CSE 4705-001: Artificial Intelligence

Fall 2023

August 15, 2023

1 Description

This course provides a broad introduction to artificial intelligence (AI), the branch of computer science concerned with developing agents that are able to *autonomously* make inferences, decisioins, and take actions as they acquire knowledge about their surroundings in pursuit of a goal. In particular, this course teaches these fundamentals by exploring types of learning, knowledge representation, and reasoning.

2 Possible Updates to this Document

Excluding materials for purchase, syllabus information may be subject to change. The most up-to-date syllabus is located within the course in HuskyCT.

3 Instructor, TAs, Office Hours

- Instructor: Joe Johnson, joseph.2.johnson@uconn.edu
- TA_1: TBD
- TA_2: TBD
- TA_3: TBD

Resource	Day & Time	Office Hours Link
Joe Johnson	Wednesday 10:30 am - 12 pm	Joe Johnson Office Hours Room
TBD		
TBD		
TBD		

Table 1: Office Hours

4 Learning Objectives

At the end of the course, given an AI problem, students should be able to:

- Describe/define the AI problem.
- Discuss and implement algorithms for conducting search approaches to AI problems.
- Discuss important algorithms/approaches in AI research.
- Implement the principal algorithms in AI using Python.
- Discuss and implement approaches in knowledge representation.

Course Component	Grade
Homework/Programming Assignments	60%
Midterm Exam 1	15%
Final Exam	25%

Table 2: Course Components and Grade Weightings

5 Meeting Times and Location

- In-class lectures will occur Tuesday/Thursday 3:30 - 4:45 pm in Oak Hall, RM 112

- HuskyCT is the LMS for this course. Be on the lookout for assignments, announcements, and exams to be deployed using this platform.

6 Communication

The homework assignments, solutions, readings, announcements, discussion will be posted on HuskyCT. Please ensure you receive emails from HuskyCT so you get announcements. In addition, I encourage students to post and answer questions about class material and problem sets. I will also answer questions but I encourage students to try and jointly answer questions. **Do not ask or answer homework problems.**

Personal questions should be directly to my email or handled in person during office hours. I will not answer emails from Friday 6pm to Monday 9am.

7 Course Mechanics

Course Modularization: This is a 14-week course, where each week opens at 10:00 am on Monday, and ends at 11:59 pm the following Sunday. In-class lectures will occur on Tuesday and Thursday, 9:30-10:45 pm each week.

Lecture Posting: Each week, new lecture material will be posted on the HuskyCT, labeled Lecture XX – YYY, where XX corresponds to the week of the course and YYY is the title/topic for that week's lecture. Each week's materials will include a slide deck and on occasion short video segments to augment class disussions.

Homework Assignments: There will be two types of assignments - programming assignments **using Python** and written homework assignments. Assignment work must be submitted by 11:59 pm on Sunday of the week the assignment is due. Late work is not accepted.

Exams: There will be 2 exams - a midterm and a final. More details will be provided about these exams later in the semester.

Online Discussions: There will be online discussions posted during the semester. Students can post opinions/reflections to the discussion about papers assigned for reading during the week, and as part of collaboration with fellow students in a group project setting.

Grading: The grading for the course will be calculated based on Table 2 and on Table 3

Other: The last day to drop a class without a 'W' is Monday, January 30th. The last day to drop a class with a 'W' is Monday, April 10th.

8 Required Software

- Anaconda. There are many tutorials for getting acquainted with the Jupyter Notebook environment. Here are a couple of suggested ones:

  - https://www.youtube.com/watch?v=HW29067qVWk
  - https://www.datacamp.com/community/tutorials/tutorial-jupyter-notebook

Number Grade	Assigned Grade	Grade Points
93-100	A	4.0
90-92	A-	3.7
87-89	B+	3.3
83-86	B	3.0
80-82	B-	2.7
77-79	C+	2.3
73-76	C	2.0
70-72	C-	1.7
67-69	D+	1.3
63-66	D	1.0
60-62	D-	0.7
0-59	F	0.0

Table 3: Grading Scale

- Data Science, Machine Learning Python packages. There are numerous tutorials on the web for learning how to use the various packages we'll be using throughout the course. Here are a few suggested ones (but you are welcome to use others that you find helpful):

  - Pandas: https://www.datacamp.com/community/tutorials/pandas-tutorial-dataframe-python
  - Numpy: https://www.tutorialspoint.com/numpy/index.htm
  - Scipy: https://docs.scipy.org/doc/scipy/reference/tutorial/
  - Scikit-learn: https://www.datacamp.com/community/tutorials/machine-learning-python

9 Texts - Recommended, Not Required

Recommended Reference (not required): *Artificial Intelligence - A Modern Approach. 4rd Edition* Stuart Russell and Peter Norvig. 2021. Pearson. ISBN: 978-1292401133.

