

Syllabus for **STAT 8023** Computational Statistics. Fall 2023

Tuesday/Thursday, 12:30 pm – 1:50 pm,

Instructor: Bledar Alex Konomi

Department of Mathematical Sciences, French Hall West 5043

Phone (513) 556-4050 (6-4050 from on campus phones)

Office Hours: Thursday 10:30 am – 11:20 am and by appointment, 5043 French Hall

Course Description: This course is designed for Ph.D.-level statistics and mathematics students. It covers the methods and applications of common statistical computing methods. Topics include random variable generation, Monte Carlo integration and optimization, and Markov chain Monte Carlo. Some specific algorithms discussed include importance sampling, Newton-Raphson, EM, Metropolis-Hastings algorithm, Gibbs sampling, etc. It also discusses applications and extensions of these algorithms to real research problems. R Software is used for the course.

Prerequisites: A minimum grade of B- is required in STAT 7031. Students are assumed to have background knowledge of R software.

Website: All course related information is posted on UC Canvas (uc.instructure.com), including course syllabus, reading assignments, lecture notes, assignments, announcements, etc. Visit Canvas frequently.

Textbook:

Monte Carlo Statistical Methods (Sec. Edition – 2004) by Christian Robert and George Casella (Ch1-Ch9)

Introduction to Monte Carlo Methods with R (2009) by Christian Robert and George Casella (Ch1-Ch8) (ebook available from UC library)

Useful supplementary materials can be found at <https://www.ceremade.dauphine.fr/~xian/books.html>.

Course Webpage: All course related information are posted on UC canvas, including course syllabus, reading assignments, lecture notes, handouts, homework assignments, codes, announcements, etc. Visit Canvas frequently.

Grade: Your final course grade will be based on the following weighting of assessment components: Your

Table 1: Grade weighting		
Attendance-Participation	Homework	Project
10%	50%	40%

final course letter grade will be assigned according to the following grading scale: A 93–100, A- 90 – 92, B+ 87–89, B 83–86, B- 80 – 82
C+ 77–79, C 73 – 76, C- 70 – 72, D+ 67– 69, D 63 – 66, D- 60 – 62
F below 60

Homework: Homework will generally be assigned on canvas (tentatively) every one to two week throughout the semester (Tentatively 5-8 HWs).

- Your solution on homework problems needs to be submitted electronically through Canvas as one single pdf or Word file. If R codes are required to be submitted, they should be submitted as a separate file. The submitted R codes should be ready to run (reproducibility). Points are subject to be deducted if errors are produced when the submitted R codes are re-run by the instructor. No email submission will be accepted.
- The submission link will be removed once the submission deadline has passed. No hand-in will be accepted any more once the submission link is removed from Canvas.
- Prepare your solutions with problems in order. Please note that your solutions need to be presented in a clear, readable format with sufficient details. If you scan the file, please make sure the scanned file is well organized and easy to read. Submission will be returned with No credit if solutions are not in order, hard to read or lack of detail.
- Your submitted work will be graded on Canvas with feedback from the instructor. Please do not hesitate to contact the instructor for any questions on the graded homework problems.

Project: A group course project is required with a member of two students. Deliverables include two written reports and a final presentation (40 minutes).

1. The instructor will assign each group a paper.
2. Replicate one important result on the proposed algorithm discussed in the paper.
3. Compare the proposed algorithm to other (common) computing methods.
4. Please note that there are 4 milestones that your group needs to meet through the semester as specified below. The initial draft and final report must be submitted through Canvas according to the specified deadlines. Detailed template and evaluation will be posted on Canvas.
5. Each group member's contribution must be clearly described at each milestone. Particularly, each group member must have approximately the same amount of time in the final presentation. The project grade for each student will depend on the evaluation of the contributions as described.

A project presentation will be required at the end of the semester. Please include project goal, what you were trying to accomplish, technical approach, what method you were using to achieve your goal and the outcome and results, what were the results of your efforts.

A final report in the form of a paper should be also submitted by the last day of class. The code used should be also included in a separate file.

Course project milestones

Milestone 1: Monday February 16(5%). schedule an appointment with the instructor to discuss your assigned paper and your initial plan to work on the project. It is expected that you have carefully read through the paper (multiple times) before the meeting.

Milestone 2: Thursday April 2st (15%). A 3-page Initial report with the results replication; R codes submitted

Milestone 3: Thursday April 9 – Tuesday April 21 (10%) Presentation: comparison results should be included

Milestone 4: Saturday April 25 (10%) A up to 7-page final project report: A discussion on the publication with your replication and comparison results

Communication Devices Personal communication devices such as cell phones and PDAs must be either turned off or put on vibrate during class. Additionally, please refrain from texting during class.

Academic Integrity Please help maintain an academic environment of mutual respect and fair treatment. You are expected to produce original and independent work on the exams. For homework, group work is encouraged. However, it is plagiarism to copy someone else's work and call it your own. All students must submit their own written work in their own words. Academic misconduct will not be tolerated (http://www.uc.edu/conduct/Academic_Integrity.html).

Issues of Differing Abilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of those available accommodations, students must contact the Disability Services Office at 210 University Pavilion (513-556-6823).

<http://www.uc.edu/aess/disability.html>.

(This syllabus is subject to changes.)