STAT 311 A
ELEMENTS OF STATISTICAL METHODS
Spring 2022

Meeting times and locations

- M&W Lectures: 2:30-3:50pm, Electrical and Computer Engineering Building 105
- Tu&Th Quiz Section Meetings
  - Section AA (Alana McGovern): 3:30-4:20pm, Mary Gates Hall 228
  - Section AB (Alana McGovern): 4:30-5:20pm, Mary Gates Hall 242
  - Section AC (Pengyu Wang): 3:30-4:20pm, Mary Gates Hall 254
  - Section AD (Pengyu Wang): 4:30-5:20pm, Mary Gates Hall 228
  - Section AE (Zhenman Yuan): 3:30-4:20pm, Mary Gates Hall 287
  - Section AF (Zhenman Yuan): 4:30-5:20pm, Mary Gates Hall 234
- University Holidays (no lecture, quiz sections, or office hours)
  - Monday 30 May (Memorial Day)

Teaching Team

Instructor: Dr. William Brown (preferred name: Will or Dr. Brown)

- Pronouns: he/him/his
- Email: brownw@uw.edu or via Canvas
- Office days and hours: TBD, or by appointment
- Office location: Zoom

TA: Alana McGovern (preferred name: Alana)

- Pronouns: she/her
- Email: amcgov@uw.edu, or via Canvas
- Office days and hours: TBD
- Office location: Zoom

TA: Pengyu Wang (preferred name: Mr. Pengyu Wang)

- Pronouns: he/his/him
- Email: pwang425@uw.edu, or via Canvas
- Office days and hours: Fridays 1:30-2:30pm, or by appointment
- Office location: https://washington.zoom.us/j/94164984951
TA: Zhenman Yuan (preferred name: Zhenman Yuan)

- Pronouns: she
- Email: yzhenman@uw.edu, or via Canvas
- Office days and hours: Tuesdays 2:30-3:30pm, or by appointment
- Office location: TBD

Teaching team email policy

- You are strongly encouraged to use Canvas's messaging function rather than email when communicating with members of the teaching team.
- If you prefer to communicate via email, be sure to (a) use your UW (uw.edu) rather than your personal (hotmail, gmail, outlook, yahoo, etc.) email account, and (b) include an email subject beginning with "STAT 311".
- Be sure to address your instructor or TA by their preferred names and titles, as provided above.
- Be sure to write a clear email, identifying the questions for which you desire answers. If your question(s) cannot be easily answered in a short message, your instructor or TA may recommend that you meet with us during our regular office hours or set up an appointment to discuss your questions(s).
- Be sure to conclude your message with your as you would prefer to be addressed.
- Be sure to acknowledge your instructor or TA's response if appropriate, for example if we ask you follow-up questions related to your message.
- Please allow up to 48 hours for a response. After 48 hours, if you have not heard back from your instructor or TA, please feel free to send a reminder message.
- Communicating about individual grades electronically: To comply with the Family Educational Rights and Policy Act (FERPA), students and members of the teaching team are discouraged from communicating about individual students' grades via email. Instead, please use Canvas's messaging function for such communications.
- Grade petitions: If you disagree with a grader's interpretation and score of your work on any graded assignment, please submit a request for a re-evaluation only to your instructor (Will Brown); do not respond to the grader. You must submit any request for a reassessment of graded work within one week of receiving the grade and include a written explanation of your case. Note that not all re-evaluations will result in a changed grade or may even result in a reduced grade if (and only if) further problems are identified upon review.
- No member of the teaching team will accept any graded coursework submitted via email; all assignments must be submitted online via the course Canvas website.

Required material

• A computer with R and R Studio
  o R is an open-source programming language for statistical computing, available for download [here](#).
  o R Studio is a widely used user interface for R, available for download [here](#).
  o When possible, you will want to have your R-equipped computer on-hand for many Tu&Th quiz section meetings.

