INTRODUCTION TO ARTIFICIAL INTELLIGENCE SPRING 2021

CS 486 / CS 686 / CS 486

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CLASS SCHEDULE

Section	Location	Time	Instructor(s)
CS 486 / CS 686 041			Alice Gao
CS 486 / CS 686 042	No Location or Online		alice.gao@uwaterloo.ca
CS 486 / CS 686 043			
			This table is generated automatically

INSTRUCTOR / TA INFORMATION

Dr. Alice Gao is the only instructor of CS 486/686. The best way to reach Alice is through a Piazza post and NOT through email. Another good way to reach Alice is to attend one of her regular office hours on MS Teams.

If you have sensitive information in your question, please make a private Piazza post to describe the question without the sensitive information and then send a follow-up email referencing the Piazza post number.

For this term, we have the following TAs working on this course.

- Deshmukh, Anup Anand (aa2deshm)
- Hasrati, Niki (nhasrati)
- Li, Wanxin (w328li)
- Li, Xinda (x556li)
- Ogueji, Kelechi (kjogueji)
- Pacheco, Paulo (ppacheco)
- Xin, Ji (j9xin)
- Zhang, Dake (d346zhan)
- Jung, Josh (j35jung)
- Ward, Ethan (e7ward)

COURSE DESCRIPTION

> *Calendar Description for CS 486*

Goals and methods of artificial intelligence. Methods of general problem solving. Knowledge representation and reasoning. Planning. Reasoning about uncertainty. Machine learning. Multi-agent systems. Natural language processing.

Prereq: CS 341; Computer Science and BMath (Data Science) students only. Coreq: STAT 206 or 231 or 241.

Calendar Description for CS 686

Goals and methods of artificial intelligence. Methods of general problem solving. Introduction to mathematical logic Mechanical theorem proving. Game playing. Natural language processing. Preference will be given to CS graduate students. All others require approval from the department. Department approval will be by Undergraduate Advisor.

Calendar Description for CS 486

Goals and methods of artificial intelligence. Methods of general problem solving. Knowledge representation and reasoning. Planning. Reasoning about uncertainty. Machine learning. Multi-agent systems. Natural language processing.

Prereq: CS 341; Computer Science and BMath (Data Science) students only. Coreq: STAT 206 or 231 or 241.

LEARNING OUTCOMES

By the end of this course students should be able to:

Describe AI algorithms at a high level.
Describe the properties of AI algorithms.
Trace the execution of AI algorithms.
Implement AI algorithms to solve real world problems.
Explain a piece of research in an area of AI.

TENTATIVE COURSE SCHEDULE

For this term, the course is online. We will run the course using the following platforms: Learn, Marmoset, Crowdmark, Piazza, and MS Teams.

- You can find all **the course materials on Learn**. This includes lecture videos, subtitles, and transcripts, lecture notes. You can also find the lecture quizzes, assignment dropboxes, project dropboxes.
- For **communication**, we will use **Piazza and MS Teams**. We will use Piazza for making regular announcements. Alice and TAs will use MS Teams to hold live office hours.
- Assignment instructions will be posted on Learn. You must submit the written part to Learn Dropboxes and the programming part to Marmoset.
- Tests will be on Crowdmark. Tests will consist of long answer questions and will be hand marked.

TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
Artificial Intelligence: A Modern Approach by Russel and Norvig		No
Artificial Intelligence: Foundations of Computational Agents by Poole and Mackworth	Available in html format online	No

The lecture videos and slides will follow both textbooks. The lecture slides will describe the relevant readings for each lecture. Whenever possible, the lecture module on Learn will include the relevant readings for the next lecture.

STUDENT ASSESSMENT

CS 486 Tests Only

Component	Value
Tests	50%
Assignments	40%
Lecture Quizzes	10%

If a CS 486 student decides to not work on the course project, the student will be marked using this grading scheme, where the tests are worth 50% of their final grade.

