ECE.GY 6143, CS-GY 6923: Introduction to Machine Learning

Description: This course is an introduction to the field of machine learning, covering fundamental techniques for classification, regression, dimensionality reduction, clustering, and model selection. A broad range of algorithms will be covered, such as linear and logistic regression, neural networks, deep learning, support vector machines, tree-based methods, expectation maximization, and principal components analysis. The course will include hands-on exercises with real data from different application areas (e.g. text, audio, images). Students will learn to train and validate machine learning models and analyze their performance. May not take if student has already completed ECE-UY 4563.

Professor:

- Prof. Sundeep Rangan, ECE.
- Office hours: Wednesdays 16:00 to 17:00 (in my office or on zoom)

Graders:

- Graders will help you with any administrative issues and setting up python or google colab.
- They will also grade all homeworks and exams
- Please direct questions to them first.

Grader name	Email	Allocation
Tejdeep Chippa	tejdeep.chippa@nyu.edu	Full
Roshan Nayak	rn2588@nyu.edu	Full
Akshat Singh	akshat.singh@nyu.edu	Full
Aadit Anand Fadia	aaf9407@nyu.edu	Full
Sheetal Prasad	sheetal.prasad@nyu.edu	Half
Raunak Choudhary	rc5553@nyu.edu	Half

Lecture: Tuesdays 11:00-13:30, 370 Jay St, Room 202

- All lectures will be on zoom
- Attendance (in person or online) is OK. Attendance is not mandatory
- Bring your laptop. We will do in class exercise

Grading: 35% midterm, 35% final, 30% homework and labs.

- There is also 20% optional project.

Pre-requisites: This class assumes you have probability and calculus at the undergraduate level. It assumes NO machine learning experience. If you have taken ML in your undergraduate degree, you can skip this class and go directly to an advanced ML or deep ML class. Note that in ECE, the advanced ML class requires graduate-level probability. I am happy to discuss if you feel unsure. There is also no

python programming experience required. But, I assume you can pick up python if you have not coded in it before.

Class material: All the material for the class is on the github website.
https://github.com/sdrangan/introml/blob/master/sequence.md

The first week, we will cover the course admin, Unit 1 and Unit 3. For the graduate course, we skip Unit 2. You should study this unit on your own. For the following weeks, we will cover approximately one unit per week. All other details on the class including the grading can be found on:

https://github.com/sdrangan/introml/blob/master/lectures/CourseAdmin.pdf

Online format: All classes will be on pre-recorded videos so that you can watch them at your pace. I have started to produce the online content here.
https://github.com/sdrangan/introml/blob/master/online_class.md

Each unit is divided into sections. Watch the video for the section and then try to answer the short exercise before moving to the next section.

First in-class session: The first in-class session is Sept 2. Before this class, you should watch the online material for Units 1 and 3. In the class, I will go over the course admin and the in-class exercises for Units 1 and 3. I will also go over the lab and problem set that are due the following week.

Tentative Schedule of classes: To modernize the curriculum, we are modifying the later lectures a bit.

Date	Prior Years		Fall 2025	
	Unit	Description	Unit	Description
9/2/2025	1, 2	Course Admin. What is ML? Multiple Linear Regression	1, 2	Course Admin. What is ML? Multiple Linear Regression
9/9/2025	3	Model Selection	3, 4	Model Selection & Regularization
9/16/2025	4	Regularization and LASSO	5	Logistic Regression
9/23/2025	5	Logistic Regression	6	Nonlinear Optimization
9/30/2025	6	Nonlinear Optimization		Kernel methods, KNN [New]
10/7/2025		Midterm review		Decision Trees [New]
10/14/2025		No class: Spring break		No class: Spring break
10/21/2025		Midterm		Midterm
10/28/2025	7	SVMs	8	Neural Networks
11/4/2025	8	Neural Networks	9	Convolutional neural networks
11/11/2025	9	Convolutional neural networks	10	PCA
11/18/2025	10	PCA	11	Word Embeddings and tokenization
11/25/2025	11	Clustering and K-means	13	Clustering and K-means [Modified]
12/2/2025		Final Exam Review / Make Up		Final Exam Review / Make Up
12/9/2025		Final Exam		Final Exam