Department of Mathematics & Statistics
Concordia University

MACF 491 (STAT 497/MAST 679/MAST 881), Sec. M

Topics in Statistics & Probability
Topics In Mathematics & Computational Finance
Topics in Mathematics & Statistics
Bayesian statistical modeling and data analysis
Fall 2025

Instructor: Dr. Junxi Zhang
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Class Schedule: Mondays and Wednesdays, 11:45-13:00 in room H 620 SGW.
Note: There will be a mid-term break from October 11 to October 17.

Office Hours: Mondays, 13:00-15:00.
Remote office hours are available through Zoom, by appointment.

Textbook: There will *not* be one main textbook for this course. Lectures will be based on different sources, including but not limited to the following textbooks:

A First Course in Bayesian Statistical Methods, by Peter D. Hoff, Springer, 2009. Available at https://link-springer-com.lib-ezproxy.concordia.ca/book/10.1007/978-0-387-92407-6

Bayesian Data Analysis, by Andrew Gelman, John B. Carlin, Hal S. Stern, David B. Dunson, Aki Vehtari, Donald B. Rubin, 3rd Edition, CRC Press. Available at https://learning-oreilly-com.lib-ezproxy.concordia.ca/library/view/bayesian-data-analysis/9781439898222/

An Introduction to Bayesian Analysis: Theory and Methods, by Jayanta K. Ghosh, Mohan Delampady, Tapas Samanta, Springer, 2009. Available at https://link-springer-com.lib-ezproxy.concordia.ca/book/10.1007/978-0-387-35433-0

Outline: This course is an introduction to Bayesian modeling in data science and machine learning, demonstrating how to perform inference about hypotheses from data. Topics covered include:

- Introduction to Bayesian decision-making
- Bayesian parametric methods and inferences
- Prior specification methods
- Bayesian computation methods
- Bayesian nonparametric inference
- Bayesian machine learning

The course will include extensive programming in R or Python.

Pre-requisites: STAT 249 or MAST 221 and STAT 360 or MAST 333. Previous experience with fundamental programming in R or Python is assumed.

Evaluation: Students will be evaluated based on homework assignments, a mid-term project, and a final project, according to the following grading scheme:

20% Homework + 30% Midterm exam project + 50% Final project.

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.

Plagiarism: Cases of plagiarism will be treated according to the University policy.

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.