Course *Fundamentals of Artificial Intelligence (COSC 4368)*

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 basic 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
  - Evolutionary computing
  - Game theory
  - Reasoning in uncertain environments and belief networks
  - Ethics and societal aspects of AI
  - Planning

- **Exposure to AI tools** (belief networks, neural networks and maybe support vector machines)
**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 learn how to build systems that explore and act in unknown and changing environments intelligently
5. will sound knowledge of popular search algorithms and heuristic search
6. will have a basic understanding of approaches to reason in uncertain environments including Naïve Bayes, Belief Networks, and Hidden Markov Models.
7. will get some exposure to the ethical and societal problems associated with developing, deploying and using AI systems
8. will get some exposure to logical reasoning, planning, evolutionary computing and game theory, and deep learning.

**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. Decision Making and Reasoning in Uncertain Environments
IX. Ethical and Societal Aspects of AI
X. Logical Reasoning and Planning
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 (containing implementation tasks, and task which use AI tools)
2 review sessions before the course exams (35 minutes each)

The group project will center on reinforcement learning; the 3 Problem Sets will center on:
Problem Set 1: Search
Problem Set 2: Supervised Learning with Emphasis on Neural Networks
Problem Set 3: Probabilistic Reasoning, Belief Networks and Societal Aspects of AI

F. Lecture Attendance Policies

Lecture attendance will be taken in February, March and April 2022. Attendance counts 4% towards the overall course grade for the Spring 2022 teaching of the course. You can attend lectures F2F or remotely via MS Teams; however, you have to attend at least 3 F2F lectures in February, at least 2 F2F lectures in March and at least 3 F2F lectures in April 2020. Moreover, you have to attend online lecture for at least 60 minutes in order to count towards your attendance. Your attendance score will be computed by counting the lectures you attended F2F or via MS Teams; however, if you attended less than minimum required F2F lectures for a particular month a penalty of -4 will be assessed on your attendance score for that month.

We have 22 lectures in February(8), March(6), and April(8) 2022. Your attendance number grade (the number grade scale we use in Spring 2022 can be found in the section below) will be computed by converting your attendance score as follows:


G. Textbooks

Recommended Text:

H. Evaluation and Grading
Exams: 47% (Midterm Exam: 20%; Final Exam: 27%)
Problem Sets (Individual Tasks) and Group Project: 46%
Attendance: 4%
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

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.

Policy on grades of I (Incomplete): A grade of ‘I’ will only be given in extreme emergency situations and only if the student completed more than 2/3 of the course work.

Addendum: Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

I. Other COSC 4368 Practices, Policies and Guidelines
a. Please download course material from the course webpage: COSC 4368: Fundamentals of Artificial Intelligence Programming (uh.edu)
b. Regularly, check the News Section of the Course Website!
c. Missing of Exams: The UH Undergraduate Leave of Absence Policy (see also below) applies to missing course exams; if you miss course exams for reasons not listed in the policy or do not follow the proper procedure to be excused from taking the exam outlined in this policy, you will be given a grade of ‘F’ for the exam.
d. The MS Teams page 4368-Class will play a key role for teaching this course. Feel free to use chat to discuss 4368-matters.
e. However, if you have personal matters to discuss, do not use MS Teams chat but rather e-mail to discuss those matters with the course TAs and/or Dr. Eick.
f. Academic honesty will be strictly enforced; in particular
   o Collaboration with other students with respect to the individual problem set tasks is strictly prohibited.
   o Using material that has been found on the internet and presenting it as your own work without proper referencing the source of the used material represents a serious academic honesty violation.

Honesty violations will be immediately reported to the Computer Science Department, and academic honesty trial will be scheduled for offenders who already have an academic honesty violation before.

J. More UH and Course Guidelines and Policies

Face Covering Policy
To reduce the spread of COVID-19, the University strongly encourages everyone (vaccinated or not) to wear face coverings indoors on campus including classrooms for both faculty and students.

Presence in Class
Your presence in class each session means that you:
   o Are NOT exhibiting any Coronavirus Symptoms that makes you think that you may have COVID-19
   o Have NOT tested positive or been diagnosed for COVID-19
   o Have NOT knowingly been exposed to someone with COVID-19 or suspected/presumed COVID-19

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.

Students are encouraged to visit the University’s COVID-19 website for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations
Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent vaccine information, consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.
Reasonable 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).

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.

Recording of Class
Students may not record all or part 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.

Syllabus Changes
Due to the changing nature of the COVID-19 pandemic, 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 (specify how students will be notified of changes).

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 downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email
Please check and use your Cougarnet email for communications related to this course. To access this email, login to your Microsoft 365 account with your Cougarnet credentials.

Webcams
Access to a webcam is required for students participating remotely in this course. Webcams must be turned on (state when webcams are required to be on and the academic basis for requiring them to be on). (Example: Webcams must be turned on during exams to ensure the academic integrity of exam administration.)

Honor Code Statement
Students may be asked to sign an honor code statement as part of their submission of any graded work including but not limited to projects, quizzes, and exams: “I understand and agree to abide by the provisions in the (select: University of Houston Undergraduate Academic Honesty Policy, University of Houston Graduate Academic Honesty Policy). I understand that academic honesty is taken very seriously and, in the cases of violations, penalties may include suspension or expulsion from the University of Houston.”

Helpful Information

Coogs Care: https://www.uh.edu/dsaes/coogscare/

Student Health Center: https://www.uh.edu/healthcenter/