FIN 420: Financial Analytics

SYLLABUS

SUNY POLYTECHNIC INSTITUTE
SCHOOL OF BUSINESS ADMINISTRATION

Instructor: Matthew Brigida, Ph.D.

Office: Donovan 1277

Office Hours: Two hours before each class.

Email: matthew.brigida@sunyit.edu

Class Location: Online

Class Day/Time: Wednesdays 6:00–9:30pm

Supplementary Texts/Materials:

- Advanced R, by Hadley Wickam (`http://adv-r.had.co.nz/`)
- Financial Education
- 5-Minute Finance

1 Description

An overview of analytical methods used in finance, and their applications. Particular focus will be paid to methods for handling large data sets used in high-frequency trading, and machine learning and artificial intelligence methods applied to banking, investments, and energy markets.

1.1 Course Learning Outcomes & Objectives

- CLO 1. Technical Competence: Adept in applying analytics technology to solve institutional problems and enable effective financial decision making.
- CLO 2. Analytical Problem Framing: Demonstrate individual capacity to evaluate and deploy analytical methods selected from a diverse portfolio of tools analyze and manage common financial decisions.
- CLO 3. Strategic and Integrative Thinking: Understand the baseline resources available for analyzing and managing a firm's financial performance. Including collecting data, processing information and evaluating and communicating outcomes with partners; differentiate between the accounting function as a preparer of data and information and the finance function as a user of information for decision making and the role of ethics in the process.
- CLO 4. Leadership and Communication: Be capable of expressing key concepts and terms commonly used in financial analytics; by using effective written, oral and interpersonal communications to contribute to the financial performance of financial firms.

2 Course Outline

2.1 Week 0

- Course Overview:
  - What we will cover in the course.
  - The use of Python in finance.

2.2 Week 1

- Python Relative to other tools.
  - Excel
  - Other Programming Languages
  - Comparison with R
  - Using Javascript for Visualization

2.3 Week 2

Colab Notebook

- You are on a Linux Server
- Interacting with Python
  - Google's Colab and Jupyter
    - Introduction to markdown
    - Sharing notebooks
- Creating Functions and Time-Value-of-Money calculations
- Basic control flow
  - The importance of indentation

2.4 Week 3

Colab Notebook

The Python ecosystem.

- An Introduction to Useful Packages:
  - Pandas
  - Numpy
  - Scipy and Scikit Learn
  - Pytorch
  - Tensorflow and Keras
- Finding Packages
  - pip
- Python Packages
  - Extending the core language
  - Our most used packages.
  - Installing and Loading.
  - How to call methods/functions from a package.
- Python Classes and Object Orientation
  - What is a Class
  - Function vs Method: methods are functions attached to a class

2.5 Week 4

Colab Notebook

- An intro to Pandas
- Reading csv and excel files.
  - Locally and over the web.
- Inspecting the objects
- Determining dataframe size and the column types.
- Adding new columns

2.6 Week 5

Colab Notebook

2.7 Week 6

Colab Notebook

2.8 Week 7

Colab Notebook

- An introduction to Application Programming Interfaces (APIs) and online data
  - Example: Coinbase API
  - Example: Interactive Brokers API
  - EIA API.
- Connecting to databases.

2.9 Week 8

Colab Notebook

- An overview of scipy and basic statistics in Python.
  - Extracting coefficients from an estimated regression model.

2.10 Week 9

Colab Notebook

2.11 Week 10

The previous sections have used data available online through APIs and simple files. Commonly the financial analyst will have to query relational (SQL) databases. In this section we'll cover the basics of connecting to a SQL database in Python, and executing SQL queries. The resulting data table will, of course, be imported back into Python.

- Good website to learn SQL (MySQL): db-fiddle

2.12 Week 11

Colab Notebook

- Visualization:
  - Matplotlib
  - Seaborn
  - Plotly
  - ggplot (using plotnine library)
- Interactive Web Apps via Plotly's Dash

2.13 Week 12

- The Integrated Development Environment (IDE)
  - What does an IDE provide?
    - Code Completion
    - Linter
  - Git/Github and IDE Integration

2.14 Week 13

- Git/Github and IDE Integration
  - Why use version control?

