



FA 590 Statistical Learning in Finance

School of Business
Fall 2026

Instructor: Zonghao Yang

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Office: Room 515F, Altorfer Hall

Office Hours: By appointment only

Course Schedule: Tuesday, 3:30 PM – 6:00 PM

Classroom Location: Babbio 432 (Hanlon Financial Systems Lab)

Course Website: <https://ml-in-finance.vercel.app/fa590>

Teaching Assistant: Hao Fu (hfu11@stevens.edu)

Prerequisite(s): None

Corequisite(s): None

Cross-listed with: None

COURSE DESCRIPTION

This course offers a comprehensive overview of both classical and modern statistical learning methods with a strong emphasis on their application in finance. The classical approaches covered include linear regression, logistic regression, and k-Nearest Neighbors (k-NN), providing foundational tools for prediction and classification. The course will also explore modern methods such as decision trees, ensemble techniques (boosting and bagging), support vector machines, and neural networks, as well as advanced topics like model assessment, feature selection, and unsupervised learning techniques like clustering. Throughout the course, students will apply these methods to real-world financial datasets, gaining hands-on experience in statistical learning as it pertains to asset pricing, portfolio optimization, and other key areas in finance.

STUDENT LEARNING OUTCOMES

The objective of this course is to equip students with a comprehensive understanding of various statistical learning models and their applications in finance. Through a combination of lectures, coding assignments, and applied projects using real-world financial data, students will gain both theoretical knowledge and practical experience in implementing these models.

After successful completion of this course, students will be able to:

- Explain the foundations of statistical learning, including key terminology, algorithmic mechanisms, and techniques for model evaluation and selection.
- Apply statistical learning models and analytical methods to financial datasets, with applications in credit risk assessment, stock price prediction, and portfolio optimization.

- Recognize the strengths and limitations of statistical learning algorithms in addressing financial and business problems.
- Design, implement, and present a comprehensive data-driven project that applies statistical learning techniques to large-scale financial data.

PREREQUISITES

A quantitative background is required, including knowledge of probability, statistics, and calculus. Prior programming experience in languages such as Python or R is highly recommended. Students without programming experience may still enroll in the course but should anticipate challenges in completing assignments and the project. Such students are expected to be highly motivated and willing to acquire the necessary programming skills as the course progresses.

COURSE FORMAT AND STRUCTURE

This course is hybrid: it is offered in both an on-campus section and an online section. On-campus students meet in Babbio 432 (Hanlon Financial Systems Lab); online students join the same live session by Zoom at the scheduled class time. Both sections follow the same schedule, use the same materials, and are assessed on the same basis. To access the course, please visit stevens.edu/canvas. For more information about course access or support, contact the Technology Resource and Assistance Center (TRAC) by calling 201-216-5500.

Course Logistics

- The course week runs Tuesday to Monday. Slides, lecture notes, and any supporting material for a given week will be posted on Course Website before class.
- Unless stated otherwise on the assignment itself, work is due by **3 PM** Eastern Time on the date listed in the course schedule. Due dates and delivery deadlines are in Eastern Time (as used in Hoboken, NJ); students in other time zones must comply with this policy.
- All assignments and the final project are submitted through Canvas, unless stated otherwise on the assignment itself.
- Assignment files should be appended with your Stevens username, for example “assignment1_jdoe.ipynb”.
- Any changes to the schedule below will be announced in class and posted as a Canvas announcement.

Instructor Availability by Email

I will respond to email as soon as I am available, generally within 24–48 hours on weekdays. When emailing me, please place the course number and topic in the subject line (for example, “FA 590 – Assignment 2 question”). For questions of general interest, please use the Canvas discussion forum so that the whole class benefits from the answer.

Office Hours

Office hours are held by appointment only. Please email the instructor to arrange a time; appointments can be held in person at the instructor’s office (Room 515F, Altorfer Hall) or over Zoom, whichever suits you better.

Classroom and Online Etiquette

Your instructor and fellow students wish to foster a respectful learning environment, in the classroom and on Canvas alike. All opinions and experiences are to be respected in the spirit

of academic discourse. You are encouraged to comment on, question, or critique an idea, but not to attack an individual. Please keep in mind that sarcasm and humor are easily misread in written communication.

- Do not dominate a discussion; leave room for others to contribute.
- Present ideas appropriately and avoid offensive language.
- Keep an open mind and be willing to express a minority opinion.
- Think and edit before you send.
- Do not hesitate to ask for feedback.

TENTATIVE COURSE SCHEDULE

Week #	Date	Topic	Reading	Notes
1	Sep 1	Introduction I	Chapter 1 and Chapter 2, ISL	
2	Sep 8	Introduction II		
3	Sep 15	Regression Models: Linear Regression	Chapter 3, ISL	• Assignment 1
4	Sep 22	Regression Models: Applications	Chapter 6, ISL	
5	Sep 29	Classification Models: Logistic Regression	Chapter 4, ISL	• Quiz 1: Linear Regression
6	Oct 6	Model Assessment and Selection	Chapter 5, ISL	• Quiz 2: Logistic Regression • Assignment 1 Due • Assignment 2
7	Oct 13	<u>NO CLASS</u>		• Monday class schedule
8	Oct 20	Classification Models: Support Vector Machines	Chapter 9, ISL	• Quiz 3: Model Assessment and Selection
9	Oct 27	Regression and Classification Trees	Chapter 8, ISL	• Assignment 2 Due • Assignment 3
10	Nov 3	Bagging, Random Forests, Adaboost	Chapter 8, ISL	• Quiz 4: SVM and Decision Tree
11	Nov 10	Neural Networks	Chapter 10, ISL	• Quiz 5: Tree-based Algorithm • Assignment 3 Due
12	Nov 17	Portfolio Choice for Online Loans		• Quiz 6: Neural Networks
13	Nov 24	Unsupervised Learning	Chapter 12, ISL	• Deadline for Final Project (Nov 27)
14	Dec 1	Statistical Learning for Unstructured Data		
15	Dec 8	Discussion and Summary		

Note. The above schedule is subject to change. Students will be notified beforehand of any significant changes. ISL is short for the textbook *An Introduction to Statistical Learning*.