CS 486 Tests and Project

Component	Value
Tests	40%
Assignments	40%
Lecture Quizzes	10%
Project	10%

If a CS 486 student completes the optional course project, the student will be marked using the better one of the two CS 486 grading schemes. In other words, if the student's project mark is greater than their test mark, then the project is worth 10% and the tests are worth 40% of their final grade.

CS 686 Standard

Component	Value
Project	40%

Component	Value
Assignments	40%
Tests	20%

TO PASS CS 486, A CS 486 STUDENT MUST OBTAIN AT LEAST 50% ON THE TEST COMPONENT, AND COMPLETE AT LEAST 20 OUT OF THE 24 LECTURE QUIZZES.

Completing a lecture quiz means submitting at least one attempt of the quiz.

If a CS 486 student fails the test component or does not complete 20 of the 24 lecture quizzes, the student's final grade will be the minimum of 46% and the actual final mark that the student earned in the course.

TO PASS CS 686, A STUDENT MUST OBTAIN AT LEAST 50% ON THE PROJECT COMPONENT.

If a CS 686 student fails the project component, the student's final grade will be the minimum of 46% and the actual final mark that the student earned in the course.

ACADEMIC INTEGRITY STATEMENT:

When submitting any assessment, a student must declare that they have read and understood the academic integrity statement below.

I declare that the following academic integrity statements to be true.

- The work I submit here is entirely my own.
- I have not shared and will not share any of my code with anyone at any point.
- I have not posted and will not post my code on any public or private forum or website.
- I have not discussed and will not discuss the contents of this assessment with anyone at any point.
- I have not posted and will not post the contents of this assessment and its solutions on any public or private forum or website.
- I will not search for assessment solutions online.
- I am aware that misconduct related to assessments can result in significant penalties, possibly including failure in the course and suspension (this is covered in Policy 71: https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71).

Failure to accept the integrity statement above will result in your assessment not being graded.

MOSS (Measure of Software Similarities) is used in this course as a means of comparing students' assessment solutions in order to support academic integrity.

ASSIGNMENTS

There will be four assignments. The assignments are worth 40% of a student's final mark. The assignments are weighted equally.

Each assignment is available for roughly three weeks. The assignments are to be completed individually. No late assignment is accepted.

The assignment instructions will be posted on Learn. For any written questions, students must make their submissions to the Dropboxes on Learn. For any programming questions, students must make their submissions on Marmoset.

Each assignment typically consists of two questions. Typically, the first one is a written question, and the second one involves significant programming. The programming question is in Python.

One or two TAs will be responsible for each assignment. They will hold office hours and mark the submissions.

Collaboration Policy: The work you hand in must be your own. Unless specified otherwise, you can always use any result from the textbook, notes, or previous assignment just by citing it. You may discuss the assignment questions verbally with others, but you should come away from these discussions with no written or electronic records, and you must acknowledge the discussion. Acknowledge any sources you have used. Any assistance received (from human or nonhuman sources) that is not given a proper citation may violate the university policies.

Assignment 1:

- Available on Thursday, May 20.
- Due at 11:59 pm ET on Wednesday, June 9.

Assignment 2:

- Available on Thursday, June 10.
- Due at 11:59 pm ET on Wednesday, June 30.

Assignment 3:

- Available on Thursday, July 1.
- Due at 11:59 pm ET on Wednesday, July 21.

Assignment 4:

- Available on Thursday, July 22.
- Due at 11:59 pm ET on Thursday, August 5, with a no-penalty extension to 11:59 pm ET on Wednesday, August 11.

TESTS

There will be three tests on Crowdmark. Each test becomes available at 11:59 PM ET on Tuesdays and is due at 11:59 pm ET on Wednesdays. You must complete each test within two hours.

A CS 486 student must pass the test component to pass the course.

The tests must be completed individually. Each test is open-book. You may consult any material that you can find.

Each test may contain true/false, multiple-choice, short-answer, and long-answer questions. The tests will be marked by hand.

