SBS 290: INTRO TO STATISTICS WITH R

Fall 2024, Mon/Wed 3:00pm - 04:30pm

INSTRUCTOR

Dr. Tanushree Agrawal

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OFFICE HOURS: Held in Ikeda 402, please make an appointment on Calendly using this link: xx

COURSE DESCRIPTION

Welcome to this introductory statistics class! 📊🧱📚💻 Statistics is the study of variation. It is the set of tools and concepts that have been developed, over centuries, to help us understand variation. And this is important, because there is a lot of variation in the world! 🌍🔢🔍 Statisticians find ways to turn variation in the world into data, and then analyze that data to deepen their understanding of the world.

Learning statistics can feel hard😵 It takes sustained effort💪💪💪 over long periods of time, whether you are a beginner or a professional statistician! Even those with substantial statistics experience are always learning new things and deepening their understanding. In this course, you will get started along the pathway to understanding. Instead of spending your time doing mathematical calculations, you will learn about the big ideas and understand how they all fit together.

We will focus on the central concept of a statistical model, and use it to (1) describe data/variation in the world, (2) make predictions (or inferences) about the future, and (3) guide research decisions. Along the way, you will also learn about common statistical tests like t-tests, ANOVAs, regression, correlation, and chi-square. Understanding the basics of statistics is crucial to understanding the world around you, and will be relevant to many jobs that you may hold in the future.

Technology is a fundamental part of doing statistics these days. Most statistics courses include learning to use software for data analysis. In this course, we will use R (yes, it's just called R, the letter) for all data analysis. R is a free coding language commonly used by statisticians. Writing code will help you understand statistics better than simply clicking on buttons in a statistics package. And, it also will give you a super practical skill at the end of this course that you didn't have before! (You can even put it on your resume!)

COURSE OBJECTIVES

Through your active and engaged participation in this course, you will:

- Learn how to analyze data, using R
- Understand the core concepts of the domain of statistics, i.e., the ideas that will help you make sense of all the numbers
- Prepare you to learn more about statistics in the future (because statistics is a BIG field, and we will only scratch the surface!)
- Understand the critical role of statistics in behavioral science research

GIVING YOURSELF THE BEST SHOT AT ACHIEVING THESE GOALS: The most successful students are those who pay active attention and ask questions in class, review lectures/readings slowly and carefully, complete all exercises, and answer all practice questions to the best of their ability.

Because the material is designed to be read slowly, try not to put off your assignments until the last minute. If you skim the materials, you won't learn much at all.

Test yourself, repeatedly! Don't just work through the practice problems and quiz questions once. If you really want to learn, go through them again, especially if you find the material difficult to understand.

When you work through quiz questions again, don't just look through your previously scored responses. Cover them up, and generate the answers again. Lots of research shows that you will learn MUCH more by answering again!

COURSE MATERIALS

BRIGHTSPACE WEBSITE: Brightspace will be the primary hub for all activities and communication in this course. You will be able to access all materials through our class on Brightspace. There is no textbook for this class; Any required readings will be posted on Brightspace.

COMPUTER WITH R SOFTWARE (FREE): You are required to bring a laptop with R Studio installed on it, to each class. R is a statistical analysis and data visualization software package that we will be using extensively for in-class exercises and homework.

GRADE BREAKDOWN

Quizzes:	15%	best 15 of 18 quizzes, each worth 1%
Challenges:	40%	4 challenges, each worth 10%
Exams:	45%	3 exams, 15% each

Final letter grades in the course will be assigned according to the following percentage scale

A+	97.00+	B+	87.00-89.99	C+	77.00-79.99	D	60.00-69.99
A	93.00-96.99	B	83.00-86.99	C	73.00-76.99	F	0.00-59.99
A-	90.00-92.99	B-	80.00-82.99	C-	70.00-72.99		

Grades will be rounded to the nearest hundredth of a point and the stated letter grade cutoffs will be applied without exception. I reserve the right to adjust all students' grades up if deemed appropriate, but grades will not be adjusted down under any circumstances.

ASSIGNMENTS

QUIZZES (BEST 15 OF 18 QUIZZES, EACH WORTH 1%)

At the beginning of every lecture, there will be a short multiple-choice quiz (closed-book) to test you on the concepts we learned in the previous lecture. These are meant to be a low-stakes way to test yourself, make sure you understand the material, and point out to you where you may need to work harder. Anything presented/discussed during class and anything found within the relevant assigned materials (e.g., book chapters, articles, videos, etc.) is fair game!

LATE POLICY: Late quizzes will not be accepted for a grade (because we will be discussing answers in class right after the quiz). So, make sure you come to class on time!