• For some quiz section exercises, it may be useful to have a simple calculator on-hand, capable of addition, subtraction, multiplication, division, squaring, and taking square roots. Calculator apps on phones and other devices are tolerated, but please limit your device usage to performing calculations.

**Course motivation, objectives, and assessment**

*Course motivation*

STAT 311 is an introduction to the discipline of statistics for students pursuing futures in quantitative fields. As a discipline, statistics encompasses a variety of mathematical methods applied to the description of variability in data, modeling the random processes that lead to such variability, and quantifying uncertainty stemming from such variability. Throughout the quarter, this course immerses students in realistic data-driven tasks to cultivate greater statistical literacy, competence in computational statistics (emphasizing the R statistical programming language), and critical thinking.

*Course objectives*

By the end of this course, you should be able to

- identify limitations in data collection methods and explain how this limits the scope of statistical inference;
- recite the different goals of descriptive and inferential statistics;
- understand random processes through the lens of probability theory and simulation, including the use of parametric probability distributions to model realistic patterns of randomness in nature;
- understand the logic of statistical inference, emphasizing inferences based on the concept of a sampling distribution;
- manage, produce numerical and visual summaries of patterns in, and draw statistical inferences from data using R;
- distinguish between families of methods suitable for drawing inferences about (1) one variable, and (2) relationships between two variables;
distinguish between parameter estimation and hypothesis testing in inferential statistics.

Prerequisites

From the University of Washington course catalog: either STAT 220, STAT 221/CS&SS 221/SOC 221, STAT 290, MATH 120, MATH 124, MATH 125, MATH 126, MATH 134, MATH 135, MATH 136, Q SCI 190, or MPT-AS Math placement test score of 154-163.

More generally, a minimum prerequisite of precalculus is required. However, most students in STAT 311 are already in or are applying to quantitative majors, and students who are uncomfortable with abstract mathematical thinking and logic will be at a severe disadvantage.

How we will facilitate and assess your accomplishment of course goals

- Lectures: M&W Lectures will introduce students to statistical concepts and methods, including clarification of many of the concepts and methods discussed in the course readings
- Quiz section exercises: Tu&Th quiz section meetings will give students a chance to (a) develop practical skills conducting statistical data analysis using the R statistical programming language, and (b) actively engage statistical concepts and methods by doing exercises from the textbook and beyond.
- Lab Participation Reports: There will be approximately eight lab reports due throughout the quarter. These assignments are relatively low-stakes exercises, intended to monitor your engagement in R tutorials during many of your quiz sections, as well as your degree of success in cultivating statistical programming skills, based on lab tutorials. These will be uploaded to the course Canvas website upon completion.
- Homework: There will be approximately six written homework assignments throughout the quarter, which will include coding components. These are medium-stakes assignments that give students a chance to demonstrate your acquired understanding of statistical concepts and methods, as well as your practical skills in data management and analysis, including through computation. Your solutions to these homework assignments will be uploaded to the course Canvas website upon completion.
- Mini exams: There will be four non-cumulative mini-exams, each covering two chapters of the textbook and corresponding lectures and lab work. The focus of these assignments will be on evaluating your retention and understanding of statistical concepts and the logic underlying different methods in statistical data analysis. Each will be completed online, through Canvas.

How your grade will be calculated
- Percentage grades
  - Lab Participation Reports: 30% weight
  - Homework: 30% weight
  - Exams: 40% weight (10% per exam)
- Grade Point (GP) conversion from percentage (P) grades
  - If \( P \leq 17.5\% \), then \( GP = 0.0 \)
  - If \( 17.5\% < P < 20\% \), then \( GP = -0.8 + 0.08P \)
  - If \( 20\% \leq P < 90\% \), then \( GP = 0.04P \)
  - If \( 90\% \leq P < 98\% \), then \( GP = -0.9 + 0.05P \)
  - If \( 98\% \leq P \), then \( GP = 4.0 \)
- Late work policy
  - Late work will be accepted for up to four 24-hour periods following the due date. However, out of fairness to your fellow students, 25% of your earned points will be deducted automatically by Canvas for each 24-hour period late. Canvas is very strict about this policy, so please be sure to allow yourself enough time to submit your work early.