The three tests are weighted equally. The weight of the tests in a student's final grade is explained below.

- If a CS 486 student does not complete the project, the tests are worth 50% of the student's final grade. If a CS 486 student completes the project and their project grade is greater than their test grade, the tests are worth 40% of the student's final grade.
- For a CS 686 student, the tests are worth 20% of the student's final grade.

Test 1:

- Available at 11:59 pm ET on Tuesday, June 15.
- Due at 11:59 pm ET on Wednesday, June 16.
- Test 1 covers lectures 1-9.

Test 2:

- Available at 11:59 pm ET on Tuesday, July 6.
- Due at 11:59 pm ET on Wednesday, July 7.
- Test 2 covers lectures 1-15 with an emphasis on lectures 10-15.

Test 3:

- Available at 11:59 pm ET on Tuesday, August 3.
- Due at 11:59 pm ET on Wednesday, August 4.
- Test 3 covers lectures 1-24 with an emphasis on lectures 16-24.

PROJECT

Requirements: Every CS 686 student is required to complete a course project individually.

A CS 686 student must pass the project component to pass the course.

Any CS 486 student has an option to complete a course project in a group of three students. If a CS 486 student achieves a higher mark in the course project than in the tests, the project will be worth 10%, and the tests will be worth 40% of their final grade.

Deadlines: There are two deliverables for the project. The two deliverables are weighted equally. The deliverables are due at 11:59 PM ET on Fridays.

No late project report submission is accepted. A student must submit all the deliverables to receive a final mark on the project. Students must make their submissions to the Dropboxes on Learn.

The details about the deliverables are as follows.

Project Proposal:

- Due at 11:59 PM ET on Friday, June 11.

Project Final Report:

- Due at 11:59 PM ET on Friday, August 13.

LECTURE QUIZZES

The purpose of the lecture quizzes is for you to test your understanding of the lecture materials in a low-stress way.

There is one lecture quiz for each of the twenty-four lectures. Each lecture quiz is available at 9 AM ET on Mondays or Wednesdays and due 48 hours after its release time. Students must complete the lecture quizzes individually.

For CS 486 students, the lecture quizzes are worth 10% of the student's final grade. For CS 686 students, the lecture quizzes are optional.

A CS 486 student must complete at least 20 out of the 24 lecture quizzes to pass the course. Completing a lecture quiz means submitting at least one attempt of the quiz.

The lecture quizzes are weighted equally. **We will drop the four lowest lecture quiz marks.**

Lecture quizzes may consist of true/false, multiple-choice, and short-answer questions. Learn will automatically mark true/false and multiple-choice questions for correctness and mark the short-answer questions for completion. You will get a mark for a short-answer question as long as your answer is not empty.

There is no time limit for each lecture quiz. A student has up to three attempts for each lecture quiz. The final mark will be the highest mark out of the three attempts. After each attempt, you can see the questions that you answered incorrectly in the submission view. After the due date of each lecture quiz, you can see all the questions and all their sample solutions in the submission view.

REMARK REQUESTS:

Assignments, Tests, Project: Once the marks are released, you have one week to submit a remark request. Follow the instructions on Piazza to submit a remark request.

Lecture Quizzes: We do not accept remark requests for lecture quizzes. Remember that you have three attempts for each lecture quiz, and the four lowest lecture quiz marks will be dropped. If you have any questions about the lecture quizzes, please let us know via Piazza.

ASSIGNMENT SCREENING

Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course. See Administrative Policy below for more information and links.

ADMINISTRATIVE POLICY

Piazza

Alice will use Piazza to make regular announcements throughout the term. **Each student is required to check Piazza at least once a day.**

The FAQ post on Piazza contains links to all the important Piazza posts.

Office hours

Alice will host office hours from **3:30 pm to 4:30 pm ET on Mondays and Wednesdays** on MS Teams. **Alice's first office hour will be at 3:30 pm ET on Monday, May 17.**

If you would like to meet with Alice but the regular office hour does not work for you, please schedule an appointment with Alice by making a private Piazza post.

