UC SANTA BARBARA
Bren School of Environmental Science & Management

EDS 232: Machine Learning for Environmental Science

Quarter: Winter 2025
Units: 4
Grading: Letter

Welcome to Machine Learning

Machine learning (ML) is a field of inquiry devoted to understanding and building methods that 'learn', that is, methods that leverage data to improve performance on some set of tasks. In this course, we will focus on the core concepts of machine learning that beginning ML users must know. We will cover 'classical machine learning' primarily using Python, and explore some applications to environmental science.

To understand broader concepts of artificial intelligence or deep learning, a strong fundamental knowledge of machine learning is indispensable.

Instructor information, meeting times, & materials

Instructor: Mateo Robbins
Email: mjrobbins@ucsb.edu
Student hours: Tuesday 10:45 -11:45pm (Location: Bren 1424)
The best ways to contact me: email or Slack

TA: Annie Adams
Email: aradams@ucsb.edu
Student hours: Thursdays 11:00 - 12:00pm, (Location: Bren 4328)

Class meets:

Lecture: TTh 9:30am - 10:45am PST (Bren 1424)
Section: Th 1:00pm - 1:50pm, 2:00 - 2:50 pm (Bren 3022)

Course website:

https://maro406.github.io/eds-232-machine-learning/

Required textbook:

An Introduction to Statistical Learning with Applications in Python

Basic course information

Learning objectives: The goal of EDS 232 is to equip students with a strong foundation in the core concepts of machine learning. By the end of the course, you will be able to:

- Explain key machine learning concepts such as classification, regression, overfitting, and the trade-off in model complexity.
- Identify and justify appropriate data preprocessing techniques and integrate them into machine learning pipelines.
- Demonstrate an intuitive understanding of common machine learning algorithms.

- Build supervised machine learning pipelines using Python and scikit-learn on real-world datasets.
- Apply best practices for machine learning development so that your models generalize to data and tasks in the real world.
- Measure and contrast the performance of various models

Course Details

- Class meetings:
    - Tuesdays will usually involve a lecture with slides.
    - Thursdays will usually be hands-on coding time working on assigned labs.
- Labs:
    - The best way to learn about a machine learning method is to program it yourself and experiment with it. The weekly lab assignments will generally involve implementing machine learning algorithms testing them on some data.
    - Labs will generally be due Wednesdays at 11:59pm the week after they are assigned.
- Sections:
    - Sections will involve live coding demonstrations and are intended to reinforce the concepts covered in lecture and lab
- Quizzes:
    - In order to master machine learning, you will need to understand the concepts underlying the algorithms we are implementing in the labs. Quizzes will generally happen weekly on Thursdays and are designed to orient you to key course concepts that are presented in lecture.
    - Quizzes will be administered via Canvas. You must be present in class in order to take the quiz.
    - You will have the opportunity to drop your lowest quiz score from your final grade.
- Participation
    - You are expected to attend all lectures and labs, and participate in the sections. If you anticipate missing one of these meetings, reach out to me ahead of time via email to let me know. In addition, you will turn in reflections on the material presented by guest speakers.

Tentative schedule of topics*:

Week #	Dates	Lecture
1	1/7, 1/9	Introduction, Linear Regression and ML Modeling Fundamentals I
2	1/14, 1/16	Regularized Regression and ML Modeling Fundamentals II
3	1/21, 1/23	Logistic Regression, Classification
4	1/28, 1/30	K-nearest neighbors, Decision Trees
5	2/3, 2/6	Random Forest
6	2/11, 2/13	Gradient Boosting
7	2/18, 2/20	Clustering
8	2/25, 2/27	Support Vector Machines
9	3/4, 3/6	Deep Learning
10	3/11, 3/13	Kaggle

**see course website for an up-to-date schedule*

How to be successful in this class

My expectations:

I expect you to take advantage of the opportunities that this course offers you by being an active and thoughtful participant and by trying your best on the various elements of the course. I expect you to take ownership of your learning and to reach out to me or your teaching assistant if you are struggling or have concerns. I expect you to take the opportunity to learn from your peers through activities in lecture, section, and the course Slack channel. I expect you to be respectful and courteous to one another.

Grades:

Grading is important as it gives feedback to both you and I about how the learning process is going. That said, I think it's useful to keep in mind that at this point in your

career what you learn and know is far more important than letter grades on a transcript.

Grading breakdown

- Labs : 75%
- Quizzes: 20%
- Participation: 5%

Grading scale

Score	Grade	Score	Grade
92-100	**A**	**80-81**	**B-**
90-91	**A-**	**78-79**	**C+**
88-89	**B+**	**72-77**	**C**
82-87	**B**	**70-71**	**C-**

Access, accommodations and conduct

Course conduct:
UCSB Student Code of Conduct
I view our course as a learning community, and I request your help in fostering a welcoming environment in the classroom where everyone feels supported, included, and comfortable participating.

Access and Accommodations: Please submit requests for accommodations often and early. It is never too late to apply for DSP accommodations. If you have any kind of disability, whether apparent or non-apparent, learning, emotional, physical, or cognitive you may be eligible to use formal accessibility services on campus. To arrange class-related accommodations, please contact DSP. DSP will initiate communication about accommodations with faculty. By making a plan through DSP,

appropriate accommodations can be implemented without disclosing your specific condition or diagnosis to course instructors.

Additional student resources

Bren Support, Safety, and Resources:
https://bren.ucsb.edu/diversity/support-safety-and-resources

The text below is provided by the UCSB Disabled Students Program.

Counseling and Psychological Services (CAPS): 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. CAPS is 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. They can be reached by phone at 805.893.4411, or online at http://caps.sa.ucsb.edu. The CAPS building is the pink building next to the Humanities and Social Science building (HSSB)

Food insecurity: http://food.ucsb.edu/ includes the Cal Fresh Program http://food.ucsb.edu/calfresh and the Associated Students food bank https://foodbank.as.ucsb.edu

Resource Center for Sexual and Gender Diversity (RCSGD) in the SRB, offers a host of services for LGBTQI+ students including a library and many events throughout the year. http://rcsgd.sa.ucsb.edu/

Dream Scholars/Undocumented Student Services Program offers workshops, helps students find scholarships and financial support as well as providing community for our undocumented students. http://www.sa.ucsb.edu/dreamscholars/home

Campus Learning Assistance Services (CLAS) helps students grow academically by offering workshops, walk-in and pre-scheduled tutoring, and writing help both for native and non-native (ESL) English as a second language speakers. Over 50% of students will stop by CLAS at one time or another. http://clas.sa.ucsb.edu

Student Resource Building (SRB) houses many campus resources offices, including the African Diasporic Cultural resource Center, the American Indian Resource Center, the Asian Resource Center, the Middle Eastern Resource Center, the Non-Traditional and Re-Entry Student Resource Center.
http://www.sa.ucsb.edu/student-resource-building/home

Multicultural Center (MCC), located in UCEN, hosts a wide variety of cultural events and educational programming throughout the year, including film showings, lectures, musical performances, and more: http://mcc.sa.ucsb.edu/

Financial Crisis Response Team: If you are experiencing issues of housing insecurity contact the Financial Crisis Response Team at financialcrisis@sa.ucsb.edu to begin application for assistance.

Health and Wellness: Student well-being is integral to academic success, student development, and life satisfaction. On this website, students will find links to a range of services related to well-being such as: assistance with basic needs (food, housing, finances); counseling and physical health resources, daily wellness centers and programs; social connection, and personal safety. https://wellbeing.ucsb.edu/