Course description

You will learn to implement and apply Machine Learning algorithms. This course emphasizes practical skills, and focuses on giving you skills to make these algorithms work. You will learn about commonly used learning techniques including supervised learning algorithms (logistic regression, linear regression, support vector machines, neural networks, deep learning), unsupervised learning algorithms (K-means, principal component analysis), as well as learn about specific applications such as anomaly detection and building recommender systems. This class is taught in the flipped-classroom format. You will watch videos and complete in-depth programming assignments, online quizzes, problem sets at home and then come to class for discussion sections. This class will culminate in an open-ended final project, which the teaching team will help you on.

Logistics

Prerequisites: Basic programming skills such as cs106a, basic probability, and basic linear algebra such as Math 51.

Grade breakdown:

- Problem Sets: 20%
- Programming Assignments and Quizzes: 25%
- Attendance: 5% (you can miss one section for free)
- Midterm: 25%
- Project: 25%

Note: The first day of class starts on Monday April 8th, 2019 in 200-002.

Late day policy: Homeworks for this class can be divided in two categories:

- Coursera related (Programming Assignments, Quizzes): no late days allowed and are due on Sundays at 11:59 pm.
- Problem Sets and Project related items: you will submit 3 Problem Sets, 1 Project Proposal, 1 Project Milestone, 1 Project Final Report and 1 Project Poster. The Project Final Report and the Project Poster are due on Gradescope on Sunday June 9th, 2019 at 11:59 pm. All the other submissions will be due on Gradescope at 11:59pm on Tuesdays. You have three late days over the quarter.
Late days extend the deadline by one calendar day. Late days cannot be used on the Project Final Report/Project Poster. Elements submitted after the late day will not be graded. You can not use two late days on the same assignment.

**Logistics:** Here are some logistics guidelines to ensure a smooth quarter.

- **Grading:** the class uses Gradescope to grade Problem Sets and Projects. Enroll using code **97X45B**
- **Question:** the class uses Piazza for questions and answers regarding the material and logistics of the class.
- **Deadlines:** the Syllabus (this document) is the reference of the class for deadlines, class policies, late days, grades, ... It supersedes every other source of information.
- **Administrative requests:** for administrative requests (OAE requests, alternate midterm, ...), email Younes

**Review Session:** Thursday May 23\textsuperscript{rd}, 2019 (5:00-6:00pm, location: Shriram 104)

**Midterm:** Friday May 24\textsuperscript{th}, 2019 (5:00-6:30pm, location: 320-105)

**Final Project Presentation:** Monday June 10\textsuperscript{th}, 2019 (3:30-6:30pm, location: AT&T Patio)

**Office Hours** (location: Huang Basement):

- Younes 11-1 pm on Mondays
- Paul 5-7 pm on Wednesdays
- Michael 9-11 am on Thursdays and 2-4 pm on Fridays.

*Note:* 3 sections will be proposed every week. All sections will cover the same content, but you should stay in one throughout the quarter. Deadlines remain the same no matter what section you are attending. The syllabus is divided by sections and mentions only the first one (Monday). However, the same thing applies to all sections. For the first day of class we are all meeting on Monday April 8\textsuperscript{th}, 2019 in 200-002. For the following weeks, you will be assigned to a section. If you can not make it to a section let us know and we will assign you to a different one. Section assignments will be sent out on week 2 of the quarter.

**Section Times:**

- Monday 1:30-2:50 pm in 380-380D
- Tuesday 1:30-2:50 pm in Little Field 107
- Wednesday 1:30-2:50 pm in 200-203

**Session 1: Monday April 8\textsuperscript{th} 2019**

**Content:** Overview of Machine Learning and models

**Homework:** Week 1 & 2 on Coursera due **11:59pm Sunday April 14\textsuperscript{th} 2019**

- **Quizzes:** Introduction, Linear regression with one variable, Linear algebra, Linear regression with multiple variables, Octave/Matlab tutorial.
- **Programming Assignments:** Linear regression (both assignments including optional)
Session 2: Monday April 15th 2019 (applies to all sections)

Content: Linear regression
Homework: Week 3 on Coursera due 11:59pm Sunday April 21st 2019
  • Quizzes: Logistic regression/Regularization
  • Programming Assignments: Logistic regression

Problem Sets: Problem Set 1 released

Session 3: Monday April 22nd 2019 (applies to all sections)

Content: Logistic regression, Regularization
Homework: Week 4 on Coursera due 11:59pm Sunday April 28th 2019
  • Quizzes: Neural Networks
  • Programming Assignments: Multi-class classification, Neural Networks

Session 4: Monday April 29th 2019 (applies to all sections)

Content: Neural Networks
Homework: Week 5 on Coursera due 11:59pm Sunday May 5th 2019
  • Quizzes: Neural network learning
  • Programming Assignments: Neural network learning

Problem Sets: Problem Set 1 due 11:59pm Tuesday April 30th 2019
Problem Sets: Problem Set 2 released

Session 5: Monday May 6th 2019 (applies to all sections)

Content: Neural Networks
Homework: Week 6 on Coursera due 11:59pm Sunday May 12th 2019
  • Quizzes: Advice for applying Machine Learning, Machine learning system design
  • Programming Assignments: Regularized linear regression and Bias/Variance

Project: Project Proposal due 11:59pm Tuesday May 7th 2019
Problem Sets: Problem Set 3 released

Session 6: Monday May 13th 2019 (applies to all sections)

Content: Bias/Variance
Homework: Week 7 & 8 on Coursera due 11:59pm Sunday May 19th 2019
  • Quizzes: Support Vector Machines, Unsupervised Learning, Principal Component Analysis
  • Programming Assignments: Support Vector Machines, K-means clustering and PCA

Problem Sets: Problem Set 2 due 11:59pm Tuesday May 14th 2019
Session 7: Monday May 20th 2019 (applies to all sections)

Content: Support Vector Machines, Principal Component Analysis, K-Means Clustering
Homework: Week 9 on Coursera due 11:59pm Sunday May 26th 2019
  • Quizzes: Anomaly Detection, Recommender Systems
  • Programming Assignments: Anomaly Detection, Recommender Systems

Midterm: Midterm is on Friday May 24th from 5:00 - 6:30 pm
Problem Sets: Problem Set 3 due 11:59pm Tuesday May 21st 2019

Session 8: Monday May 27th 2019 (applies to all sections)

Content: Advice on Machine Learning systems
Homework: Week 10 & 11 on Coursera due 11:59pm Sunday June 2nd 2019
  • Quizzes: Large scale Machine Learning, application photo OCR
  • Programming Assignments: None

Project: Project Milestone due 11:59pm Tuesday May 28th 2019

Session 9: Monday June 3rd 2019 (applies to all sections)

Content: Maintaining Machine Learning Systems and Career Advice
Final Project Presentation: June 10th 2019 (3:30-6:30pm, location: ATT Patio)
Project: Project Final Report & Project Poster due 11:59pm Sunday June 9th 2019