For each assignment, the TAs will schedule and host office hours on MS Teams.

There will be a team on MS Teams for our course. The instructor, the TAs, and all of the students will be members of this team. You will be enrolled in this team automatically. If you are not receiving the invites for office hours, please post a private message on Piazza.

In this team, we will create several channels, one for the instructor, and one for each of the TAs. Each person's office hours will be scheduled as a meeting in the respective channel.

Alice's office hours will start with a Q&A format. When you join the meeting, please type a message in the chat to indicate that you have a question. Alice will use the chat messages to determine the order in which she will answer the questions. If you have a question and wish to discuss it with Alice privately, please also indicate this in the chat. Once Alice runs out of questions during this Q&A period, she will switch to the private portion of her office hours. During private office hours, Alice will look through the chat messages and call the students individually to talk with them privately.

When you join the Q&A portion of Alice's office hour, please mute your microphone unless you are speaking. It is up to you whether you want to turn on your video or not.

Here are some instructions on how to use MS Teams.

1. You can log in MS Teams using a browser (https://teams.microsoft.com/ (https://teams.microsoft.com/)) or by downloading the mobile or desktop app (https://www.microsoft.com/en-ca/microsoft-365/microsoft-teams/group-chat-software (https://www.microsoft.com/en-ca/microsoft-365/microsoft-teams/group-chat-software)). If using a browser, please try Chrome as Safari might have audio issues.
2. Log into MS teams using your userid@uwaterloo.ca (https://mailto:userid@uwaterloo.ca/) (not your friendly address of firstname.lastname@uwaterloo.ca (https://mailto:firstname.lastname@uwaterloo.ca/)). After this, you should be taken to UW's authentication site.
3. Log in using your UW credential. The site will then take you to MS Teams.

If you are having trouble logging into MS Teams, IST has created a Wiki for some common troubleshooting issues (e.g., installing MS Teams, audio issues, etc (https://wiki.uwaterloo.ca/display/CEESKB/Microsoft+Teams) . or if you are getting a third party cookies error (https://wiki.uwaterloo.ca/display/ISTKB/Third-party+cookies+error+when+accessing+Teams+online)). If you have any other issues logging into MS Teams, then you can email IST at helpdesk@uwaterloo.ca (https://mailto:helpdesk@uwaterloo.ca/) or phone/live chat (https://uwaterloo.ca/information-systems-technology/services/ist-service-desks) with them.

Mental Health Support:

The Faculty of Math encourages students to seek out mental health support if needed.

On-campus Resources:

- Campus Wellness https://uwaterloo.ca/campus-wellness/ (https://uwaterloo.ca/campus-wellness/)
- Counselling Services: counselling.services@uwaterloo.ca/ (mailto:counselling.services@uwaterloo.ca/) 519-888-4567 ext 32655
- MATES: one-to-one peer support program offered by the Federation of Students (FEDS) and Counselling Services: mates@uwaterloo.ca (mailto:mates@uwaterloo.ca)
- Health Services: located across the creek from the Student Life Centre, 519-888-4096.

Off-campus Resources:

- Good2Talk (24/7): Free confidential helpline for post-secondary students. Phone: 1-866-925-5454
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: a set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Diversity:

It is our intent that students from all diverse backgrounds and perspectives be well served by this course and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

- We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.
- We will honour your religious holidays and celebrations. Please inform of us these at the start of the course.
- We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity (https://uwaterloo.ca/academic-integrity/) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check the Office of Academic Integrity (https://uwaterloo.ca/academic-integrity/) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) . For typical penalties, check Guidelines for the Assessment of Penalties (https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) .

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (other than a petition) or Policy 71, Student Discipline (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72, Student Appeals (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) .

Note for students with disabilities: AccessAbility Services (https://uwaterloo.ca/disability-services/) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S.

server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.