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.

People:

- Prof. Sundeep Rangan, ECE.
- TA: The main TA is William Xia, wx312@nyu.edu.
  A complete list of TAs will be provided shortly.

The TA will help you with any administrative issues and setting up python or google colab. Please direct questions to him first.

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

Grading:

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.

In-class session: There is a weekly section on Tuesdays 2-4:30.   This will be a zoom meeting and is completely optional. The TA will send a link for the zoom call. If you attend, you should watch the videos for the units before the class. I will use the time to go over problems and demos. I will not re-give the lecture. For most weeks, I expect this class to be short – just about 90 minutes or so. The midterm and the final will also be held during this time period.

First in-class session: The first in-class session is Sept 8. 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.

Piazza: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/nyu/fall2020/elgy6123/home

Tentative Schedule of classes:

Date	Material covered
9/8/2020	Course Admin
	Unit 1: What is Machine Learning?
	Unit 3: Multiple Variable Linear Regression
9/15/2020	Unit 4: Model Selection
9/22/2020	Unit 5: Regularization and LASSO
9/29/2020	Unit 6: Logistic Regression
10/6/2020	Unit 7: Nonlinear Optimization
10/13/2020	Midterm
10/20/2020	Unit 8: Support Vector Machines
10/27/2020	Unit 9: Neural Networks
11/3/2020	Unit 10: Convolutional Neural Networks
11/10/2020	Unit 11: PCA
11/17/2020	Unit 12: Clustering and EM
11/24/2020	No class Thanksgiving
12/1/2020	Final Exam Review
12/8/2020	Final Exam