COMP SCI 540 section 010

Introduction to Artificial Intelligence

COURSE INFORMATION

Introduction to Artificial Intelligence

COMP SCI 540 010 (3 Credits)
2022 Summer [1226]

Description

Principles of knowledge-based search techniques, automatic deduction, knowledge representation using predicate logic, machine learning, probabilistic reasoning. Applications in tasks such as problem solving, data mining, game playing, natural language understanding, computer vision, speech recognition, and robotics. Enroll Info: None

Prerequisite(s)

(COMP SCI 300, 320 or 367) and (MATH 211, 217, 221, or 275) or graduate/professional standing or declared in the Capstone Certificate in Computer Sciences for Professionals

Breadths

N - Natural Science

Instruction Mode

Classroom Instruction

Section Level Com B

False

Department: Computer Sciences
College: Letters and Science

2022 Summer [1226]

Term Start Date: Monday, 16-May-2022 **Term End Date:** Thursday, 15-Sep-2022

ADD TO CALENDAR

Location and Schedule: OFF CAMPUS M 5:30 PM-8:30 PM
CRN: 493061226

How Credit Hours are Met:

How Credit Hours are Met

The credit standard for this course is met by an expectation of a total of 135 hours of student engagement with the courses learning activities (45 hours per credit), which include regularly scheduled instructor: student meeting times

[insert meeting time expectations], reading, writing, problem sets, studio time, labs, field trips, and other student work as described in the syllabus.

Regular and Substantive Student-Instructor Interaction:

- Participation in regularly scheduled learning sessions (where there is an opportunity for direct interaction between the student and the qualied instructor).
- Provide personalized comments (in any medium) for an individual student's assignment or exam.
- Actively facilitate an online discussion.
- Instructor posts announcements, email, or social media check-ins about academic aspects of the class.
- Provide an overview video to accompany recorded lectures.
- Identify students struggling to reach mastery through observation of discussion activity, assessment completion, or even user activity and offer additional opportunities for interaction.
- Use of small working/study groups that are moderated by the instructor.

Other Course Information:

None.

INSTRUCTORS AND TEACHING ASSISTANTS (TAs)

Instructor

Young Wu
YW@CS.WISC.EDU

Instructor Availability and Preferred Contact:

Wednesdays from 5:30 to 8:30 pm in Dune.

TA Availability and Preferred Contact :

Thursdays from 5:30 to 8:30 pm on Zoom.

COURSE OUTCOMES, GRADING, and OTHER COURSE MATERIALS

Course Learning Outcomes (CLOs):

(Uninformed Search Methods) Identify the formulation of search for problem solving tasks. Understand important concepts in uninformed search. Apply the search methods on the formulated search problem.

- (Informed Search Methods) Understand important concepts in informed search. Differentiate from uninformed search. Solve the formulated search problem with the informed search method A*.

- (Local Search Methods) Identify the formulation of search for problem solving tasks. Apply the hill climbing method for local search problems. Identify and summarize the important features of the simulated annealing and genetic algorithms.

- (Game Playing) Recall the concept of games. Perform the minimax game playing method on formulated game tasks. Apply alpha-beta pruning to speed up the minimax method.

- (Unsupervised and Supervised Learning) Identify and summarize important features about supervised learning and unsupervised learning. Differentiate between the two types of tasks.

- (Classic Learning Methods) Apply linear regression, hierarchical agglomerative clustering algorithm, k-means clustering, or K nearest neighbor algorithm on given problem instances. Judge if the method is appropriate for a given task.

- (Neural Networks and Deep Learning) Apply Perceptron learning rule on given problem instances. Implement neural networks using given software packages.

- (Reinforcement Learning) Understand the concepts of reinforcement learning. Identify and summarize its important features. Compute value function and Q function. Apply value iteration and Q learning on given problems.

- Remember algorithms including logistic regression, perceptron, neural network, convolutional network, support vector machine, k-nearest neighbors, decision tree, naïve Bayes, Bayesian network, hierarchical clustering, principal component analysis, uninformed search, informed search, hill climbing, simulated annealing, genetic algorithms, minimax game, and alpha-beta pruning.

- Understand the mathematics and statistics behind algorithms listed in Course Learning Outcome 1.

- Apply the algorithms listed in Course Learning Outcome 1 to specific problems in fields including computer vision, natural language processing, robotics and game theory.

