Department of Mathematics & Statistics
Concordia University

> ### MACF 491 (STAT 497/MAST 679/MAST 881), Sec. H
> Topics in Mathematical & Computational Finance
> *Winter 2020*

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Office Hours: Monday and Wednesday, 10:30-11:30

Class Schedule: Monday and Wednesday, 8:45-10:00

Texts: *An introduction to statistical learning,* by G. James, D Witten, T. Hastie and R. Tibshirani, Springer. Available for free online at
http://faculty.marshall.usc.edu/gareth-james/ISL/

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 finance and insurance 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%), final exam (40%) and term project (20%).

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.

CIA Accreditation: This course is accredited by the Canadian Institute of Actuaries (CIA) under the University Accreditation Program (UAP). A grade of B+ or better in this course is needed to apply to the CIA for the exemption of Exam SRM. For more information, click here.

In addition to the university's internal policies on conduct, including academic misconduct, candidates pursuing credits for writing professional examinations shall also be subject to the Code of Conduct and Ethics for Candidates in the CIA Education System and the associated Policy on Conduct and Ethics for Candidates in the CIA Education System. For more information, please visit Obtaining UAP Credits and the CIA FAQ.

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: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2]*