INTRODUCTION TO ARTIFICIAL INTELLIGENCE WINTER 2021

CS 486 / CS 686

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CLASS SCHEDULE

Section	Location	Time	Instructor(s)
CS 486 / CS 686 041	No Location or Online		Alice Gao alice.gao@uwaterloo.ca
CS 486 / CS 686 042			
			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 7 TAs working on this course.

- Wanxin Li (w328li)
- Xinda Li (x556li)
- Alister Liao (z6liao)
- Paulo Pacheco (ppacheco)
- Charupriya Sharma (c9sharma)
- Blake Vanberlo (bvanberl)
- Ethan Ward (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.

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 three platforms: Learn, Piazza, and MS Teams.

Learn:

We will use Learn for posting course materials, submitting assignments and projects, completing quizzes and surveys, and recording marks.

Piazza:

We will use Piazza for making regular announcements, searching for teammates, question answering and discussions.

MS Teams.

We will use MS Teams for Alice's and TAs' office hours.

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 NOT to work on the 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%
Project	10%
Lecture Quizzes	10%

If a CS 486 student completes the optional 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%
Assignments	40%
Tests	20%

CS 686 Project Heavy

Component	Value
Project	60%
A1 and A2	20%
Tests	20%

To encourage CS 686 students to produce a high-quality project report, I decided to offer an alternative marking scheme. The alternative marking scheme shifts the weights of A3 and A4 to the project. Thus, A1 and A2 count for

10% each and the project counts for 60% each. Each CS 686 student's final mark is the higher value of the marks calculated by using the two marking schemes.

A CS 486 STUDENT MUST PASS THE TEST COMPONENT AND THE ASSIGNMENT COMPONENT TO PASS THIS COURSE.

If a CS 486 student fails the test component or the assignment component, the student's final grade will be the minimum of 47% and the actual final mark that the student earned in the course.

A CS 686 STUDENT MUST PASS THE PROJECT COMPONENT AND THE ASSIGNMENT COMPONENT TO PASS THIS COURSE.

If a CS 686 student fails the project component or the assignment component, the student's final grade will be the minimum of 47% and the actual final mark that the student earned in the course.

If a CS 686 student chooses the alternative marking scheme described above, they are not required to pass the assignment component to pass the course.

ASSIGNMENTS

There will be 4 assignments. Each assignment is available for roughly 3 weeks. The assignments are to be completed individually. No late assignment is accepted.

The assignment instructions will be posted on Learn. Students must make their submissions to the Dropboxes on Learn. The Learn Dropbox only keeps the latest submission.

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

Each assignment consists of 2-3 questions. At least one question requires significant programming. For the programming question, we highly recommend that you use Python. However, you can use any language of your choice.

One or two TAs will be responsible for marking every assignment. They will hold office hours to answer questions regarding the assignment. They will also 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 be considered a violation of the university policies.

Academic integrity statement: When submitting an assignment, 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 assignment not being graded.

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

Assignment 1:

- Posted on Thursday, January 21.
- Due at 11:59 pm ET on Thursday, February 11.
- Lead TAs: TBD

Assignment 2:

- Posted on Friday, February 12.
- Due at 11:59 pm ET on Thursday, March 4.
- Lead TAs: TBD

Assignment 3:

- Posted on Friday, March 5.
- Due at 11:59 pm ET on Thursday, March 25.
- Lead TAs: TBD

Assignment 4:

- Posted on Friday, March 26.
- Due at 11:59 pm ET on Wednesday, April 14, with an extension with no penalty to 11:59 pm ET on Thursday, April 15.
- Lead TAs: TBD

TESTS

There will be 3 tests on Learn. Each test becomes available at 12 PM (noon) ET on Wednesdays and is due at 11:59 pm ET on Fridays. You must complete a test within 2.5 hours.

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 12 pm ET on Wednesday, February 3.
- Due at 11:59 pm ET on Friday, February 5.
- Test 1 covers lectures 1-6.

Test 2:

- Available at 12 pm ET on Wednesday, March 17.
- Due at 11:59 pm ET on Friday, March 19.
- Test 2 covers lectures 1-16 with an emphasis on 7-16.

