



Course STAT 6324: Computational Statistics

Time TuTh, 2:00 pm–3:20 pm

Location Hyer Hall 0102

Instructor Information

Instructor	Sy Han (Steven) Chiou
Office	Heroy Hall 105
Email	schiou@smu.edu
Office hours	Thursday 3:30 pm - 5:00 pm.

General Course Information

Course website	All course materials, such as lecture notes, homework assignments, and exams, will be posted on Canvas.
Prerequisite	STAT 5373 or STAT 6327. Basic knowledge in R.
Course description	This course has been developed to introduce students to the fundamentals of statistical computing and computational methods in statistics with emphasis on the use of statistical software packages, statistical simulation, and related topics.
Learning outcomes	1. Learn and apply efficient coding practices in R, and profile and benchmark statistical code. 2. Have a working knowledge of Rcpp and RcppArmadillo. 3. Recognize numerical failure arising from floating-point arithmetic or ill-conditioning, and correct it. 4. Understand and implement optimization algorithms for likelihood and estimating-equation problems. 5. Derive and implement EM and MM algorithms for missing-data and latent-variable models. 6. Become familiar with developing and performing simulation studies in R, and employ Monte Carlo methods to address statistical problems.
Required text	There is no required textbook for this course. All course materials, including lecture notes and code, will be posted on Canvas.
Other requirements	This course is computationally intensive; therefore, access to a laptop or desktop computer is essential. You are welcome to bring your laptop to class to follow along with in-class examples. However, please exercise discretion to avoid disturbing your fellow classmates.

Course Policies

Grading criteria	The course letter grade will be determined based on homework assignments and two in-class exams. The breakdown of the grade distribution is as follows. Homework (50%): • There will be 6 homework assignments. • The lowest homework grade will be dropped. Exams (25% × 2): • There will be two in-class exams. • Exam 1 will be on October 8 (Thursday) and Exam 2 will be on December 3 (Thursday). • R will be required complete the exams. • The exam will be open book and open note but closed internet. • Students are not allowed to collaborate with classmates or people outside of class.
Submission guidelines	Here are some general policies: • All reports should be submitted via Canvas within the designated submission window. • All reports should be prepared with the provided R Markdown templates and knitted to pdf. • A .Rmd file and a .pdf file (generated by R Markdown are required in submission. • Late submissions will not be graded and will be counted as 0. • Submissions a .Rmd that won't compile will not be graded.
Letter grade	The letter grade will be assigned based on the overall course score with the cutoffs: A: [93, 100]; A⁻ [90, 93); B⁺ [87, 90); B [83, 87); B⁻ [80, 83); C⁺ [77, 80); C [60, 77); F [0, 60).

Tentative Calendar

Week	Tuesday	Thursday	Due
1	August 25: Efficient coding in R	August 27: Efficient coding in R	
2	September 1: Efficient coding in R	September 3: Efficient coding in R	HW 1
3	September 8: Rcpp and RcppArmadillo	September 10: Rcpp and RcppArmadillo	
4	September 15: Rcpp and RcppArmadillo	September 17: Rcpp and RcppArmadillo	HW 2
5	September 22: Matrix factorizations	September 24: Matrix factorizations	
6	September 29: Matrix factorizations	October 1: Matrix factorizations	HW 3
7	October 6: Exam 1 review	October 8: Exam 1	
8	October 13: Fall break - No class	October 15: Optimization	
9	October 20: Optimization	October 22: Optimization	HW 4
10	October 27: The EM algorithm	October 29: The EM algorithm	
11	November 3: The EM algorithm	November 5: Random number generation	HW 5
12	November 10: Random number generation	November 12: Random number generation	
13	November 17: Spline smoothing	November 19: Spline smoothing	HW 6
14	November 24: Thanksgiving - No class	November 26: Thanksgiving - No class	
15	December 1: Exam 2 review	December 3: Exam 2	

Institutional Policies and Procedures

Generative AI

The use of any form of Generative AI (e.g., ChatGPT, iA Writer, DALL-E) is not permitted in this course. The assignments have been designed to ensure that you develop and demonstrate the knowledge and skills associated with the learning outcomes laid out in the syllabus. Because generative AI tools and detection software are developing at a rapid pace, it is possible that assignments you turn in might appear as “false positives” and raise concerns of possible academic dishonesty. To ensure that you can demonstrate intellectual ownership of the assignments you submit, you are therefore encouraged to maintain clear evidence of your work (e.g., time-stamped drafts and notes; copies and links to source material). Any violation of these rules will be treated at the undergraduate level within the SMU Student Honor Code and at the graduate and professional level within the honor codes found in their respective school policies. If there is sufficient cause for concern, an incident report will be submitted for review by the Office of Student Conduct and Community Standards.

Disability Accommodations

Students who need academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214- 768-1470 or visit <http://www.smu.edu/Provost/SASP/DASS> to begin the process. Once they are registered and approved, students then submit a DASS Accommodation Letter through the electronic portal, DASS Link, and then communicate directly with each of their instructors to make appropriate arrangements. Please note that accommodations are not retroactive, but rather require advance notice in order to implement.

Religious Observance

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. <https://www.smu.edu/StudentAffairs/ChaplainandReligiousLife/ReligiousHolidays>

Excused Absences for University Extracurricular Activities

Students participating in an officially sanctioned, scheduled university extracurricular activity should be given the opportunity to make up class assignments or other graded assignments that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See 2020- 2021 SMU Undergraduate Catalog under “Enrollment and Academic Records/Excused Absences.”)

Student Academic Success Programs

Undergraduate students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students who would like support for subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; <https://www.smu.edu/sasp>.

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