AMS 394: Statistical Laboratory

Fall 2022

Course Information:
Instructor: Kai Li
Office: Harriman Hall 132
Class: Tue, Thu 8:00-9:20am, Melville Lbry. W4540
Email: kai.li@stonybrook.edu
Office Hours: Tue, Thu 9:30-11:00pm (in person) or by appointment (online via Zoom)
Course Page: Blackboard (`https://blackboard.stonybrook.edu/`)

Graduate Teaching Assistant: Shuo Li
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Office Hours: Fri, 3:00-5:00pm (in person) or by appointment (online via Zoom)

Course Description: Designed for students interested in statistics and their applications. Basic statistical techniques including sampling, design, regression, and analysis of variance are introduced. Includes the use of statistical packages such as SAS and R. Students translate realistic research problems into a statistical context and perform the analysis.

Prerequisites: AMS 310 or AMS 315

Recommended Textbooks: This is a restricted list of various interesting and useful books that will be touched on during the course. You may need to consult them occasionally.

- *Introductory Statistics with R* by Peter Dalgaard, 2nd edition, 2008, Springer

- *The Little SAS Book: A Primer* by Lora D. Delwiche and Susan J. Slaughter, 6th edition, 2019, SAS Institute

- *Applied Statistics and the SAS Programming Language* by Ronald P. Cody and Jeffrey K. Smith, 5th edition, 2005, Pearson

Topics to be Covered: Chapters 1, 2, 3, 4, 5, 6, 7, 8, 11 from *Introductory Statistics with R* (ISwR), chapters 1, 2, 3, 4 from *The Little SAS Book: A Primer* (TLSASB), and chapters 3, 5, 6, 7, and 9 from *Applied Statistics and the SAS Programming Language* (ASwSAS).

Homework: Assignments will be given regularly, posted on Blackboard, to be turned in via Blackboard, as a single text file. Please name your homework as firstName_lastName_HW# (e.g., Kai_Li_HW1). No late homework will be accepted and will be due at the beginning of class on the due date, except for the last homework. If you want to correct your submission (before the deadline), you may upload a revision. Only your last submission will be graded. There will be

approximately 8 homework sets, equally weighted. The lowest homework score will be dropped before computing your average.

You may discuss homework problems with other students taking the course and with the instructor and teaching assistant. The work that you turn in should always be your own write-up, and you should show that you personally understand everything that you write. You are not to view other student writeups or use them (or use internet resources) while writing your own solution. Please make certain that your writing is neat and clear (if handwritten), and that you have expressed your reasoning.

Exam: There will be three in-person exams. Midterm 1 will be during class, tentatively scheduled for Thursday, September 22. Midterm 2 will be during class, tentatively scheduled for Tuesday, October 18, and is noncumulative. The final will be held during the University-assigned date/time, on Wednesday, December 7, 11:45-1:45pm, and is noncumulative; the location will most likely be our regular classroom (Melville Lbry. W4540), but this will be confirmed later. All exams are open books and notes, according to instructions that will be provided with the exams.

Project: There will be an individual project for all students. The project will be assigned tentatively on Thursday, October 20 at 8:00am. The tentative due date for the project is Thursday, December 1 at 11:59pm on Blackboard. Please turn in your project as a single R file, and name it as firstName_lastName_Project (e.g., Kai_Li_Project).

Grading Policy: Your total average score will be calculated based on 15% homework, 15% midterm 1, 20% midterm 2, 25% final, and 25% project.

Learning Outcomes: Upon successful completion of this course, students should be able to:

- Handle basic knowledge and operations about R and SAS.

- Know how to read and operate data in R and SAS.

- Conduct t test (one-sided, two-sided, one-sample, two-sample) in R and SAS.

- Conduct linear regression and variable selection in R and SAS.

- Conduct ANOVA (one-way and two-way) in R and SAS.

- Conduct χ^2 test in R and SAS.

Student Accessibility Support Center Statement: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity,

including categories of academic dishonesty please refer to the academic judiciary website at `http://www.stonybrook.edu/commcms/academic_integrity/index.html`

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Tentative Course Schedule

Week	Date	Textbook	Topic	Notes
1	Tue. 8/23	ISwR	Ch1: Basics	
	Thu. 8/25	ISwR	Ch1: Basics	
2	Tue. 8/30	ISwR	Ch2: The R environment	
	Thu. 9/1	ISwR	Ch3: Probability and distributions	HW1 due 9/8
3	Tue. 9/6	ISwR	Ch4: Descriptive statistics and graphics	
	Thu. 9/8	ISwR	Ch4: Descriptive statistics and graphics	HW2 due 9/20
4	Tue. 9/13	ISwR	Ch5: One- and two-sample tests	
	Thu. 9/15	ISwR	Ch5: One- and two-sample tests	
5	Tue. 9/20	ISwR	Ch6: Regression and correlation	HW3 due 9/27
	Thu. 9/22		Midterm 1	
6	Tue. 9/27	ISwR	Ch11: Multiple regression	
	Thu. 9/29	ISwR	Ch11: Multiple regression	
7	Tue. 10/4	ISwR	Ch7: ANOVA & the Kruskal–Wallis test	
	Thu. 10/6	ISwR	Ch7: ANOVA & the Kruskal–Wallis test	HW4 due 10/13
8	Tue. 10/11		No Class (Fall Break)	
	Thu. 10/13	ISwR	Ch8: Tabular data	
9	Tue. 10/18		Midterm 2	
	Thu. 10/20	TLSASB	Ch1: Getting Started with SAS	Project due 12/1
10	Tue. 10/25	TLSASB	Ch2: Accessing Your Data	
	Thu. 10/27	TLSASB	Ch2: Accessing Your Data	HW5 due 11/8
11	Tue. 11/1	TLSASB	Ch3: Working with Your Data	
	Thu. 11/3	TLSASB	Ch4: Manipulating with Your Data	
12	Tue. 11/8	ASwSAS	Ch6: T-tests and Nonparametrics	HW6 due 11/15
	Thu. 11/10	ASwSAS	Ch6: T-tests and Nonparametrics	
13	Tue. 11/15	ASwSAS	Ch5: Correlation and Regression	HW7 due 11/22
	Thu. 11/17	ASwSAS	Ch9: Multiple-Regression Analysis	
14	Tue. 11/22	ASwSAS	Ch3: Analyzing Categorical Data	
	Thu. 11/24		No Class (Thanksgiving Break)	
15	Tue. 11/29	ASwSAS	Ch7: Analysis of Variance	HW8 due 12/5
	Thu. 12/1	ASwSAS	Ch7: Analysis of Variance	
16	Wed. 12/7		Final	11:45-1:45pm