Robotics and Warfare
- Week 16: AI and Human Nature

- Final exam: Saturday, May 9th 10:15 a.m.-12:15 p.m.

Bibliography

References, supplementary readings, websites of interest
Full list can be found online at https://richardkelley.io/AI109

UNIVERSITY POLICIES

All of Catholic University's policies are detailed at Catholic University Policy Webpage.

Academic Integrity

Academic dishonesty at The Catholic University of America is not tolerated. As such, academic integrity is not merely avoiding plagiarism or cheating, but it certainly includes those things. Academic integrity means, above all else, taking responsibility for your work, your ideas, and your effort, and giving credit to others for their work, ideas, and effort. If you submit work that is not your own – whether test answers, whole papers, or something in-between – that is considered to be academic dishonesty. University procedures related to academic dishonesty are conducted with respect and dignity, while also preserving accountability, and they presuppose that all participants will treat each other with respect and dignity.

- Undergraduate Student Academic Dishonesty Policy
- Graduate Student Academic Dishonesty Policy

Grades and Academic Standing

- Undergraduate policies on grades and academic standing
- Graduate policies on grades and academic standing

University Recording Policies

- Recording Classroom Lectures Policy
- CUA Recording Policy

Accommodations for students with disabilities

- Any student who feels they may need a reasonable accommodation based on the impact of a disability should contact the Office of Disability Support Services (Office of Disability Support Services) by emailing at CUA-DSS@cua.edu