        * Collaborate with others more easily.
        * Show others your work.
    - Github from Colab
    - Virtual Environments
        - Ensuring compatible python and package versions.
        - Anaconda Python

2.15 Bonus Project: The Pairs Trade

2.16 Bonus Project: Classify Failed Banks with a Deep Neural Network

2.17 Algorithm Identification in High-Frequency Markets

2.18 Determining the Effect of Bank Capital Adequacy Requirements

2.19 Bank Stress Testing

2.20 Machine Learning in Portfolio Construction

2.21 Constructing an Artificial Intelligence Investment Advisor

3 Exams

There will be two brief exams—a midterm and a final.

4 Attendance/Participation

Throughout the semester I will take attendance, give unanounced quizzes, and otherwise evaluate your participation. Failure to attend class and participate will reduce your participation score, unless your absence is due to a **verifiable** medical or family emergency. In such a case you must provide documentation.

5 Grading

Item	Points
Assignments	60
Midterm	10
Final Exam	10
Attendance/Participation	20
Total Points	100

Final grades will be assigned according to the A+, A, A-, etc scale.

5.1 An Important Note on Grading

There is no special consideration if you need a certain grade in this course to graduate. **If you require a certain grade in this class to graduate it is your responsibility to earn that grade.** Specifically if you receive a 'D' in this course I will not allow you to do extra assignments after the course is complete in exchange for a higher grade.

6 How To Ask Questions

See this post.

7 Email Communication

Questions about course material should be posted to the most relevant discussion board. Email should only be used for personal matters. When sending an email, be sure to put the course in the subject line (FIN 420).

8 Guidelines and Accommodations

Academic Integrity Policy Students Enrolled in this course are required to understand and fully comply with all aspects of the Academic Integrity Policy as described in the SUNY Polytechnic Institute Handbook (available at: `https://sunypoly.edu/pdf/student_handbook.pdf`)

8.1 Accommodations for Students with Disabilities

Students with disabilities are welcome at SUNY Polytechnic Institute. The Disabilities Services Office is located in the Career Services Suite, B101, Kunsela Hall Hours: Monday through Friday 8:30 a.m. – 4:30 p.m. or by appointment. E-mail: suzanne.sprague@sunyit.edu Phone: (315) 792-7170

Any current or prospective student may contact our office to discuss potential academic accommodations. Typical accommodations include extended time for testing, testing in a quiet location, textbooks in alternate format, and others as determined by the nature of the disability. These accommodations must be supported by documentation from outside sources, such as a recent psychological evaluation or medical report that clearly identifies the nature of your disability and the impact of your disability or treatment upon learning. (SUNY Poly is not responsible for providing evaluation or funding to complete the needed documentation.)

The Disabilities Services Office will assist with requesting the required documentation or exploring resources that may provide testing or documentation. Once documentation is received, the Disability Counselor meets with the student to discuss the information based on his or her experiences and perspective. A student's explanation of how his or her disability affects learning and what accommodations are needed is extremely important. Once a determination is made regarding the reasonable and appropriate accommodations, a plan is written which students sign and share with instructors. This plan does not disclose the nature of the disability, although many students have found that discussing their circumstances with faculty can be helpful.

Accommodations are implemented to ensure compliance with the Americans with Disabilities Act of 1990 (ADA) and Section 504 (subsection E) of the Rehabilitation Act. The intent of which is to provide access for otherwise qualified persons. SUNY Poly is not required to lower or substantially modify essential academic requirements, or make modifications that would fundamentally alter the nature of a service, program, or activity or that would result in an undue financial or administrative burden. Additionally, accommodation plans must be updated each semester.

The Disabilities Services Office is happy to advocate or coordinate with outside service providers, by student request and with written consent to communicate. Parents should be aware that legal rights and responsibilities change from high school to the college, both in terms of the type of support provided and in terms of parental involvement in the process. Students are solely responsible for self-identifying and following up with our office for

any needs that they may have. Any student who wishes to have our office communicate with a parent must sign a written consent for permission to communicate.

8.2 Course Syllabus Disclosure Statement Spring 2020

Accommodations for Students with Disabilities

In compliance with the Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act, SUNY Polytechnic Institute is committed to ensuring comprehensive educational access and accommodations for all registered students seeking access to meet course requirements and fully participate in programs and activities. Students with documented disabilities or medical conditions are encouraged to request these services by registering with the Office of Disability Services. For information related to these services or to schedule an appointment, please contact the Office of Disability Services using the information provided below.

Evelyn Lester, Director Office of Disability Services lestere@sunypoly.edu (315) 792-7170

Utica Campus Peter J. Cayan Library, L145

Albany Campus Suite 309, Students Services Office NanoFab South