

# Syllabus

## CSci 5521 (001): Machine Learning Fundamentals

3 Credits, Fall 2023

01:00 PM-02:15 PM Tuesday, Thursday, online via Zoom/Canvas

### Overview

**Course Email Address:** [csci5521.s2024@gmail.com](mailto:csci5521.s2024@gmail.com) (<mailto:csci5521.s2024@gmail.com>)

Make sure to follow the subject format as shown [here \(https://canvas.umn.edu/courses/413065/pages/online-instruction-logistics-q-and-a\)](https://canvas.umn.edu/courses/413065/pages/online-instruction-logistics-q-and-a) for your emails (you should include the topic of your email); otherwise, you may get a delay in response.

### Instructor

Catherine Zhao ([qzhao@cs.umn.edu](mailto:qzhao@cs.umn.edu) (<mailto:qzhao@cs.umn.edu>))

### Teaching Assistant (TA)

Xianyu Chen ([chen6582@umn.edu](mailto:chen6582@umn.edu) (<mailto:chen6582@umn.edu>))

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Please find all zoom links for lecture and office hours [here \(https://canvas.umn.edu/courses/413065/pages/course-information-and-zoom-links\)](https://canvas.umn.edu/courses/413065/pages/course-information-and-zoom-links).

### Course Prerequisites

This machine learning class is built on prior knowledge in statistics, probability, linear algebra, algorithms, and programming with Python. It is strongly encouraged that you have taken CSci 2033 Elementary Computational Linear Algebra, Stat 3021 Introduction to Probability and Statistics or their equivalent, and have some knowledge about multi-var calculus. If not, please talk to the instructor.

You can assess your readiness for the class in Homework 0. If you find the problems beyond your

understanding, especially after you review the following materials, you might have difficulty in passing the class.

Here are some good resources for your preparation or assessment of your readiness for the class.

- **Matrix calculus and linear algebra (Matrix Cookbook)** (<https://www.math.uwaterloo.ca/~hwolkowi/matrixcookbook.pdf>)
- **Probability theory (Bishop-Chap2)** (<https://canvas.umn.edu/courses/413065/files/40985033?wrap=1>)  ([https://canvas.umn.edu/courses/413065/files/40985033/download?download\\_frd=1](https://canvas.umn.edu/courses/413065/files/40985033/download?download_frd=1)) ([https://canvas.umn.edu/courses/333012/files/29894227/download?download\\_frd=1](https://canvas.umn.edu/courses/333012/files/29894227/download?download_frd=1)) ([https://canvas.umn.edu/courses/290861/files/26085264/download?download\\_frd=1](https://canvas.umn.edu/courses/290861/files/26085264/download?download_frd=1))
- ([https://canvas.umn.edu/courses/290861/files/26085264/download?download\\_frd=1](https://canvas.umn.edu/courses/290861/files/26085264/download?download_frd=1)) **Python Programming Tutorials** (<https://www.python.org/about/gettingstarted/>)

## Course Description

Machine learning is one of the fastest growing fields in computer science. The objective of this class is to provide rigorous training in conceptual, theoretical and experimental machine learning through lectures and hands-on experience. Topics include various supervised and unsupervised learning methods including a basic introduction to deep neural networks. The course will not only teach the theoretical underpinnings of machine learning, but also train the practical know-how to powerfully apply these methods to various problems and applications pertaining to machine learning and artificial intelligence.

## Textbook

Required textbook:

- **Introduction to Machine Learning** (<http://login.ezproxy.lib.umn.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=2957329&site=ehost-live>) by Ethem Alpaydin (Third or Fourth Edition).

Recommended reading:

- *Pattern Recognition and Machine Learning* by Christopher Bishop.

Other supplementary materials and lecture notes will be used and uploaded to Canvas.

## Course Components and Meeting Times

The course will be in remote format, with (1) lectures meeting remotely and asynchronously 75-90

minutes/week, covering basic concepts and general topics of machine learning; and (2) lectures/discussions meeting remotely and synchronously 60-75 minutes/week, covering more specific concepts and algorithms, examples, and applications.