CHALLENGES (4 ASSIGNMENTS, EACH WORTH 10%)

Over the course of the semester, you will complete 4 challenges. These are take-home assignments that will give you hands-on experience with data analysis in R. Each challenge may require roughly 3 hours of work BUT be aware that the amount of time necessary will vary across challenges and across people. So, don't leave it till the last minute!

LATE POLICY: Late submissions will be eligible for **½ credit** if they are received by the last day of class (i.e., by 11:59pm on Dec 5th).

EXAMS (3 EXAMS, EACH WORTH 15% EACH)

There will be three closed-book exams that will test material covered during its respective unit. You will be responsible for knowing information covered in class AND found in any of the relevant assigned materials (e.g., challenges). Exams will primarily include multiple choice, short answer, and fill in the blank question formats. All exams will be completed in the classroom on the dates indicated on the course schedule.

Make-up opportunities may be granted based on the policy below.

COURSE SCHEDULE

Date	Day	Agenda	Checklist & Deadlines
Sep 9	Mon	Introductions	
PART I: Exploring Variation			
Sep 11	Wed	A modeling approach to statistics; Intro to R	
Sep 16	Mon	Understanding data	○ Quiz 1 (*in class at 3pm)*
Sep 18	Wed	Sampling	○ Quiz 2 (*in class at 3pm)* ○ **Submit Challenge 1** *(by Sun 9/22)*
Sep 23	Mon	Examining distributions of data	○ Quiz 3 (*in class at 3pm)*
Sep 25	Wed	5-number summaries & box plots	○ Quiz 4 (*in class at 3pm)*
Sep 30	Mon	The data generating process	○ Quiz 5 (*in class at 3pm)*
Oct 2	Wed	Review & Workshop	○ Quiz 6 (*in class at 3pm)* ○ Bring questions to class
Oct 7	Mon	**EXAM 1**	○ Prepare for Exam 1 (*in class at 3pm)*
Oct 9	Wed	Explaining variation	
Oct 14	Mon	~~~ NO CLASS: 🍁 *Happy Fall Break!* 🍁 ~~~	
Oct 16	Wed	Sources of variation	○ Quiz 7 (*in class at 3pm)*
PART II: Modeling Variation			
Oct 21	Mon	Starting with a simple model	○ Quiz 8 (*in class at 3pm)*
Oct 23	Wed	Quantifying error	○ Quiz 9 (*in class at 3pm)* ○ **Submit Challenge 2** *(by Sun 10/27)*
Oct 28	Mon	Z scores & the normal distribution	○ Quiz 10 (*in class at 3pm)*
Oct 30	Wed	Adding an explanatory variable to the model	○ Quiz 11 (*in class at 3pm)*
Nov 4	Mon	Digging deeper into group models	○ Quiz 12 (*in class at 3pm)*
Nov 6	Wed	Models with quantitative explanatory variables	○ Quiz 13 (*in class at 3pm)*
Nov 11	Mon	**EXAM 2**	
PART III: Evaluating Models			
Nov 13	Wed	The logic of inference (*p*-values)	○ **Submit Challenge 3** *(by Sun 11/17)*
Nov 18	Mon	Model comparisons (*F* and *t* distributions)	○ Prepare for Quiz 14 (*in class at 3pm)*
Nov 20	Wed	Model comparisons (Type I/II errors)	○ Prepare for Quiz 15 (*in class at 3pm)*
Nov 25	Mon	Confidence intervals & bootstrapping	○ Prepare for Quiz 16 (*in class at 3pm)*
Nov 27	Wed	Online workshop	○ **Submit Challenge 4** *(by Fri 12/1)*
Dec 2	Mon	Models with qualitative outcomes (Chi-square)	○ Prepare for Quiz 17 (*in class at 3pm)*
Dec 4	Wed	Review	○ Prepare for Quiz 18 (*in class at 3pm)*
Dec 9	Mon	**EXAM 3**	○ Prepare for Exam 3 (*in class at 3pm)*

COURSE POLICIES

CLASS ETIQUETTE

ATTENDANCE: Please arrive on time for class. Late arrivals and early departures are disruptive, especially in the intimate class settings at Soka. Although attendance is not mandatory, I strongly recommend that you attend every class and come to each session fully prepared (i.e., having read all the assigned materials). If you aren't there, you'll miss important material. If you are there but aren't prepared, you won't be able to effectively engage in the hands-on data analysis activities. Also, missing class will cost you points on the quizzes!

