Artificial Intelligence
CS380

Professor:
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Teaching Assistants: (all office hours in the CLC)
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Course Overview
This course is about the theory and practice of constructing systems (machines) that can be considered intelligent. The course will strive to cover both theoretical aspects of AI and practical aspects of AI.

Course Objectives
- Describe rationality in agents
- Introduce the complexity of inference and efficient inference algorithms
- Describe different search algorithms, including uninformed and informed search, local search, and constraint satisfaction problems
- Practice programming AI representations and algorithms, and experimentally explore challenging AI problems through problem formulation and algorithm implementation
- Introduce components of and issues related to agent-based systems and multi-agent systems
- Introduce machine learning and its different techniques

Prerequisites
- CS260, minimum grade of 'C'
- CS270, minimum grade of 'C'
- A serious interest in AI
- Basic competency in computer science including data structures, algorithms, and programming. Basic competency in mathematics including proof techniques such as induction

Textbook (required)
Russel and Norvig Artificial Intelligence: A Modern Approach. (4^{th} edition)
We will follow the book fairly closely but not cover all of it. We will also cover topics not found in the textbook, with occasional supplemental material assigned.

Coursework and Grading

Grading will consist of a midterm and final exam, and programming assignments. The midterm and final exam will cover topics from the textbook, lectures, and any supplemental materials provided.

Grading breakdown:

- Midterm exam: 10%
- Final exam: 20%
- Homework: 60%
- Participation: 10%

Class participation will be determined by participation in class discussions, attendance, and in class exercises. We will frequently devote some part of the lecture periods to class exercises, during which you will be asked to do some reading, thinking, etc. in conjunction with people near you and answer questions on a Google Form. You will need to have a device capable of connecting to the internet to respond. **Extra credit opportunity: 1 point on your overall final grade: Do a short and informal presentation about something related to AI, 5 minutes max, at the start of class.**

The following scale will be used to convert points to letter grades. **Note, an A+ is never automatic in my courses:**

Points	Grade	Points	Grade	Points	Grade
Exceptional	A+	**83-86.99**	B	**70-72.99**	C-
93-100	A	**80-82.99**	B-	**67-69.99**	D+
90-92.99	A-	**77-79.99**	C+	**60-66.99**	D
87-89.99	B+	**73-76.99**	C	**0-59.99**	F

I will always round up based on standard rounding rules, an 89.51 will become an A-, an 89.49 will not. The line needs to be drawn somewhere, this is where I draw it.

Late Policy

I will adjust deadlines for the whole class as necessary, based on my observation of student effort and questions being asked over Discord, and attending office hours (mine or the TAs). Individual extensions will not be granted outside of extreme circumstances. Grade center has a column for late days allowed, you all start off with 5 of them and can use them for any of the homework assignments. Late days are used all or nothing, you cannot split them into half days. They will be applied automatically; you do not need to let me know you intend to use them. Late days cannot be applied to exams. Once you exhaust your late days, late assignments will be accepted with a 25% penalty on day 1, a 50% penalty on day 2, and will not be accepted on day 3+. No late work of any kind will be accepted once finals week starts. **Unused late days will be applied as extra credit points to the homework portion of your final grade.**

Tentative Schedule

Week 1 (Ch. 1, 2): **Introduction to AI and agents**
- Problem solving, rationality
- Types of agents

Weeks 2 & 3 (Ch. 3, 4): **Search**
- Uninformed search (BFS, DFS, Bi-Directional)
- Informed search (A*, IDA*)
- Local search (Hill climbing, GA / GP)

Week 4 (Ch. 5): **Adversarial Search / AI & Games**
- Adversarial Search
- Minimax trees
- Alpha-beta pruning
- Monte Carlo tree search

Week 5: **Midterm Exam Review & Midterm Exam**

Week 6 (Ch. 6): **Knowledge Representation**
- Constraint satisfaction problems

Weeks 7 & 8 (Ch. 17, 22): **Non-deterministic search**
- Markov Decision Processes
- Reinforcement Learning
- Note: Chapter 16 may also be useful but will not be directly covered

Weeks 9 & 10 (Ch. 18, 21 & Supplemental): **Big-data AI**
- Introduction to machine learning (Ch. 18)
- Deep learning (Ch. 21)
- Neural Networks (Ch. 21)
- Large Language Models
- Biologically-inspired AI / Distributed AI
- Neurosymbolic Computing
- If time allows, a review for the final exam

Finals week: **Final Exam**

University Policies:

This course follows university, college, and department policies, including but not limited to:

- Academic Integrity, Plagiarism, Dishonesty and Cheating Policy: https://drexel.edu/provost/policies-calendars/policies/academic-integrity
- Student Life Honesty Policy from Judicial Affairs: https://drexel.edu/studentlife/community-standards/code-of-conduct/academic-integrity-policy
- Students with Disability Statement: https://drexel.edu/disability-resources/support-accommodations/student-family-resources
- Course Add/Drop Policy: https://drexel.edu/provost/policies-calendars/policies/course-add-drop/

- Course Withdrawal Policy: https://drexel.edu/provost/policies-calendars/policies/course-coop-withdrawal/
- Drexel Student Learning Priorities: https://drexel.edu/institutionalresearch/assessment/outcomes/dslp/
- Office of Disability Resources: http://www.drexel.edu/ods/student_reg.html
- Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website at https://drexel.edu/disability-resources/support-accommodations/student-family-resources, or contact DR for more information by phone at 215.895.1401, or by email at disability@drexel.edu.

Academic Honesty Policy

Assignments / labs / exams must be completed by yourself and yourself alone unless otherwise explicitly stated. However, this is not CS172. Use your favorite search engine, stackoverflow, generative AI, etc… to look up APIs, how to use a library, how to do some specific thing in python as long as it's not the main point of the assignment. E.g. if the assignment is how to code up the A* algorithm, looking up how to do this on stackoverflow, copying and pasting that code into your submission, is **not** okay. Any sources you used, even if code was not directly copied, need to be cited. **Note:** Do not use generative AI to generate part or whole assignments. You are free to use it to learn how APIs work, get explanations for different methods, or similar use cases. **Use for generating code for your programming submissions or answers to written submissions will be considered a violation of the academic honesty policy and you will earn yourself an 'F' for this course. Any use *at all* on an exam will result in an 'F' for this course.**