CSC 599.70: Introduction To Data Science

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Class Hours: Monday 6:30-9pm
Class Room: NAC 5-123 / 7-106

Course Description

This course consists of a survey of analytical tools and concepts in data science, with goal of equipping students with an understanding of the best practices used by professional data scientists and analysts in top companies in technology, finance, and media. The course begins with an overview of fundamentals in data handling and exploratory data analysis, followed by an introduction to core concepts in statistical modeling and machine learning, and concludes with a brief introduction to advanced concepts in data science.

Students will work with a wide variety of real world data sets throughout the course in order to gain hands on experience. Emphasis will be placed on frequent practice through writing and reviewing code each week. In addition, students will be assigned and expected to discuss short reading assignments ranging from academic reviews of popular topics in analytics as well as data science and engineering blog posts from companies such as Airbnb, Facebook, and Spotify. Tasks and readings will aim to demystify the work of data teams in the real world, and familiarize students with the concepts and resources needed to secure and succeed in analytical roles.

Prerequisites/Corequisites

Prerequisites: Intro to Programming (CSc102/103) or equivalent and Probability and Statistics (CSc217). The course assumes profiency in basic programming paradigms, data structures, and statiscal concepts. Students will also need a basic profiency in the *Python* computing language to be acquired independently in the early weeks of the course.

Course Objectives

Through this course, students should be able to:

1. Explain the key steps in a data science project.
2. Apply Python to load, clean, and process data sets.
3. Identify key elements of and patterns in a data set using computational analysis and statistical methods.
4. Explain and visualize empirical findings using with Python and other resources.
5. Explain fundamental principles of machine learning.
6. Apply predictive algorithms to a data set.
7. Work effectively in a team dedicated to analyzing data.

Course Policies

Grading

Element	Weight
Group Project	30%
Homework / Quizzes	30%
Midterm Exam	30%
Attendance / Class Partipation	10%

Project

The bulk of the course grade will be a group project that will be due in the final class on May 13. Students will be expected to work on the project throughout the semester and will be required to provide evidence of their progress. Grades will be assigned on the basis of overall project quality, demonstration of core principles taught in the class, and individual contributions to the group's effort. More details on the course project will be announced in the first weeks of the course.

Assignments

This class includes short, frequent assignments to check comprehension. All assignments and quizzes will be graded on a 10-point scale. All quizzes will be announced in advance of class.

- **No late assignments accepted**. Assignments not turned in by the set deadline will be scored as 0/10. Exceptions will be granted only as mandated by CUNY policy.
- **Worst two assignments dropped**, includes missed assignments.

Exam

A short midterm exam will be held in late March and will focus on broad concepts the course has surveyed thus far. The format will mimic the style of questions frequently asked in interviews for data-related roles.

Participation

Students are expected to attend class and be active participants in discussion. This includes, but is not limited to, discussing assigned readings and videos and sharing ideas during classroom exercises.

Deadlines

Projects and homeworks must be turned in on time, with exceptions and extensions only granted in extraordinary circumstances as outlined by College policy. Students are expected to use their ability to drop the lowest two homeworks and quizzes judiciously.

Resources

Students are expected to have:

- A Github account (free account ok).
- A DataCamp account. Educational access is available free of charge and will be provisioned by the second week of class.
- Access to a cloud-based Jupyter notebook service. Examples include Binder, Google Colaboratory, and Microsoft Azure.
- *Recommended*: Access to a computer with a standard data science stack installed, including Anaconda Python 3.6 or greater and Jupyter.

Recommended Texts and Materials

- **Required Text**: *Data Science from Scratch*, Joel Grus. 2nd Edition, April 2015 (O'Reilly). Available online.
- **Additional required readings and videos** will be made available to students in advance of each week's assignments. All will be availble online at no cost.
- In addition to the required materials, students may find the following resources helpful in supplementing course materials:
  - **Recommended Text**: *Python for Data Analysis*, Wes McKinney. 2nd Edition, October 2017 (O'Reilly). Available online.
  - **Recommended Text**: *Elements of Statistical Learning*, Trevor Hastie, Robert Tibshirani and Jerome Friedman. 2nd Edition, 2009 (Springer). Available free online here.

Tentative Schedule: Spring 2019

Subject to revision. Latest version available on the course page.

Week	Date	Topic
1	January 28	Course Intro: What is Data Science and Why Does It Matter?
2	February 4	Data Exploration 1: How to Get Data
3	February 11	Data Exploration 2: Processing and Cleaning Data
4	February 25	Data Exploration 3: Statistics and Stories We Tell Ourselves
5	March 4	Models 1: Intro to Regression and Classification
6	March 11	Models 2: Regression and Classification, Part 2
7	March 18	ML 1: Trees, Bias vs. Variance Tradeoffs
8	March 25	Midterm, Project Workshop
9	April 1	ML 2: Performance Evaluation and Ensemble Models
10	April 8	ML 3: NLP, Text as Data, and Bayes Rule
11	April 15	ML 4: Unsupervised Learning
12	April 29	TBD
13	May 6	TBD
14	May 13	Project Presentations and a Discussion of Life in Data

CUNY Policy on Academic Integrity

The CUNY Policy on Academic Integrity is available here. The policy, as adopted by the Board, is available to all students. Academic dishonesty is prohibited in the City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion.

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students with disabilities seeking accommodations and/or support services at The City College of New York are required to register with the AccessAbility Center/Student Disability Services (AAC/SDS). For more information, visit www.ccny.cuny.edu/accessability.