

ACTU 491 (MACF 491/STAT 380/MAST 679), Sec. H
Topics in Actuarial Mathematics Statistical Learning
Winter 2025

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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 February 24 to March 2.

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.

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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.