UNIVERSITY *of* HOUSTON

COLLEGE OF NATURAL SCIENCES & MATHEMATICS   **HTTP://NSM.UH.EDU**

COURSE TITLE/SECTION: Fundamentals of AI (COSC 4368)/12510   *January 20, 2024*
TIME: MOWE 2:30-4p in SEC 103

FACULTY: Christoph F. Eick   **OFFICE HOURS**: MO 4-5p WE 9-10a (MS Teams)
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Course Website: COSC 4368: Fundamentals of Artificial Intelligence Programming (uh.edu)

Consult the course website for more information about COSC 4368! Use the course webpage (and not the MS Team page associated with the course) to download course information, such as lecture slides and read the news section regularly.

A.   Catalog Description

Prerequisite: COSC 2320 or COSC 2430.
Description: An overview of main topics in the field of artificial intelligence.
Topics include search techniques, reasoning with logic, planning, decision making, machine learning, and robotics.

B.   Purpose

This course introduces students to the basics of knowledge representation, problem solving, reasoning, and learning methods of artificial intelligence. Upon completion COSC 4368 students should be able to develop intelligent systems by assembling solutions to concrete computational problems; understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering and appreciate the role of problem solving, learning and reasoning in understanding human intelligence from a computational perspective. In particular students will get exposure to the following themes:

- More general themes:
  – Search algorithms
  – Probabilistic reasoning
  – Making sense out of data/data science
- AI-specific Topics:
  – Heuristic search, constraint satisfaction problems, and games
  – Learning from examples and reinforcement learning
  – Deep Learning centering on autoencoders and diffusion models
  – Evolutionary computing
  – Game theory
  – Reasoning in uncertain environments and belief networks
  – Ethics and societal aspects of AI
- Exposure to AI tools (belief networks, neural networks, support vector machines, autoencoders)

C. Course Objectives

Upon completion of this course, students

1. will know what the goals and objectives of artificial intelligence are
2. will have a basic understanding and obtain practical experience on how to build real-world intelligent systems
3. will have sound knowledge of popular classification and prediction techniques, such as artificial neural networks and support vector machines.
4. will get some exposure to "constructive AI", namely autoencoders and diffusion models.
5. will learn how to build systems that explore and act in unknown and changing environments intelligently
6. will sound knowledge of popular search algorithms and heuristic search
7. will have a basic understanding of approaches to reason in uncertain environments including Naïve Bayes, Belief Networks, and Hidden Markov Models.
8. will get some exposure to the ethical and societal problems associated with developing, deploying and using AI systems
9. will get some exposure to evolutionary computing and game theory.

D. Course Content

I. Introduction to Artificial Intelligence
II. Problem Solving, Search and Games
III. Evolutionary Computing
IV. Game Theory
V. Reinforcement Learning
VI. Supervised Learning
VII. Deep Learning
VIII. Ethical and Societal of AI Aspects
IX. Decision Making and Reasoning in Uncertain Environments
X. Planning (optional topic)

E. Course Elements

Course Delivery Mode: Face to Face but lectures will be streamed on MS Teams.
23 lectures
2 exams
1 7-week long group project
1 group homework credit presentation (groups present solutions of homework-style problems during the lecture)
3 problem sets
2 review sessions before the course exams (35 minutes each)

The group project will center on reinforcement learning; the 3 problem sets contain individual tasks which will center on:
Problem Set 1: Search
Problem Set2: Supervised Learning and Constructive AI
Problem Set3: Reasoning in Uncertain Environments and Societal and Ethical Aspects of AI

F. Lecture Attendance Policies

Lecture attendance will be taken starting January 29, 2024. Attendance counts 3% towards the overall course grade for the Spring 2024 teaching of the course. Excused Absence Policy (link can be found below) applies to missing course lectures.

G.   Textbooks

Recommended Text:
     S. Russell and P. Norvig, *Artificial Intelligence, A Modern Approach*, Fourth Edition, Prentice Hall/Allyn&Bacon, 2021.

