EECS 445: Introduction to Machine Learning
Winter 2021

Course Staff

Professors:	**Sindhu Kutty (she/her/hers)**	skutty@umich.edu
	Jenna Wiens (she/her/hers)	wiens@umich.edu
GSI:	**Karl Koenig (he/him/his)**	
IAs:	**Eric Chen (he/him/his)**	
	Sahas Dendukuri (he/him/his)	
	Allen Diao (he/him/his)	
	Serafina Kamp (she/her/hers)	
	Adityasai Koneru (he/him/his)	
	Junhui Li (she/her/hers)	
	Blake Martin (he/him/his)	
	Amanda Yao (she/her/hers)	
	Anthony Zhao (he/him/his)	
	Naitian Zhou (he/him/his)	

Course Description

EECS 445 provides an introduction to machine learning, including algorithms and applications. This course is a programming-focused introduction to machine learning. Increasingly, extracting value from data is an important contributor to the global economy across a range of industries. The field of machine learning provides the theoretical underpinnings for data- analysis as well as, more broadly, for modern artificial intelligence; it has had a major impact on many real-world applications. We will introduce theory and implementation of state-of-the-art machine learning algorithms for large-scale real-world applications. Topics include supervised learning (regression, classification, kernel methods, neural networks, and regularization) and unsupervised learning (clustering, density estimation, and dimensionality reduction).

In this course, we will emphasize understanding of foundational algorithms and “tricks of the trade” through implementation and basic theoretical analysis. On the implementation side, the emphasis will be on practical applications of machine learning to computer vision, data mining, speech recognition, text processing, bioinformatics, and robot perception and control. Real datasets will be used whenever feasible to encourage understanding of practical issues. On the theoretical side, the course will give an undergraduate-level introduction to the foundations of machine learning topics including regression, classification, kernel methods, regularization, neural networks, graphical models, and unsupervised learning.

Prerequisites:

- (Enforced) EECS 281 and (MATH 214 or 217 or 296 or 417 or 419)
- (Advisory) STATS 250 or equivalent

Course Components

Lectures

Our class will be run entirely remotely. You may find support and additional resources for these unusual times here: https://covid-19.engin.umich.edu/student-resources/

Section 001 Mondays and Wednesdays 10am-11:30am (ET) Synchronous + Recorded. Section 001 will have live lectures, with live Q&A, and the entire lecture will be recorded. All questions (along with the names and potentially audio and video of those asking questions) and chat will be recorded and shared with course participants from all sections. Lectures will include slides and note taking. Lectures will be held on zoom and links will be provided on the course calendar. While attendance is strongly encouraged it is not mandatory. Further, students from any section can attend/participate. If you choose not to attend synchronously, you are expected to watch all recordings and keep up to date with the material. Quizzes and exams will be based in part on lecture material.

Sections 002 & 003 Asynchronous. Class will not meet at scheduled time. In lieu of a live lecture, please either attend Section 001 or review the recording and materials from Section 001 when made available on Canvas.

Discussion

Discussions will be consolidated into two sections on Thursdays to accommodate students in as many time zones as is feasible (see calendar for details). These will also be recorded. In addition to attending lectures, you are encouraged to attend these discussions weekly. During discussion, the course staff will go over additional examples related to concepts introduced in lecture. You will also have the opportunity to ask additional questions and get clarification regarding concepts covered in the lecture.

Canvas

Information about the course including assignments and supplementary readings will be posted on Canvas (https://canvas.umich.edu/). You are expected to check the site frequently.

Piazza

We will use Piazza for course-related questions & answers. You should be able to access the course Piazza site from Canvas. If not, please reach out to us asap. A lot of our communication with you outside of lectures, discussions and office hours will be through posts on piazza.