A note on Canvas's dynamic grade reports

Canvas reports your grade for each assignment as it is entered. Check these reports regularly to make sure that your grades have been entered properly. Canvas also provides an estimate of your overall course grade, but this report is based only on the scores you have received for graded assignments; ungraded assignments are ignored. Consequently, your overall grade estimate may move up or down dramatically especially early in the quarter, and it will continue to move up or down even near the end of the quarter, as graders enter each new grade into your record. Consequently, you should not regard Canvas's overall course grade estimate as official, final, or authoritative; use it only as a way of monitoring your success in accomplishing course goals.

UW Community standards and academic integrity

- Course COVID-19 policies: Students in this course are expected to uphold the University of Washington's COVID-19 Prevention and Response Policies, including the UW Face Covering Policy. As of Friday 25 March 2022, this Face Covering Policy includes mandatory face covering in healthcare settings and on UW shuttles. Face coverings are also strongly recommended in other indoor settings (e.g., during in-person lectures and quiz section meetings) during the first two weeks of the Spring 2022 quarter (28 March through 8 April 2022) regardless of vaccination status. After 8 April 2022, face coverings are still recommended indoors for members of the UW community who have vaccine exemptions, who are immunocompromised or at high risk for severe illness, in childcare settings, when engaging in activities that generate high amounts of respiratory aerosols in close proximity to others, in crowded settings, etc. For updates to the UW's COVID-19 Prevention and Response Policies, please visit this UW webpage.
• **Collaborative learning and diversity statement:** Learning in a structured social setting is a very different experience from independent, self-guided learning. Interacting with your teaching team and with your peers presents a unique learning opportunity, but to enjoy the full rewards of such collaborative learning and the free exchange of ideas, mutual respect is indispensable between all parties involved. Your teaching team is committed to encouraging and valuing diverse student perspectives, showing every student our utmost respect, and investing ourselves in cultivating your mastery of the course content. We also expect that you will show each other and the teaching team a similarly high and sustained level of respect. We understand that diversity is integral to academic excellence and strive to create welcoming and respectful learning environments, promoting equal access and opportunity for everyone enrolled in the course. **Actions on the part of students that contradict these goals are expressly in violation of the University of Washington’s Student Conduct Code and are not tolerated.** As a condition of enrollment, all students assume responsibility to observe high standards of conduct that will contribute to their own and their peers’ academic goals, as well as to the welfare of the UW's academic community more generally. For more information on this and other policies related to diversity, please visit the following website: [http://www.washington.edu/diversity/](http://www.washington.edu/diversity/)

• **Academic integrity statement:** Collaborative study is not only accepted but encouraged, if you find cooperation beneficial to your learning. However, for submitted course assignments (Problem Sets), one unique submission per student is required, written in your own words. If you have worked on submitted assignments with other students in the class, be sure to note this collaboration on your work, including your collaborators’ names. You cannot collaborate in any way with your peers or anyone else while completing the Reading Quizzes or Exams. All submitted coursework should adhere to the University of Washington’s Student Conduct Code. Plagiarism is not tolerated. Plagiarism includes but is not limited to copying phrases, sentences, or paragraphs without proper citation; paraphrasing another person’s ideas or words without citing them; etc. Sharing answers to questions on quizzes and exams with your peers is also not tolerated. Academic misconduct of any kind is grounds for failure in the class and removal from the University of Washington. Lack of familiarity with the rules of academic conduct does not excuse misconduct. For more information please visit the following websites:


