



STAT 535C Statistical Computing, 2024 Term 1 Instructors: Benjamin (Ben) Bloem-Reddy and William (Will) Welch

Contents: Much could be covered, and the final choices are topics Ben and Will have found useful in their own research and their students'. The main themes are: errors in numerical computation; algorithms for matrix decompositions and updates; random numbers; Monte Carlo, including MCMC and Gibbs; cross-validation and bootstrap; profiling your code to identify bottlenecks; simulation experiments (your project?!); classical Newton-type optimization; practical concerns in optimization like multi-start; constrained optimization; more modern stochastic optimization methods, including Bayesian optimization.

What will not be covered: This will not be a course on how to use R (or python) packages for popular methods in statistics. While we will predominantly use R for implementation, it is not really a course about efficient programming in R either. Rather, we will emphasize the fundamentals of choosing algorithms for efficient computation in any language. A common theme will be “not everything is as it seems”, i.e., just because the math is set out in a particular way it doesn't mean computation should blindly follow that choice!

Textbooks: Please see the course schedule for selected chapters from a few texts. All are free online.

Website: canvas.ubc.ca

Assessment: 4 assignments, 10% each; project proposal 5%; project Part 1 5%; project Part 2 25%; final exam 25%. The project will likely be individual work.

Academic concession (From UBC and Faculty of Science Policy): You may need to request an academic concession for medical reasons, on compassionate grounds, or in certain cases of conflicting responsibilities. Please refer to UBC's policy on [Academic Concession](#) for details. To apply for an academic concession, please inform your Ben and/or Will as soon as possible.

If you are ill (From UBC and Faculty of Science Policy): Please don't come to class if you have an illness that could be transmitted to your classmates (e.g., a respiratory infection). In this class, grading is intended to provide flexibility so that you can prioritize your health and still succeed. Please inform your Ben and/or Will if you are ill and will miss a small number of classes due to illness. If you are ill for a long period of time, please contact Ben or Will to discuss, and apply for an academic concession. More information about UBC's framework for preventing communicable disease is [here](#).

Academic Integrity (From UBC and Faculty of Science Policy): The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required.

This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.