Additionally, you are encouraged to use Piazza to connect with other students in the class, answer each other's questions and notify course staff of typos. You can even ask questions privately to the staff. **Please note that the staff might ask you to post your questions on Piazza if we feel it will be beneficial to other students.** Course staff will monitor Piazza at regular intervals, but will not provide immediate responses. For more immediate feedback, students are encouraged to attend office hours. Please do not share answers to homework on Piazza.

Course Materials, Textbook and Programming Language

Course slides and additional reference materials (including discussion notes and solutions to assignments) will be posted online via canvas or on the course schedule.

Recommended Textbooks (optional)

The course does not have a required textbook; the following books are good references (all available online and/or through the UM library):

1. A Course in Machine Learning by Hal Daume III (available online)
2. Pattern Recognition and Machine Learning by Christopher Bishop (available online)
3. Machine learning: A Probabilistic Perspective by Kevin Murphy
4. Hands-on Machine Learning with Scikit-Learn and TensorFlow by Aurelion Geron
5. Mining of Massive Datasets by Leskovec, Rajaraman and Ullman (available online)

We will use python extensively for the coding assignments and projects in this course. We will upload videos to acquaint you with relevant portions of python. We will also provide notes. Additionally, there are various python references available online. We will link to these in the tutorial notes.

For other questions, you can reach the course staff at: eecs445-staff@umich.edu. If you send the course staff an email that requires more than a few sentences of reply, you might be asked to come to office hours or set up an individual meeting. If you do not get a reply within 48 hours, please resend your email. The course staff will work hard to be respectful of you. Please be respectful and professional in your emails. **Please do not contact the staff individually.** You may reach the professors at their respective email addresses listed above for matters that you wish to communicate directly with them. **In communicating directly with your professors, please use the following as is in the subject line as we will filter for it: [EECS 445 W21]**

Course Grading:

Homework (evenly weighted)	25%
Projects (evenly weighted)	20%
Midterm	20%
Final	25%
Quizzes	9%
Course Evaluation	0.5%
Mock Exam	0.5%

Below are the *guaranteed* grade thresholds: if your final raw score exceeds the threshold for grade X, your final letter grade will be X ***or better***. The actual thresholds will be determined after the final exam (but will be no higher than what appears below). A failing grade on the final exam is grounds for failing the course.

A: 94% and above
A-: 90%
B+: 87%
B: 83%
B-: 80%
C+: 77%
C: 70%

Grading Philosophy:

In any humanities or social science class, you must write clearly and concisely to get your point across. It is not sufficient that a correct argument appears *somewhere* in your answer, if it is also accompanied by incorrect or faulty reasoning. The same applies for this course: your responses must be *clear*, *concise*, and *correct* to receive full credit.

Grade Components:

Homework Assignments (25%) + Projects (20%)

Homework assignments play an important role in the learning process. There will be 6 roughly biweekly assignments: homework HW1 - HW4, and two mini-projects. Due dates will be specified in Ann Arbor local time on each assignment.

Late submission policy for homework and projects:
You have 3 late days to use over the course of the semester for all homework and 3 late days for projects. These will be strictly enforced and are meant to cover unexpected life events. **Use these wisely!** We will count late days in increments of days starting immediately. For example, suppose that you submit 15 minutes late. This counts as a late day and will decrease your remaining late days for that assignment type by 1. **No late submissions will be accepted after the 3 days have been used up**. Unfortunately, exceptions can only be made for emergency situations (e.g. family or medical), and **should be requested with as much notice as possible and/or be evidenced by documentation**. Please plan accordingly and/or be ready to provide documentation of medical issues, etc.

Midterm (20%) and Final Exam (25%)

One midterm and a cumulative final exam will be given. A large fraction of the questions on these exams will be similar to lecture, discussion and homework problems or very slight variations/extensions. Thus a good way to study is to make sure you know how to solve these problems.