Test 3:

- Available at 12 pm ET on Wednesday, April 21.
- Due at 11:59 pm ET on Friday, April 23.
- Test 3 covers lectures 1-24 with an emphasis on 17-24.

PROJECT

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

Every CS 486 student has an option to complete a course project in a group of 3 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 four deliverables for the project. The deliverables are due at 11:59 PM ET on Tuesdays. A student has 3-4 weeks to work on each deliverable. No late project report submission is accepted. A student must submit every deliverable to receive a final mark on the project. Students must make their submissions to the Dropboxes on Learn. The Learn Dropbox only keeps the latest submission.

Marking: The four deliverables are weighted equally.

Peer Reviews: For each deliverable, CS 486 students must complete a peer review, in which they can describe the contribution of each group member to each project deliverable. The purpose of peer reviews is to ensure that every group member contributes equally to the project. If there are problems with a group, the group members should try to resolve the issue themselves. If the group members are unable to resolve the problem, the course staff will reach out and try to help them resolve the problem. Alice reserves the right to assign different marks to the group members based on the results of the investigation.

The details about the deliverables are as follows.

D1 Proposal

- Due at 11:59 pm ET on Tuesday, February 2. (3 weeks after the beginning of classes)
- Tasks:
    - For a CS 486 student: Find group members. Join a group on Learn. Complete the group contract. You must use the template posted on Learn.
    - Choose a project topic.
    - Complete the sections of the project report that are relevant to D1. You must use the template posted on Learn.
    - Complete the D1 peer-review survey (due 1 day after the D1 deadline).

D2 Methodology

- Due at 11:59 pm ET on Tuesday, February 23. (3 weeks after the D1 deadline)
- Tasks:
    - Identify the algorithm you will use to solve the problem. Identify the method you will use to evaluate your model or algorithm.
    - Complete the sections of the project report that are relevant to D2. You must use the template posted on Learn.
    - Complete the D2 peer-review survey (due 1 day after the D2 deadline).

D3 Results

- Due at 11:59 pm ET on Tuesday, March 23. (4 weeks after the D2 deadline)
- Tasks:
    - Complete the implementation. Obtain the results.
    - Complete the sections of the project report that are relevant to D3. You must use the template provided on Learn.
    - Complete the D3 peer-review survey (due 1 day after the D3 deadline).

D4 Final Report

- Due at 11:59 pm ET on Tuesday,April 13. (3 weeks after the D3 deadline)
- Tasks:
    - Complete the sections of the project report that are relevant to D4. You must use the template posted on Learn.
    - Each group makes a short video describing the project implementation.
    - Each group makes a Piazza post describing their project.
    - Each group comments on two other project posts on Piazza.
    - Complete the D4 peer-review survey (due 1 day after the D4 deadline).

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 24 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.

The lecture quizzes are weighted equally. The six lowest lecture quiz marks will be dropped.

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

Tests: Once the test marks are released, you have one week to submit a remark request. Most questions on the test are marked automatically on Learn. The only valid reason to dispute a question that's marked automatically is that you had an alternative interpretation of the question, which caused you to choose incorrect answers. In this case, describe your alternative interpretation in detail. Follow the instructions on Piazza to submit a remark request.

Project: Once the project deliverable 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 six 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 the links to all the important Piazza posts.

There will be one email through Piazza each week, typically on Sunday afternoons. Each post will summarize the important contents and due dates for the upcoming week. Students are required to read this post carefully.

Office hours

Alice's office hours as described below.

- 3:30 pm to 4:30 pm ET on Mondays and Wednesdays. Once a month, Alice's Wednesday office hour will be moved to Tuesday due to a department meeting.
- Alice's first office hour will be at 3:30 pm on Monday, January 18, 2020. Before this, if you'd like to meet with Alice, please make a private post on Piazza to request an appointment.

For each assignment, the TAs will host office hours and the office hours will be scheduled 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. Any student can join the meeting at the beginning. If a student has a question, 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.