Machine Learning

CSC 246 Fall 2026

Meeting Information

Tuesday/Thursday 3:25-4:40 pm
Gavett Hall Room 206

Instructor

Jiaming Liang
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Teaching Assistant

Tung Lam Tran
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Office Hours

3:00-4:00 pm, Wednesday, Wegmans Hall 2403 (Jiaming Liang)
4:00-5:00 pm, Monday, Wegmans Hall 4209 (Tung Lam Tran)

Prerequisites

Students should be familiar with multivariate calculus, linear algebra, basic probability, and Python programming. Prerequisites: MATH 165 and a complete calculus sequence (e.g., MATH 14x, 16x, or 17x). Recommended: STAT 190 or similar statistics course.

Course Description

This course provides an introduction to the mathematical foundations and modern practice of machine learning for computer science students. Topics include supervised learning, regression and classification, support vector machines and kernel methods, unsupervised learning, neural networks and modern deep learning architectures, generative models, diffusion models, and reinforcement learning. The course emphasizes understanding how and why the methods work while keeping the mathematical prerequisites at an undergraduate level. Programming demonstrations and assignments will use Python/PyTorch.

Topics (subject to change)

1. Foundations and supervised learning: empirical risk, linear and logistic regression, regularization, and model selection.
2. Optimization and generalization: gradient methods, stochastic gradient methods, automatic differentiation, bias-variance tradeoffs, and an introduction to generalization bounds.
3. Support vector machines and kernel methods: margins, soft-margin SVMs, duality, kernels, and kernelized learning.

4. Unsupervised learning: principal component analysis, clustering, Gaussian mixture models, and the EM algorithm.
5. Neural networks and deep learning architectures: multilayer perceptrons, backpropagation, CNNs, ResNets, attention, and Transformers.
6. Generative modeling and generative AI: autoencoders, VAEs, GANs, normalizing flows, diffusion models, and foundation models.
7. Reinforcement learning: Markov decision processes, Bellman equations, Q-learning, deep RL, and policy-gradient methods.

Textbooks

1. Andreas Lindholm, Niklas Wahlstrom, Fredrik Lindsten, and Thomas B. Schon. *Machine Learning: A First Course for Engineers and Scientists.* Cambridge University Press, 2022.
2. Simon J. D. Prince. *Understanding Deep Learning.* MIT Press, 2023.

Recommended Readings and Coding Resources

1. Shai Shalev-Shwartz and Shai Ben-David. *Understanding Machine Learning: From Theory to Algorithms.* Cambridge University Press, 2014.
2. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola. *Dive into Deep Learning* https://d2l.ai.

Assessments & Grading

- 30% homework (6 problem sets x 5% each)
- 25% midterm exam (Oct. 15)
- 15% quiz (Nov. 19)
- 30% final exam (Dec. 21)

The final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Academic Integrity

Academic integrity is a core value of the University of Rochester. Students are strongly encouraged to discuss homework problems with one another. However, each student must write up and turn in their own solutions, written in their own words/consisting of their own code. All assignments and activities associated with this course must be performed in accordance with the University of Rochester's Academic Honesty Policy. More information is available at: http://www.rochester.edu/college/honesty.

Absences/Late Submissions

Out of fairness to the entire class, late submission of homework will not be accepted in the absence of a prior agreement between the student and instructor. In particular, excused absences include illnesses, religious observations, career fairs and job interviews. In the event that an excused absence such as above prevents a student from submitting an assignment, their homework grade will be calculated on a prorated basis.

Diversity, Equity, Inclusion, & Belonging

Instructors, teaching assistants, and students should work together to ensure that our class is a welcoming, inclusive, respectful, and vibrant place for all of its members to share, learn, and grow. Our class will not tolerate discrimination, prejudice, or harassment of any kind. More resources can be found at: https://www.rochester.edu/diversity/.

Accessibility

Students needing academic adjustments or accommodations because of a documented disability must contact the Disability Resource Coordinator for the school in which they are enrolled. I am happy to accommodate any and all accommodations, so long as they are documented with the Office of Disability Resources. I am glad to meet to discuss your specific situation or to help ensure you have the support you need. For additional information, please see: https://www.rochester.edu/college/disability/.