Everyone is expected to take all exams at the scheduled times. The times of the exams can be found on the course schedule. It is departmental, college, and university policy that travel schedules and holiday activities **never** take precedence over exam schedules. In a case of a conflict due to a university sponsored event (such as participation in a sponsored sports event or a competition) a university official in charge of the event should contact the instructors by the second week of the semester (for the actual deadline please refer to class announcements) to determine how the missing grade will be made up.

Quizzes (9%)

Throughout the course, you will be assigned quizzes due approximately weekly. The main purpose of these quizzes is to ensure that you keep up with the course material. Nine percentage points of credit for quiz scores will be earned by students who get a perfect score on ¾ of the quiz questions. Otherwise, this portion of the grade will be assigned to your final exam score. In that case, your final exam will be

worth 34% of your final grade.

Course Evaluation (0.5%)

The course evaluation is important to us and counts 0.5% towards your final grade. Students will receive 0.5 points if they submit the final course evaluations **and** upload a screenshot indicating completion (a corresponding assignment will be made available for this). While submitting the midterm evaluations are not required it is **strongly encouraged**.

Mock Exam (0.5%)

Since the exams in this course will necessarily be held remotely, we will release a mock exam to familiarize you with the mode of submission. This will be worth 0.5% of your grade. The due date will be specified clearly and will be strictly enforced.

Regrading Policy:

If a student feels that credit has been inappropriately allocated, then they may ask for a regrade. The student should submit these via gradescope. Regrade requests must be made within **a week** after grades for that assignment are released. Any exceptional policy for exam regrades will be specified separately.

*****No oral and/or e-mail regrade requests will be accepted*****

Students are cautioned that they have the possibility of both gaining and losing points (i.e., if the regrade determines that the answer was more incorrect than marked). Students are reminded that accuracy alone is not sufficient; the answer should also be clear.

Honor Code and Collaboration:

Unless otherwise specified in an assignment, all submitted work must be your own, original work. If you are referencing others' work, put it in quotes! If you are directly quoting, or building on others' writing, provide a citation. See the Rackham Graduate policy on Academic and Professional Integrity for the definition of plagiarism, and associated consequences.

Violations of the Honor Code will be taken seriously; Please see details:
https://elc.engin.umich.edu/honor-council/

Students are **encouraged to collaborate** (except when taking exams). Please use Piazza to this effect and also to find other students to work with on assignments, i.e., create study/homework groups. However, when turning in work that benefited from a collaboration, the student must state that clearly. Students are expected to **write their solutions on their own** and **should not look at any other student's write-up**.

Student Sexual Misconduct

Policy Title IX prohibits discrimination on the basis of sex, which includes sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We understand that sexual violence can undermine students' academic success and we encourage anyone dealing with sexual misconduct to talk to someone about their experience, so they can get the support they need. Confidential support and academic advocacy can be found with the Sexual Assault Prevention and Awareness Center (SAPAC) on their 24-hour crisis line, (734) 936-3333 and at sapac.umich.edu.

Alleged violations can be non-confidentially reported to the Office for Institutional Equity (OIE) at institutional.equity@umich.edu

Student Mental Health and Wellbeing

We want you to be successful in and outside of this class. Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers many resources, some of which are listed at Resources for Student Well-being on the Well-being for U-M Students website. You can also search for additional resources on that website.

Handling Data with Integrity & Unfair Advantage

You may not falsify or misrepresent methods, data, results, or conclusions, regardless of their source. You may not possess, look at, use, or in any way derive advantage from the solutions of homework, exams or papers prepared in prior years (or from other courses), whether these solutions were former students' work products or solutions that have been made available by University of Michigan faculty or on the Internet.

Accommodations for Students with Disabilities

If you think you need an accommodation for a disability, please let the course staff know at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make any of the staff aware of your needs, we can work with the Office of Services for Students with Disabilities (SSD) to help us determine appropriate accommodations. SSD (734-763-3000; http://www.umich.edu/~sswd/) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. The course staff will treat any information you provide as private and confidential.

Have Fun, Be Safe and Stay Well!