

FIN*4000
Advanced Topics in Finance
Winter 2025
0.5 Credits

General Course Information

Instructor: Fred Liu
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Office Location MacKinnon 714
Office Hours TBA
Department/School Department of Economics and Finance

Class Schedule: Tuesday, Thursday 5:30PM - 6:50PM

Pre-requisites: **ECON*3710, ECON*3740**, (1 of ECON*3100, ECON*3810, ECON*4700), (2 of ECON*3360, ECON*3660, ECON*3760, ECON*3860, ECON*3960, FARE*4240, FIN*3000, FIN*3100, FIN*3200, FIN*3300, FIN*3400, FIN*3500)

Restrictions:

Course Description

Machine Learning for Economics and Finance

Machine learning is having an increasing impact in economics and finance. Examples of areas where it has been applied are credit decisions, private equity, algorithmic trading, fraud detection, understanding customer behavior, hedging, and asset management. Additionally, machine learning is now part of the Chartered Financial Analyst (CFA) curriculum.

This course will introduce students to the tools of machine learning with an emphasis on their applications in economics and finance. After taking this course, students will gain a rigorous understanding of many state-of-the-art machine learning algorithms, including those tested on the CFA.

Students will learn enough about machine learning to be able to work productively as financial analysts or data scientists. This is likely to be an essential skill for economics and finance professionals in the future. The course will cover the main techniques used by data scientists to handle large data sets for prediction in a changing environment. In this course, students will gain hands-on experience using Python to analyze real economics and finance data. Python is widely used in the finance and technology sectors and is particularly useful for handling large data sets (Python is the new Excel). Students are not expected to be familiar with Python prior to taking this course.

Summary of Course Content and Materials

- Introduction: ISL Ch. 1
- Introduction to Python
- Introduction to Machine Learning: ISL Ch. 2, Ch. 5
- Linear regression: ISL Ch. 3
- Regularization: ISL Ch. 6
- Classification: ISL Ch. 4
- Natural Language Processing
- Tree-Based Methods: ISL Ch. 8
- Support Vector Machines: ISL Ch. 9
- Deep Learning: ISL Ch. 10
- Academic Research in Financial Machine Learning
- Select Topics from: Model Interpretability, Data Visualization, Apache Spark, Git, Unsupervised Learning (ISL Ch. 12)

Course Assessment

			Due Date/ location
Assessment 1:	30%	Ten assignments worth 3% each.	To be posted on CourseLink.
Assessment 2:	30%	Midterm	Feb. 25 in class
Assessment 3:	10%	Capstone Project	April 4
Assessment 4:	30%	Final Exam	See exam schedule
Total	100%		

Assignments

There will be ten problem sets assigned throughout the semester. The purpose of the problem sets is to help you monitor your progress and assist you in mastering the methods so that you will be able to complete the Capstone Project. Students are encouraged to collaborate on the problem sets; however, each student must write and submit their own answers.

Capstone Project

Your capstone project is an opportunity for you to explore an interesting machine learning problem of your choice in the context of a real-world economics or finance data set. You may work as an individual or as a group of two or three. Your capstone project must be about new things you have done this semester, you can't use results that you have developed in previous semesters.

Course Resources

Required Text:

1. “An Introduction to Statistical Learning with Applications in Python” (ISL) by James, Witten, Hastie, Tibshirani, and Taylor 2023. (Available free at <https://www.statlearning.com/>)
2. “The Elements of Statistical Learning, 2nd Edition” by Hastie, and Tibshirani, Friedman, 2009. (Available free at https://hastie.su.domains/ElemStatLearn/printings/ESLII_print12_toc.pdf)

Course Policies

Midterm

The midterm will be held in the lecture slot on the specified date in class. If the midterm exam is missed, then you must contact the instructor immediately. The midterm exam will not be rescheduled but depending on the circumstances the weight may be shifted to the final exam. For example, if only the midterm is missed, then the exam would have a new weight of 60%.

Final Exam

Please also note that the final exam is a cumulative exam. It covers the entire semester and all aspects of the course.

Grading Policies

Unless you have discussed an extension well ahead of the due date with the instructor, late penalties of 5% of the total grade earned per day (including weekends) will be assigned to any assessment (i.e. deducted from the total mark). Extensions will only be granted on the basis of valid medical or personal reasons, and need to be requested via email to the instructor as soon as possible. Late assignments will not be accepted once graded assignments have been returned officially to the class at large, unless circumstances permit and alternative arrangements have been made.

Students who find themselves unable to meet course requirements by the deadlines or the criteria expected because of medical or personal reasons, should review the regulations on academic consideration in the Academic Calendar and discuss their situation with the instructor, program counselor or other academic counselor as appropriate.

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-grds.shtml>

Missed Assignments:

A grade of zero will be assigned if you fail to submit an assignment, unless you are ill or have other compassionate reasons. Please read your Undergraduate Calendar for the regulations regarding illness and compassionate grounds. Please note, vacation travel, moving house, or outside work commitments will not be accepted as valid reasons for missing deadlines.

If you have religious observances which conflict with the course schedule or if you are registered with Student Accessibility Services, please contact the course instructor in order to make arrangements for your assessment if appropriate.

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Student Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email sas@uoguelph.ca or see the website: <https://wellness.uoguelph.ca/accessibility/>

Course Evaluation Information

Please refer to the [Blue by Explorance system](#).

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Drop date

The last date to drop one-semester courses, without academic penalty, is **Friday, April 4, 2025**. For regulations and procedures for Dropping Courses, see the Academic Calendar:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Equity, Diversity, and Inclusion Statement

At the Lang School of Business and Economics, we are committed to developing leaders with a social conscience, an environmental sensibility, and a commitment to their communities. A core tenet within this vision is that diversity is a strength with which we can experience greater connection and understanding.

As such, we affirm the importance and shared responsibility of our students, faculty, and staff creating and promoting equity and inclusion within our learning spaces. Creating these kinds of learning cultures is a process, not a destination; it requires ongoing willingness on the part of each person to thoughtfully and critically listen, unlearn, learn, and engage as they are exposed to a multitude of perspectives and lived experiences. We encourage dialogues between students and instructors to address and advance opportunities for fostering greater diversity and inclusion in the learning environment. Openness to conversations with each other enables us to reflect and grow as we learn from one another respectfully and holistically.

As a department that is training the professionals of the future, we expect our learning spaces to abide by all institutional policies and guidelines, in particular those outlined by the Office of Diversity and Human Rights and the [University of Guelph Human Rights Policy](#). Discrimination and harassment, as defined by our policies, will not be tolerated. Individuals should inform the appropriate party as per University policies if they experience any such behaviours.