- Analyze the applicability and efficiency of the algorithms listed in Course Learning Outcome 1 for specific problems in fields including computer vision, natural language processing, robotics and game theory.

- Evaluate the correctness and efficiency of the algorithms listed in Course Learning Outcome 1.

- Create and design simple modifications and improvements of prototype of the algorithms listed in Course Learning Outcome 1.

Grading:

In-class Quizzes (1% each week x 10 weeks)
Math Homework (1% each week x 10 weeks)
Group Discussions (1% each week x 10 weeks)
Programming Homework (4% each week x 10 weeks)
Midterm Exam (15%)
Final Exam (15%)

Conversion between percentage grade to letter grade:
90 - 100 : A
85 - 89 : AB
80 - 84 : B
75 - 79 : BC
70 - 74 : C
60 - 69 : D
0 - 59 : F

Midterm and final exam grades will be curved by dropping the questions which significant proportion of the students cannot answer correctly. The students who answered those correctly keep the points as bonus points.
Quiz and homework grades will not be curved.
The final grade will not be curved.

Attendance and participation is part of the grading through the weekly quizzes during the lectures.

Course Website, Learning Management System and Digital Instructional Tools:

Course website: https://pages.cs.wisc.edu/~yw/CS540S22E.html

Canvas, Zoom will be used in the course.

Discussion Sessions:

There are no discussion sessions.

Laboratory Sessions:

There are no lab sessions.

Required Textbook, Software, & Other Course Materials:

Optional textbooks: (SS) Understanding Machine Learning: From Theory to Algorithms by Shai Shalev-Schwartz and Shai Ben-David and (RN) Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.

Required software tools: Java or Python.

Homework & Other Assignments:

Rules for homework:
Students must be present either in person or on Zoom during the lectures to participate in the quizzes.
Students cannot submit code written by other students or the course staff, or found online as part of their programming homework without proper attribution.
Students cannot submit output produced by other students as part of their programming homework.

Quizzes are submitted through Socrative.
Math homework and programming homework are submitted on the course website.

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

Exams, Quizzes, Papers & Other Major Graded Work:

Math homework and Programming homework are due the Monday after they are assigned, but can be submitted without penalty one week after the due date.

The midterm exam is on July 11, in-class, open book, with the alternative date July 13.
The final exam is on August 22, in-class, non-cumulative, open book, with the alternative date August 24.

ADDITIONAL COURSE INFORMATION AND ACADEMIC POLICIES

Teaching & Learning Data Transparency Statement

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported digital tools used to support teaching and learning, to help support success through learning analytics, and to enable proctoring capabilities. View the university's full teaching and learning data transparency statement.

Privacy of Student Records & the Use of Audio Recorded Lectures Statement

View more information about FERPA.

Lecture materials and recordings for this course are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability who has an approved accommodation that includes recording. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities, with the exception of sharing copies of your personal notes as a notetaker through the McBurney Disability Resource Center. Students are otherwise prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

How to Succeed in This Course

Resource links to other campus services:

- University Health Services
- Undergraduate Academic Advising and Career Services
- Office of the Registrar
- Office of Student Financial Aid
- Dean of Students Office
- Graduate Student Services

Course Evaluations

Students will be provided with an opportunity to evaluate this course and your learning experience. Student participation is an integral component of this course, and your confidential feedback is important to me. I strongly encourage you to participate in the course evaluation.

Digital Course Evaluation (AEFIS)

UW-Madison uses a digital course evaluation survey tool called AEFIS. In most instances, you will receive an official email two weeks prior to the end of the semester, notifying you that your course evaluation is available. In the email you will receive a link to log into the course evaluation with your NetID. Evaluations are anonymous. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

Students' Rules, Rights & Responsibilities

Rights & Responsibilities

For spring 2022, instructors and students should consult the following website for current campus health and safety guidance: covidresponse.wisc.edu.

Diversity & Inclusion Statement

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Academic Integrity Statement

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

Accommodations for Students with Disabilities

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (UW-855) require the university to provide reasonable accommodations to students with disabilities to access and participate in its academic programs and educational services. Faculty and students share responsibility in the accommodation process. Students are expected to inform faculty of their need for instructional accommodations during the beginning of the semester, or as soon as possible after being approved for accommodations. Faculty, will work either directly with the student or in coordination with the McBurney Center to provide reasonable instructional and course-related accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: McBurney Disability Resource Center)

Academic Calendar & Religious Observances

Academic Calendar & Religious Observances