H.   Evaluation and Grading

Exams: 47% (Midterm Exam: 21%; Final Exam: 26%)
Problem Sets (Individual Tasks, about 32%) and Group Project(about 15%): 47%
Attendance: 3%
Group Homework Credit: 3%

Translation number to letter grades:
A:100-92 A-:92-88 B+:88-84 B:84-80 B-:80-76 C+:76-71 C: 71-
66 C-:66-62 D+:62-58 D:58-54 D-:54-50 F: 50-0
Students may discuss course material and homeworks, but must take special care to discern the difference between **collaborating** in order to increase understanding of course materials and collaborating on the homework / course project itself. We encourage students to help each other understand course material to clarify the meaning of homework problems or to discuss problem-solving strategies, but it is **not** permissible for one student to help or be helped by another student in working through homework problems and in the course project. If, in discussing course materials and problems, students believe that their like-mindedness from such discussions could be construed as collaboration on their assignments, students must cite each other, briefly explaining the extent of their collaboration. Any assistance that is not given proper citation may be considered a violation of the Honor Code, and might result in obtaining a grade of F in the course, and in further prosecution.

I. Course Exams

Course exams will be paper exams which you take in a UH classroom, likely our assigned classroom. If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to the exam. Please see Student Protocols for what to do if you experience symptoms and Potential Exposure to Coronavirus for what to do if you have potentially been exposed to COVID-19. Consult the (Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons. Exams will be open books/notes paper exams, but the use of cell phones and computers is not allowed.

Moreover, if you miss a course exam for reasons that are not covered by UH Excused Absence policies (described in more detail in Section M) you will get a grade of 'F' for the missed exam.

J. Mental Health and Wellness Resources

The University of Houston has a number of resources to support students' mental health and overall wellness, including CoogsCARE and the UH Go App. UH Counseling and Psychological Services (CAPS) offers 24/7 mental health support for all students, addressing various concerns like stress, college adjustment and sadness. CAPS provides individual and couples counseling, group therapy, workshops and connections to other support services on and off-campus. For assistance visit uh.edu/caps, call 713-743-5454, or visit a Let's Talk location in-person or virtually. Let's Talk are daily, informal confidential consultations with CAPS therapists where no appointment or paperwork is needed. The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-5149 during clinic hours, Monday through Friday 8 a.m. - 4:30 p.m. to schedule an appointment. The A.D. Bruce Religion Center offers spiritual support and a variety of programs centered on well-being.

Need Support Now?

If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis support 24/7 at 713-743-5454, or the National Suicide and Crisis Lifeline: call or text 988, or chat 988lifeline.org.

K. Title IX/Sexual Misconduct

Per the UHS Sexual Misconduct Policy, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/.

L. Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with Disabilities).

M. Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

N. Recording of Class
Students may not record all or parts of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

M. Syllabus Changes
Please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through the course webpage and during the lecture.

O. Resources for Online Learning
The University of Houston is committed to student success, and provides information to optimize the online learning experience through our Power-On website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, and Blackboard; requesting a laptop through the Laptop Loaner Program; using your smartphone as a webcam; and x If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see Student Protocols for what to do if you experience symptoms and Potential Exposure to Coronavirus for what to do if you have potentially been exposed to COVID-19. Consult the (select: Undergraduate Excused Absence Policy or Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons.

P. UH Email
Please check and use your Cougarnet email for communications related to this course. You will also need your Cougarnet account to access the course MS Team and for listening to course lecture. To access this email, login to your Microsoft 365 account with your Cougarnet credentials. Your Cougarnet Account also allows you to download Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

Q. Academic Honesty Policy
High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

R. Security Escorts and Cougar Ride

UHPD continually works with the University community to make the campus a safe place to learn, work, and live. Our Security escort service is designed for the community members who have safety concerns and would like to have a Security Officer walk with them, for their safety, as they make their way across campus. Based on availability either a UHPD Security Officer or Police Officer will escort students, faculty, and staff to locations beginning and ending on campus. If you feel that you need a Security Officer to walk with you for your safety please call 713-743-3333. Arrangements may be made for special needs.

Parking and Transportation Services also offers a late-night, on-demand shuttle service called Cougar Ride that provides rides to and from all on-campus shuttle stops, as well as the MD Anderson Library, Cougar Village/Moody Towers and the UH Technology Bridge. Rides can be requested through the UH Go app. Days and hours of operation can be found at https://uh.edu/af-university-services/parking/cougar-ride/.

S. Use of AI related and Other Tools

The use of AI-related tools, such ChatGPT, is permitted in this course. However, student reports must cite all AI-related tools and other tools and documents that were used to conduct the task at hand and describe for what they were used. Not acknowledging the use of AI and related other tools in course tasks represents a serious academic honesty violation.

T. Other Helpful Links

Coogs Care**: https://uh.edu/dsa/coogscare/**
Student Health Center**: https://www.uh.edu/healthcenter/**