Recommended Reference (not required): *Introduction to Data Mining. 2nd Edition*. Pang-Ning Tan. 2018. Pearson. ISBN: 978-0133128901

Recommended Reference (not required): *Introduction to Statistical Learning*. Gareth James, Daniella Witten, Trevor Hastie, Robert Tibshirani. 2017. Springer. ISBN: 978-1071614204

Recommended Reference (not required): *Data Science Design Manual*. Steven S. Skiena. 2017. Springer. ISBN: 978-3319554433

10 Collaboration

All homework assignments must be completed individually. It is okay for you to discuss a problem with a classmate as long you abide by the following condition:

- Each student you collaborate with should be named on the homework assignment.

- You must first consider each problem on your own and generate ideas on how to solve the problem.

- You may discuss problems and ideas jointly. The goal of collaboration is to understand the high level ideas of the problem. Do not go further than this.

- You must write solutions completely on your own.

- The midterm exams and the final exam will be an individual effort.

- Do not use other resources (outside of your textbooks and collaborators) to attempt to find the problem or the solution. This includes using the internet to search for parts of the problem.

Week	Date	Topics	Reading (Ch.)	Exam	Assignment
1	08/28	Introduction to AI, Intelligent Agents	R&N: 1, 2		1: 08/28-09/10
2	09/04	Classical Search - Uninformed Search	R&N: 3		
3	09/11	Classical Search - Informed Search	R&N: 3		2: 09/11-09/24
4	09/18	Beyond Classical Search - Local Search	R&N: 4		
5	09/25	ML Overview, Univariate Linear Regression	Slides		3: 09/25-10/08
6	10/02	Multiple Regression	Slides		
7	10/09	Classification - Logistic Regression	Slides		
8	10/16	Overfitting and Regularization	Slides	**Exam 1:** 10/18-10/20	
9	10/23	Decision Trees	Slides		4: 10/23-11/05
10	10/30	Unsupervised Learning - Clustering	Slides		
11	11/06	Unsupervised Learning - Anomaly Detection	Slides		5: 11/06-11/19
12	11/13	Neural Networks - Part 1 - Another Look at Logistic Regression	Slides		
	11/20	**Thanksgiving Break - No Classes**			
13	11/27	Neural Networks - Part 2 - Shallow Neural Networks	Slides		6: 11/27-12/08
14	12/04	Neural Networks - Part 3 - Deep Neural Networks	Slides		
15	12/11	**Final Exam Week**		**Final Exam:** 12/11-12/13	

Table 4: Tentative class schedule

11   Tentative Class Schedule

Table 4 contains a tentative plan for the topics week by week. As this course is intended to serve as a kitchen sink into which we toss a whole array of topics, this list is tentative and subject to change.

12   Policies

Academic Honesty   This course expects all students to act in accordance with the Guidelines for Academic Integrity at the University of Connecticut. If you have questions about academic integrity or intellectual property, you should consult with your instructor. Additionally, consult UConn's guidelines for academic integrity.

The collaboration policy described above is designed to allow students the resources to succeed while ensuring they learn and master the material. If you are unsure if something is acceptable according to the collaboration policy, talk to me!

Violations of this policy will be considered violations of the academic integrity policy and will be reported to the Academic Integrity Hearing Board. Consequences may include (but are not limited to) failure of the class. Example violations include: not reporting collaborators, jointly writing solutions, copying or plagiarizing solutions from other sources, and cheating on the exam.

Student Conduct Code   Students are expected to conduct themselves in accordance with UConn's Student Conduct Code.

Copyright   My lectures, notes, handouts, and displays are protected by state common law and federal copyright law. They are my own original expression. Students may take notes. In addition, students will be consulted before using their solutions either with or without their name.

Students with Disabilities   The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020, or http://csd.uconn.edu/.