Specifically, (1) the asynchronous lecture recordings will be posted on Canvas at least 2 days before the first class of the week, and you are expected to view them on your own. (2) The Thursday classes (i.e., 01:00 PM - 02:15 PM Thursdays) will be remote and synchronous lectures/discussions, and you should participate synchronously if possible.

Instructor contact hours: As a 3 credit class, it will include 1.25-1.5 hours of video lectures and 1-1.25 hours of remote synchronous lectures/discussions.

Student workload statement: It is expected that a student will spend about 1-2.5 hours/week watching lecture videos, 1-1.5 hours/week attending lecture/discussion sections, and 6-10 hours/week on reading, homeworks, and other studying.

Lectures may contain information not in the assigned readings, but you will be responsible for this information on the exam and assignments. Thus, it is important that you watch/attend the lectures and discussions.

## Course Evaluation

Your performance will be evaluated based on the following components:

**Quizzes** 9% (3 x 3%): There will be 4 quizzes (best 3 out of 4 scores will be used). Each quiz will take about 15 mins. It will be posted at the end of the Thursday class and due in 24 hours at Gradescope. The quiz will be open book, with access to *only* materials from this class.

**Homeworks** 56% (4 x 14%): 5 homework assignments. HW0 will not count towards your grade but will evaluate your background and readiness for the course. All homeworks are due at 11:59 PM CDT. You can do the programming only in Python and using specific libraries. Please follow the instructions in each homework for details.

**Midterm** 15%: There will be one midterm (Thursday March 21st). The exam will be open book, with access to *only* materials from this class. The exams will be posted on Canvas at the beginning of class on the exam date, and you will have 24 hours to complete and submit your exam to Gradescope.

**Final** 20%: There will be one final (Saturday May 4th). The exam will be open book, with access to *only* materials from this class. The exams will be posted on Canvas, and students will have 48 hours to complete and submit their exam to Gradescope.

**Course Schedule:** see [Schedule.pdf \(https://canvas.umn.edu/courses/413065/files/42959000?wrap=1\)](https://canvas.umn.edu/courses/413065/files/42959000?wrap=1), [↓ \(https://canvas.umn.edu/courses/413065/files/42959000/download?download\\_frd=1\)](https://canvas.umn.edu/courses/413065/files/42959000/download?download_frd=1)

[https://canvas.umn.edu/courses/391294/files/40029526/download?download\\_frd=1](https://canvas.umn.edu/courses/391294/files/40029526/download?download_frd=1)) ([https://canvas.umn.edu/courses/333012/files/32284680/download?download\\_frd=1](https://canvas.umn.edu/courses/333012/files/32284680/download?download_frd=1))

Note on collaboration: in general, you are welcome to discuss the assignment problems in general with others, but **you must work out and write your own solutions: any in-person or online discussion should stop before you start discussing or designing a solution.**

## Final Grades:

Grading for this course is on an absolute scale, so that the performance of others in the class will not affect your grade. If you are registered A-F, final grades will be assigned based on the following University of Minnesota Letter Grade Scale:

- 100%-93%: A
- 93%-90%: A-
- 90%-87%: B+
- 87%-83%: B
- 83%-80%: B-
- 80%-77%: C+
- 77%-73%: C
- 73%-70%: C-
- 70%-67%: D+
- 67%-60%: D
- 60%-0%: F

If you are registered S/N:

- 100%-70%: S
- 70%-0%: N

## Policies

### Late Submission Policy

You have a total of *4 grace days* for late submissions for homeworks. **Note:** Grace days cannot be used for exams/quizzes.

You can choose to use them as convenient to delay one/more homework submissions.

Submission timelines will be strictly enforced (through Gradescope), e.g., if you are past the due

date+time by 5 minutes, that will be considered a late submission, and use up a grace day or incur late penalty if the grace days are already used up.

Grace days are counted by days, not hours. You don't need to inform the TAs about the usage of your grace days unless you don't want to apply grace days on your current assignment. We will keep a visible record of your remaining grace days and update after grading each assignment.

