Department of Mathematics & Statistics
Concordia University

MACF 491 (ACTU 491/STAT 380/MAST 679), Sec. H

Topics in Mathematical & Computational Finance:
Statistical Learning
Winter 2026

Instructor: Dr. Y. Lu
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Office Hours: TBA.

Class Schedule: Tuesdays and Thursdays, 11:45-13:00.
Note: There will be a mid-term break from March 2 to March 8.

Texts: *An introduction to statistical learning*, by G. James, D Witten, T. Hastie and R. Tibshirani, Springer. Available for free online at https://www.statlearning.com/

The elements of statistical learning, by J. Friedman, T. Hastie and R. Tibshirani, Springer series in statistics. Available for free online at https://web.stanford.edu/~hastie/ElemStatLearn/

Outline: This course is an introduction to statistical learning techniques. Some applications to data science will be illustrated. Topics covered include:

- Cross-validation
- Regression methods
  - Linear and non-linear models (GLMs, GAMs)
  - Variable selection methods
  - Shrinkage methods: ridge regression and LASSO
- Classification methods
  - K-nearest neighbors
  - Linear and quadratic discriminants
  - Logistic regression
  - Support vector machines
- Tree-based methods
- An introduction to neural networks
- Unsupervised learning
  - Clustering: K-means, hierarchical clustering
  - Principal component analysis

Evaluation: The total score is determined according to the following rule:
Undergraduate students: assignments (20%), mid-term exam (30%), and final exam (50%).
Graduate students: assignments (15%), mid-term exam (25%), term project (10%), final exam (50%).

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Final Exam: It will be scheduled by the Exams Office.

NOTE: Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office, **not** to your instructor. It is the Department's policy and the Examination Office's policy **that students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

CIA Accreditation: This course is required to access the Capstone examination from the accreditation program of the Canadian Institute of Actuaries (CIA) under the University Accreditation Program (UAP).

Student Services
You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

Behaviour
All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property
Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published

or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances
In the event of extraordinary circumstances and pursuant to the Academic Regulations the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.