

CS/Math 350: Foundations of Machine Learning

This course explores the process of machine learning through the lens of empirical modeling. We will develop the theory and algorithms that underpin the process of learning interesting things about data. Algorithms we will develop typically include: singular value decomposition and eigenfaces, the n-armed bandit, projections and linear regression, data clustering (k-means, Neural Gas, Kohonen's SOM), linear neural networks, optimization algorithms, autoencoders, and deep networks. The course will involve some computer programming, so previous programming experience is helpful. May be elected as Computer Science 350. Prerequisite: Mathematics 240.

Instructor: Doug Hundley

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Phone: 509-527-5151

Website: Here, and <http://people.whitman.edu/~hundledr/courses/M350.html>

Class Times: Monday, Wednesday, and Friday 10 AM

Class Location: Olin 229

Office Hours: TBA

If you can't make these times, feel free to send an email to me to schedule a different time or to schedule an online visit.

Course Materials: There is no required text for this course. I will be providing notes for each topic.

Course Goals: At the end of this course, you will understand the mathematical foundations of machine learning. Primarily, we'll discuss topics from linear algebra and statistics, and how to use the theory to construct the popular machine learning algorithms.

Technology: Where possible, we'll work with Matlab, R or Python. There may be times where Matlab is the preferable option, but typically it will be your choice. There is also a free online version of Matlab called Octave that we'll occasionally use in class.

Grading Criteria.

Homework/Lab work: Homework and lab work will be assigned daily and will be picked up weekly, so we'll have at least one assessment each week. You are expected to produce your own solutions to all homework problems, but for similar problems, you are encouraged to work in groups. There may be times when you work in a group- In those instances, each group member will turn in their own copy of the work. Collectively, homework will account for 25% of the overall grade.

Exams: There will be two midterms and the final. The midterms will partially be in-class, and typically have some take-home component. The final exam will be a take-home final, and will be announced at least a week in advance. The exams are all weighted equally at 25% each (75% total).

GRADING: Grading is done on a standard scale:

A = 92 – 100 A- = 90 – 91 B+ = 88 – 89 B = 82 – 87 B- = 80 – 81
C+ = 78 – 79 C = 72 – 78 C- = 70 – 71 D = 60 – 69 F = 59 and below

Assistance: I encourage you to come see me. If you can't make it during office hours, either email me if you have short questions, or let me know when you would like to meet.

Academic Honesty. Academic standards will be strictly adhered to as outlined in the College's policies. This means that cheating will not be tolerated. Looking at another student's exam or quiz (whether or not you mean to copy answers) while taking it will be considered cheating. Please don't test this policy!

Academic Support Services

If you are a student who will need accommodation in this course, please meet with Richard Middleton-Kaplan, Director of Academic Support Services (Olin 314, (509) 527-5767) for help developing a plan to address your academic needs. Once the ARC notifies me that you are eligible to receive accommodation, I will provide that accommodation as discreetly as possible. If your accommodation includes special exam arrangements, please contact me a week before each exam so we can make those arrangements. Email is a good way to contact me.

Please be courteous to your fellow students: There are frequent times in class when you'll be asked to work on the topic at hand, so you must be able to write and draw during class. Typically, that means that you should use either regular paper or a tablet, but laptops don't work well. See me if you have questions.

Be sure to check your Whitman email regularly. I will occasionally send out important information about the class via email.

Absence Policy: Generally, I do not take attendance, so if you're sick, please stay home and get the notes from a friend. If you're sick during an assessment day, you need to contact me as soon as possible. Additionally, more than one such absence may result in a penalty on the exam that is missed. If you miss an assessment due to either a college sponsored event or for religious reasons (see the policy below), then be sure to let me know in advance so that alternative testing can be arranged.

Religious Observances In accordance with Washington State Law and Whitman College's Religious Accommodations Policy, I will provide reasonable accommodations for all students who, because of religious observances, may have conflicts with scheduled exams, assignments, or required attendance in class. Please review the course schedule at the beginning of the semester to determine any such potential conflicts and send me an email by the end of the second week of class so that I can take note of your need for religious accommodations. If you believe that I have failed to abide by this policy, [here is a link to the College's grievance policy: https://www.whitman.edu/human-resources/grievance-policy](https://www.whitman.edu/human-resources/grievance-policy).