If you do need to miss class for any reason, you are responsible for all material covered and for any course schedule changes made in your absence. Note that remote access to class (i.e., Zoom) will NOT be provided under any circumstances. Please refer to this syllabus, Brightspace, and your classmates regarding the content you missed before contacting me

IN-CLASS BEHAVIOR: Every student in this classroom, regardless of personal history or identity, is a valued member of this group. Your experiences are valuable and important, and you should feel free to share them as they become relevant to our class. Please be courteous and respectful to others in class. A climate of mutual respect allows us to ask difficult questions and to participate in honest discussions about difficult issues, even in the context of strong disagreement. Creating this kind of open, honest, and respectful climate is our shared responsibility.

ELECTRONIC DEVICES: Cell phone use is not permitted during class. However, we will be using laptops regularly, so you will be 😈 very tempted 😈 to do non-class related stuff (e.g., checking email, social media, online shopping, etc.) – Don't do it! Trust me! It is a slippery slope, and if you miss content in this class, you will find it difficult to recover because the class builds on itself. Finally, research has consistently shown that taking notes by hand is more conducive to the learning process than simply using an electronic device (Mueller & Oppenheimer, 2014). So, I strongly encourage you to take handwritten notes even though you will be using your laptop.

CONTACTING ME: The most efficient way to contact me is by email. Please include a meaningful subject line with the course number (e.g., SBS290 Help). Please do not assume your email has been received unless/until you receive a response. You can expect a response within 24-48 hours during the workweek; however, there is no guarantee of a response over weekends and holidays.

EXCUSED ABSENCES

If you have a scheduling conflict or an emergency arises that affects your ability to complete any of the graded components of the course, please contact me as soon as possible to make alternative arrangements. You must provide documentation for a university-approved reason, such as

hospitalization, family emergency, etc. Note that you must notify me AND obtain my permission to miss the exam PRIOR to its occurrence; otherwise, you will receive a zero for that exam grade.

If you are not sure whether your reason for missing class counts as an approved reason, please ask me! I am often willing to excuse absences when I know about them in advance or you communicate with me in a timely manner.

ACADEMIC INTEGRITY

All students are expected to adhere to standards of academic integrity. Cheating of any kind on any assignment will not be tolerated. It is disrespectful to your peers, the university, and to me. If you are unsure what might constitute a violation of academic integrity, consult me and/or the Soka website on academic honesty: https://catalog.soka.edu/academic-honesty. Any evidence of academic misconduct will be reported to the Office of the Dean of Students. Consequences for academic misconduct may include a failing grade in the course and official action (e.g., academic probation or suspension) by the University.

My advice to you is to always err on the side of caution. If you have questions about whether something is okay or might constitute academic dishonesty, just ask! I am happy to provide clarification and would much rather have a pleasant conversation with you before you submit an assignment than discuss concerns about academic integrity after you turn it in.

UNIQUE CIRCUMSTANCES REQUIRING SPECIAL ACCOMODATIONS

Can you not see or hear very well? Is English your second or third language? Do you have to miss class because of work, childcare, or parole appointments? Is money tight, and you can't afford books right now? Can you concentrate better if you stand or walk around in class? If, at any point in the block/semester, a disability or personal circumstances affects your learning in this course, please contact me. I am committed to helping you succeed in this class as this course is intended for all students, including those with mental or physical disabilities, illness, injuries, impairments, or any other condition that tends to affect one's equal access to education negatively. If at any point in the term, you find yourself not able to fully access the space, content, and experience of this course, you are welcome (but not required) to contact me. For services and resources on physical, mental and social well-being, contact our on-campus counselor or the Student Health Center. If you have a documented condition (physical or psychological) and experience educational barriers due to your condition, I encourage you to contact Disability Services as soon as possible to explore what accommodations may allow you to access your education fully. None of these resources will disclose your specific condition to your instructors without your permission.

RESOURCES FOR YOU

TIME MANAGEMENT

For some helpful tips and tricks related to improving time management skills and creating good study habits, check out https://www.soka.edu/writing-center/time-management and https://sites.rhodes.edu/time-management-tools/apps-managing-time-study. There's even a link to some handy apps!

COUNSELING SERVICES

If you wish to speak to a counselor about any psychological and/or emotional distress that youare experiencing, you can get in touch with the Soka University Counseling Services (https://www.soka.edu/student-life/living-sua/counseling-services). April Nelson Afoa is Soka's primary counselor on campus. Students can request an appointment by contacting the counselor directly at Counseling@soka.edu or by calling (949) 480-4192.

NATIONAL HOTLINES

- National Domestic Violence Hotline: 1-800-799-7233
- National Eating Disorders Association Information and Referral Helpline: 1-800-931-2237
- National Sexual Assault Hotline: 1-800-656-4673
- National Suicide Hotline: 1-800-273-8255
- Substance Abuse and Mental Health Services Administration Treatment Referral Helpline: 1-877-726-4727