**Equal access, accommodations, and other useful resources**

In the case of unexpected family, health, or other emergencies that interfere with your ability to complete assigned coursework on time, notification of absence at your earliest convenience is expected. Documentation to validate your absence may be requested by your instructor.
For students who have established accommodations with Disability Resources for Students (DRS, https://depts.washington.edu/uwdrs/), please communicate your approved accommodations to your instructor (William Brown) at your earliest convenience so we can discuss your needs in this course. For students who have not yet established accommodations through DRS but have a temporary health condition or permanent disability that requires accommodations, you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability@uw.edu. Such conditions include but are not limited to mental health, attention-related, learning, vision, hearing, physical or health impacts. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s), and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).

For facts and resources about the COVID-19 pandemic, see the University of Washington's page here: https://www.washington.edu/coronavirus/

For resources and points of contact to promote a safer UW community, see https://www.washington.edu/safecampus/

Course schedule

**Week 01**

- Monday 28 March: Course overview
- Tuesday 29 March: **NO QUIZ SECTION MEETINGS**
- Wednesday 30 March: Motivating statistics; the nature of data; a typology of variables
- Thursday 31 March: Introductions and quiz section overviews

**Week 02**

- Monday 4 April: R overview; the research cycle and data collection; statistical dependence, causality, and confounding
- Tuesday 5 April: Lab 0 (R and R Markdown basics)
- Wednesday 6 April: Chapter 1 wrap-up; Chapter 2
- Thursday 7 April: Questions from Chapter 1
- Friday 8 April: Lab 0 due

**Week 03**

- Monday 11 April: Chapter 2
- Tuesday 12 April: Lab 1 (Summarizing numerical data)
- Wednesday 13 April: Chapter 2; Mini-exam 1 opens
- Thursday 14 April: Lab 2 (Summarizing categorical data)
- Friday 15 April: Lab 1 due

**Week 04**

- Monday 18 April: Chapter 3: Lab 2 due; Mini-exam 1 closes
- Tuesday 19 April: Finish Lab 2
- Wednesday 20 April: Chapter 3
- Thursday 21 April: Lab 3 (Probability experiments and simulation)
- Friday 22 April:

**Week 05**

- Monday 25 April: Chapter 4: Lab 3 due
- Tuesday 26 April: Lab 4 (The normal distribution); Homework 1 due
- Wednesday 27 April: Chapter 4; Mini-exam 2 opens
- Thursday 28 April: Lab 5 (Sampling distributions)
- Friday 29 April: Lab 4 due

**Week 06**

- Monday 2 May: Chapter 5: Lab 5 due; Mini-exam 2 closes
- Tuesday 3 May:
- Wednesday 4 May: Chapter 5
- Thursday 5 May:
- Friday 6 May: Homework 2 due

**Week 07**

- Monday 9 May: Chapter 5
- Tuesday 10 May: Lab 6 (Confidence intervals and hypothesis tests for proportions)
- Wednesday 11 May: Chapter 6
- Thursday 12 May:
- Friday 13 May: Lab 6 due
Week 08

- Monday 16 May: Chapter 6; **Mini-exam 3 opens**
- Tuesday 17 May:
- Wednesday 18 May: Chapter 7
- Thursday 19 May:
- Friday 20 May: **Mini-exam 3 closes**

Week 09

- Monday 23 May: Chapter 7
- Tuesday 24 May:
- Wednesday 25 May: Chapter 8
- Thursday 26 May:
- Friday 27 May: **Homework 3 due**

Week 10

- Monday 30 May: **NO CLASS OR OFFICE HOURS** (Memorial Day observation)
- Tuesday 31 May: Lab 7
- Wednesday 1 June: Chapter 8; **Mini-exam 4 opens**
- Thursday 2 June:
- Friday 3 June: **Lab 7 due**

Finals Week

- Monday 6 June: **Mini-exam 4 closes**
- Tuesday 7 June:
- Wednesday 8 June: **Homework 4 due**