

New York University Tandon School of Engineering

Department of Finance and Risk Engineering

FRE6871 – *R Advanced tools for data science* (1.5 Units)

Spring 2024

Professor Jason Yarmish

Mondays 6:00pm-8:41pm; 1/22/2024 – 3/11/2024

[Jan: 22, 29 ; Feb: 5, 12, 26 ; Mar: 4, 11]

2 MetroTech Center, Room 845

To contact professor: Yarmish@nyu.edu

Course description

This course focuses on the use of R to understand the foundations of machine learning and data mining with a special focus on financial data.

Students will learn about accessing, cleaning, annotating, summarizing, visualizing and modeling data, presenting results and how to find and learn new libraries to fit project specific needs.

Students will write code and do code reviews. They will study and run code from the text and will learn the subject matter from multiple angles. There will be a quiz each class testing material from the previous class. We will be covering a broad range of programming, probability and statistics so prior knowledge of these areas will be helpful.

We will learn statistical tools used to clean and describe data. Students will learn a variety of topics including how to do regressions, classification, clustering, principal component analysis working with financial time series and more.

Required weekly homework, code review, interactive tutorials readings and more will be available via our online classroom.

Required Textbook

Title: R in Action - Data Analysis and Graphics with R

Publisher: Manning Publications; 2nd edition

Author: Dr. Rob Kabacoff

ISBN-13: 978-1617291-38-8

ISBN-10: 1-617291-38-2

Class Readings

Textbook

Distributed Materials

Grading

Quizzes:	50%
Homework & participation:	20%
Final Project:	30%

Tentative course outline

Week	Topics
1	Introduction to R Creating a dataset Getting started with graphs
2	Basic data management Advanced data management Basic Graphs
3	Basic Statistics Regression Analysis of variance
4	Intermediate Graphs Resampling statistics and bootstrapping Generalized linear models
5	Principal components and factor analysis Time Series Advanced methods for missing data
6	Cluster analysis Classification
7	Performance Analytics Create performance charts Create a monthly returns table Calculate monthly statistics Compare distributions Show relative return and risk Examine performance consistency Display relative performance Measure relative performance to a benchmark Calculate Downside Risk

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at [212-998-4980](tel:212-998-4980) or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.

Inclusion statement:

New York University values an inclusive and equitable environment for all our students. We hope to foster a sense of community in our class and consider it a place where all individuals will be treated with respect. The needs of all students will be addressed both in and out of class. Note that the diversity that students bring to this class is a resource, strength, and benefit. As with all class questions or issues, if you feel these standards are not being upheld, please let me know. Looking forward to learning together this semester.

NYU School of Engineering Policies and Procedures on Academic Misconduct

- A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.
- B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
 2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
 3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
 4. Unauthorized collaboration: working together on work that was meant to be done individually.
 5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
 6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.