COURSE MATERIALS

Textbook

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, and Jonathan Taylor. *An Introduction to Statistical Learning with Applications in Python*. Springer, 2023.

Other Readings

Trevor Hastie, Robert Tibshirani, and Jerome Friedman. *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*. Second Edition. Springer, 2013.

John C. Hull. *Machine Learning in Business*. Third Edition. 2021.

Marcos López de Prado. *Advances in Financial Machine Learning*. First Edition. Wiley, 2018.

Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning*. MIT Press, 2016.

Materials

A set of lecture notes will be given as the course progresses. These handouts will be very useful to conduct computations and address the underlying tasks from the coding assignments and projects. They will, however, only serve as a complement to the textbook and should not, by any means, be treated as a substitute.

COURSE REQUIREMENTS

Attendance and Engagement

Active participation in the course is expected. Students may miss up to three lectures without informing the instructor and still receive full credit. For each additional lecture missed beyond this allowance, 2 points will be deducted from the final grade.

Assignments

There will be three coding assignments, each contributing 10% to the final grade. These assignments are designed to provide hands-on experience in modeling and analysis, while also familiarizing students with various finance-specific applications. Assignments are released and submitted through Canvas on the dates listed in the course schedule.

Quizzes

There will be six quizzes throughout the semester, each contributing 5% to the final grade. The quizzes are designed to check understanding and knowledge about the course content.

Final Project

The final project asks students to design, implement, and present a data-driven analysis that applies statistical learning techniques to large-scale financial data. Students are encouraged to work in groups of up to three members; all group members will receive the same grade. Detailed requirements and the assessment rubric will be distributed on Canvas.

Critical Thinking

Critical thinking is assessed through coursework to encourage creativity and depth of thought. Each assignment is worth 1 bonus point and the final project is worth 2 bonus points, with emphasis on innovative approaches and thoughtful solutions.

Exams

There is no midterm or final exam in this course. Assessment is based on the components listed above.

TECHNOLOGY REQUIREMENTS

Baseline technical skills

- Basic computer and web-browsing skills
- Navigating Canvas

Technology skills necessary for this specific course

- Programming in Python, including the use of Jupyter notebooks
- Working with data using pandas, NumPy, and scikit-learn
- Joining and participating in a live session using Zoom (online section)
- Preparing and delivering a slide presentation of project results

Required Equipment

- Computer: current Mac (macOS) or PC (Windows 10+) with a high-speed internet connection
- Webcam and microphone: built-in or external, fully installed (online section)

Required Software

- Python 3.x with Jupyter, via the Anaconda distribution or Google Colab
- Zoom
- Microsoft Word, Excel, and PowerPoint, or equivalent

GRADING PROCEDURES

Grades will be based on:

Type	Weight
Assignments	30%
Quizzes	30%
Final Project	30%
Engagement	10%
Bonus Points: Critical Thinking	5%
Total	100% (+5%)

Late Policy

Assignments must be submitted by the stated deadline. Late submissions are not permitted unless an extension is approved by the instructor in advance. To request an extension, you must contact the instructor **before the deadline** with a valid reason. If an extension is approved, a penalty of **5% per day** will be applied to the assignment's score. No submissions will be accepted more than **7 days after the original deadline**.

Academic Integrity

Generative AI Technologies

ChatGPT and other generative AI (GenAI) tools are allowed and encouraged in this course. However, you should be aware that the material generated by GenAI may be inaccurate, incomplete, or otherwise problematic. You need to disclose, in each assignment and in the final project, how you have used GenAI, and to reflect on and summarize good use cases of GenAI, if any. Using GenAI without disclosing it is considered plagiarism and will be dealt with under relevant Stevens policies.

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at the Honor Code site (<https://stevens0.sharepoint.com/sites/TheStevensHonorBoard/>).

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found on the Graduate Academic Integrity Site (<https://www.stevens.edu/academics/graduate-study/academic-integrity>).

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Senior Vice Provost for Graduate Education or to the Honor Board, who will refer the report to the senior vice provost. The Honor Board Chairman will give the Senior Vice Provost for Graduate Education weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

ACCOMMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other disabilities to help students achieve their academic and personal potential. They facilitate equitable access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/student-diversity-and-inclusion/disability-services>. If you have any questions please contact the Office of Disability Services at disabilityservices@stevens.edu or by phone: 201.216.3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

Name and Pronoun Usage

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your pronouns and/or name, please inform the instructor of the necessary changes.

Religious Holidays

Stevens is a diverse community that is committed to providing equitable educational opportunities and supporting students of all ethnicities and belief systems. Religious observance is an essential reflection of that rich diversity. Students will not be subject to any grade penalties for missing a class, examination, or any other course requirement due to religious observance. In addition, students will not be asked to choose between religious

observance and academic work. Therefore, students should inform the instructor at the beginning of the semester if a requirement for this course conflicts with religious observance so that accommodations can be made for students to observe religious practices and complete the requirements for the course.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments can be made by phone (201-216-5177), online at <https://stevensportal.pointnclick.com/confirm.aspx>, or in person on the 2nd Floor of the Student Wellness Center.

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about your own safety or the safety of someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year-round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is not urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.