A 10% penalty will be applied to the grade for **all quizzes/exams/assignments** turned in up to 24 hours late. Those turned in between 24 and 48 hours late will receive a 20% penalty. Any submissions more than 48 hours late will get a zero grade. Penalty on homeworks will be automatically applied after grace days are used up.

## Makeup Policy

Make-up quizzes, exams, and assignments will not be offered. Exceptions will only be made for documented and extraordinary circumstances - please notify the professor **immediately** in such cases. Otherwise missing quizzes will have to count as the ones that are dropped. If you have a foreseeable conflict for midterm and final exams, notify the professor before **Feb. 1, 2024**.

## Grading Re-evaluation, Re-grading Requests

Grades will be posted on Canvas immediately after each assignment or exam is graded. This will usually take about one week. It is important that you check your grades regularly. If you see a discrepancy between your grades and the grades posted, you must alert the TA immediately. If you wish for a regrade, you can submit a regrade request for each individual problem on Gradescope. You have one week after the assignment/exam is returned to request a change.

If you have questions or concerns about your performance or final grade, you are strongly encouraged to make an appointment with the instructor to discuss it as early as possible.

## Office Hours Usage

Due to the challenges of the online teaching paradigm, debugging code during office hours could be difficult. We will primarily use office hours to discuss course content and the logic for solving problems. If you are struggling with code implementation, please send an email to the TAs.

## Academic Integrity Policy

Every student is expected to turn in his or her own work for all homeworks and exams. While

students can generally discuss homework/assignment problems, they have to design, implement, and submit their own solutions/code for the problems.

The **University Student Conduct Code** ([https://regents.umn.edu/sites/regents.umn.edu/files/policies/Student\\_Conduct\\_Code.pdf](https://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf)) defines scholastic dishonesty as: submission of false records of academic achievement; cheating on assignments or examinations; plagiarizing; altering, forging, or misusing a University academic record; taking, acquiring, or using test materials without faculty permission; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement. In this course, a student responsible for scholastic dishonesty will be assigned a penalty of an "F" or "N" for the course, and the incident will be reported to the University Office. If you have any questions regarding the expectations for a specific assignment or exam, please ask us.

Specifically, with regards to the use of Artificial intelligence (AI) language models, such as ChatGPT, they are not permitted for any work, or phase of work, in this class. Using them may interfere with your progress as an independent learner and your achievement of the course's outcomes. If you use these tools, your actions would be considered academically dishonest and a violation of the Board of Regents Student Conduct Code, Section IV, Subd.1: Scholastic Dishonesty.

## **The Disability Resource Center**

The University of Minnesota is committed to providing all students equal access to learning opportunities. The Disability Resource Center (DRC) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations.

- Students who have, or think they may have, a disability (e.g. mental health, attentional, learning, vision, hearing, physical or systemic), are invited to contact DRC to arrange a confidential discussion at 612-626-1333 or [drc@umn.edu](mailto:drc@umn.edu).
- Students registered with DRC, who have a letter requesting accommodations, are encouraged to discuss accommodations outlined in the letter with the instructor early in the semester.

## **Mental Health Resources**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential

mental health services available on campus via <http://www.mentalhealth.umn.edu> (<http://www.mentalhealth.umn.edu/>).

## **Sexual Harassment**

“Sexual harassment” means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult **Board of Regents Policy on Sexual Harassment, Sexual Assault, Stalking and Relationship Violence** ([https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual\\_Harassment\\_Sexual\\_Assault\\_Stalking\\_Relationship\\_Violence.pdf](https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual_Harassment_Sexual_Assault_Stalking_Relationship_Violence.pdf)).

## **Equity, Diversity, Equal Opportunity, and Affirmative Action**

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult **Board of Regents Policy on Equity, Diversity, Equal Opportunity and Affirmative Action** ([http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf)).

## **Other Special Circumstances**

Students with other special needs or circumstances should contact the instructor as soon as possible to make any necessary arrangements.

## **Additional Policies**

All policies (presented above) may evolve and change over the course of the semester at the discretion of the instructor. Sometimes issues arise that cannot (or were not) planned for, and the instructor may need some flexibility in handling them.