COMP SCI 540 section 001 Syllabus

Introduction to Artificial Intelligence

COURSE INFORMATION

Introduction to Artificial Intelligence

COMP SCI 540 001 (3 Credits)

2021 Fall [1222]

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

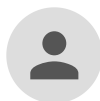### Breadths

N - Natural Science

Instruction Mode

Classroom Instruction

Section Level Com B

False

Department: Computer Sciences

College: Letters and Science

2021 Fall [1222]

Term Start Date: Monday, 23-Aug-2021 **Term End Date:** Tuesday, 1-Feb-2022

Location and Schedule:

CRN: 144541222

How Credit Hours are Met :

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This class meets for two 75-minute class periods each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 3 hours out of classroom for every class period.

Course format: The regular lecture time slots are Tuesday and Thursday 11:00AM - 12:15PM CT.

Each lecture will be a series of short mini-lectures. The lecture will be divided into three blocks. In each block, the instructor will cover some content, and then deliver short quiz questions to clear up any confusion before proceeding to the next block. We would like, whenever possible, all students to participate in the quiz. We also plan to record the

lecture and make it available afterwards to watch asynchronously outside of the lecture time. The students can ask questions anytime during the lecture and can post questions on Piazza after class.

INSTRUCTORS AND TEACHING ASSISTANTS (TAs)

Instructors

YINGYU LIANG
✉ YLIANG@CS.WISC.EDU

Andrew Wang
✉ AZWANG3@WISC.EDU

Ziyi Zhang
✉ ZIYI.ZHANG2@WISC.EDU

Wenxuan Zhao
✉ WZHAO78@WISC.EDU

Instructor Availability and Preferred Contact :

Instructors / TAs / peer mentors will hold office hours in-person or online. See the course webpage for details: https://pages.cs.wisc.edu/~yliang/courses/cs540_spring21/index.html

TA Availability and Preferred Contact :

Instructors / TAs / peer mentors will hold office hours in-person or online. See the course webpage for details: https://pages.cs.wisc.edu/~yliang/courses/cs540_spring21/index.html

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.

C1-1

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

C1-2

(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.

C1-3

(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.

C1-4

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

C1-5

(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.

C1-6

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

C1-7

(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.

C1-8

Understand and be able to apply the foundational tools in machine learning & AI: linear algebra, probability, logic, and elements of statistics.

S8346

Understand core techniques in natural language processing (NLP), including bag-of-words, tf-idf, n-gram models, and smoothing.

S8347

Understand the basics of machine learning. Identify and summarize important features in supervised learning and unsupervised learning.

S8348

Distinguish between regression and classification. Understand basic algorithms: linear regression, k-nearest neighbors, and naive Bayes.

S8349

Understand the fundamentals of game theory, how to formulate and solve several types of search problems, and basic elements of reinforcement learning

S8350

Consider how AI & ML problems are applied in real-world settings and the ethics of AI.

S8351

Grading :

The following weights are used:

- Midterm Exam: about 15%
- Final Exam: about 15%
- Homework Assignments: about 70%

At the end of the semester, the final letter grades are given based on an approximate curve. The weights placed on the assignments will be strictly enforced.

The final letter grade will be assigned based on the percentile of the averaged points in the class:

- A: Top 15-25% of course grades
- AB: next 15-25%
- B: next 0-20%
- BC: next 0-20%
- C: next 0-20%
- D/F: next 0-5%

As student performance may vary from semester to semester, the instructors reserve the right to adjust this distribution. McBurney Center students should contact the instructors to specify any special requests for the exams or homework assignments together with the supporting documentation provided by the McBurney Center. We will do our best to accommodate the requests.

Course Website, Learning Management System and Digital Instructional Tools :

All details are available on the course website: http://pages.cs.wisc.edu/~yliang/courses/cs540_fall21/index.html

Discussion Sessions :

We will use Piazza for discussions. Please follow these rules:

- Please check if someone has posted the same / similar question before you; it's much easier if we build on the thread.
- Use an informative "Summary" line to help others.

Required Textbook, Software, & Other Course Materials :

The textbook is optional: Artificial Intelligence: A Modern Approach (4th edition). Stuart Russell and Peter Norvig. Pearson, 2020. ISBN 978-0134610993.

Homework & Other Assignments :

Homework assignments include written problems and programming (in Python).

Frequently-asked questions (FAQs) on homework assignments will be posted on Piazza.

Homework is always due the minute before class starts on the due date. Late submissions will not be accepted. Assignment grading questions must be raised with the TAs within 72 hours after it is returned. Note that a regrading request for a part of a homework question may trigger the grader to regrade the entire homework and could potentially take points off. Regrading will be done on the original submitted work, no changes allowed.

The TWO lowest homework scores are dropped from the final homework average calculation. This drop is meant for emergency usage. Additional drops, late days, or homework extensions will not be provided. We encourage you to use a study group for doing your homework. Students are expected to help each other out, and if desired, form ad-hoc homework groups. However, each student must produce and turn in their own, unique work.

Potential updates on the policy will be posted on the course website.

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

Exams, Quizzes, Papers & Other Major Graded Work :

There will be a midterm exam and a final exam. The form of the exams will be determined (online or in-person). Please plan for exams at these times and let us know about any exam conflicts during the first two weeks of the semester. If an emergency arises that conflicts with the exam times, email us as soon as possible. Emergency exam conflicts will be handled on a case-by-case basis.

Exam grading questions must be raised with the instructor within 72 hours after it is returned. If a regrade request is submitted for a part of a question on the exam, the grader reserves the right to regrade the entire exam and could potentially take points off.

Potential updates on the policy will be posted on the course website.

ADDITIONAL COURSE INFORMATION AND ACADEMIC POLICIES

Privacy of Student Information & Digital Tools: Teaching & Learning Analytics & Proctoring 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. UW-Madison takes necessary steps to ensure that the providers of such tools prioritize proper handling of sensitive data in alignment with FERPA, industry standards and best practices.

Under the Family Educational Rights and Privacy Act (FERPA – which protects the privacy of student education records), student consent is not required for the university to share with school officials those student education records necessary for carrying out those university functions in which they have legitimate educationl interest. 34 CFR 99.31(a)(1)(i)(B). FERPA specifically allows universities to designate vendors such as digital tool providers as school officials, and accordingly to share with them personally identifiable information from student education records if they perform appropriate services for the university and are subject to all applicable requirements governing the use, disclosure and protection of student data.

Privacy of Student Records & the Use of Audio Recorded Lectures

See information about privacy of student records and the usage of audio-recorded lectures.

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 requiring accommodation. [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. Students are also 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

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 fall 2021, 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 [me] 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

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