STAT 311: Elements of Statistical Methods
Ranjini Grove
Winter 2021

E-mail: grover4@uw.edu
Office Hours: W 3:30 pm - 5:00 pm

Web: canvas.uw.edu/courses/1436179
Class Hours: MWF 2:30 pm -3:20 pm

Course Description

STAT 311 is a modern introduction to the discipline of statistics. Students are immersed in realistic data-driven tasks from the start of the quarter and will learn to navigate their way using a mix of statistics, computer literacy, and last but not least, good old-fashioned common sense.

Course Objectives

At the end of this course, students should be able to

1. Identify limitations in data collection methods and explain how this limits the scope of inference.

2. Use the programming language R to summarize patterns in data visually and numerically.

3. Explain the unifying logic of statistical inference.

4. Apply estimation and testing methods to analyze single variables, and also the relationship between a numerical response and a binary predictor.

5. Model a numerical response using a single numerical predictor variable (simple linear regression).


Required Materials

- Open Intro Statistics, 4th edition
- Laptop with reliable internet access
  - The Student Tech Loan Program is a great resource in case you do not have access to a laptop.
  - Xfinity WiFi Hotspots will be available for free to anyone who needs them. A map of hotspots can be found here. At a hotspot, select the “xfinity wifi” network and then launch a browser to connect.
- Chrome internet browser
Course Structure

The course will cover six themed units from the text:

- Introduction to data
- Summarizing data
- Introduction to linear regression
- Foundations for inference
- Inference for categorical data
- Inference for numerical data

Roughly speaking, Mon/Wed/Fri classes will involve presentation of new material, guided problem solving and live coding. The Tue/Thur sections will involve labs in R.

You will have the option of tuning in live to class or section (synchronous sessions) or to watch the recording afterwards. However, this class is structured as a live class; students who are looking for an asynchronous class should consider STAT 311 B.

Course Communication

Given the large number of students in this class, I ask that you post all your questions on Piazza. Questions regarding regrade requests, due date extensions, and issues of a personal nature should be sent to the instructor. Please include STAT 311 in the header.

Exams and Homework

There will be a written homework assignment (with a separate lab component) due roughly every week.

We will also have three quizzes evenly spaced throughout the quarter. All quizzes will be on CANVAS during the Friday lecture and possibly proctored using the online proctoring tool Proctorio.

<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>Jan 29</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>Feb 19</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>Mar 16</td>
</tr>
</tbody>
</table>

Tentative Course Schedule

Week 01, 01/04 - 01/08: Introduction to Data

- Mon: Syllabus Day
- Tue: Diagnostics
- Wed: Data Basics §1.2
- Thu: Lab 1 - Introduction to R and Rstudio
- Fri: Live coding (Confounding variables)
Week 02, 01/11 - 01/15: Study Design

- Mon: Sampling Principles §1.3
- Tue: Introduction to Tidyverse
- Wed: Live coding (Sampling)
- Thu: (Tutorial) Data wrangling
- Fri: Experiments ($ 1.4)

Week 03, 01/18 - 01/22: Summarizing Data

- Mon: University Holiday
- Tue: (Tutorial) A closer look at ggplot
- Wed: Summarizing Numerical Data (§2.1)
- Thu: Lab 2 - Summarizing Numerical Data
- Fri: Considering categorical data ($ 2.2)

Week 04, 01/25 - 01/29: Quiz Week

- Mon: Live coding
- Tue: (Tutorial) Numerical data- numerical summaries
- Wed: Review for quiz 1
- Thu: Review for quiz 1
- Fri: Quiz 1

Week 05, 02/01 - 02/05: Linear Regression

- Mon: Fitting a line, residuals and correlation (§8.1)
- Tue: Recitation
- Wed: Least squares regression (§8.2)
- Thu: Lab 3 - Introduction to Linear Regression
- Fri: Types of outliers (§8.3)

Week 06, 02/08 - 02/12: Foundations For Inference

- Mon: Sampling distributions (§5.1)
- Tue: Recitation
- Wed: Live coding
- Thu: Lab 4 - Sampling distribution of sample proportions
- Fri: The Normal distribution (§4.1)

Week 07, 02/15 - 02/19: QUIZ week

- Mon: University Holiday
- Tue: Recitation
- Wed: More normal calculations
- Thu: Review for quiz2
- Fri: Quiz 2
Week 08, 02/22 - 02/26: Inference for Categorical Data

- Mon: Confidence intervals for a proportion (§5.2)
- Tue: Recitation
- Wed: Confidence levels
- Thu: (Tutorial) Confidence intervals
- Fri: Hypothesis testing for a proportion (§5.3)

Week 09, 03/01 - 03/05: Inference for Categorical Data

- Mon: p-values
- Tue: Recitation
- Wed: TBD
- Thu: Lab 5 - Inference for a single proportion
- Fri: Difference of two proportions (§6.2)

Week 10, 03/08 - 03/12: Inference for numerical data

- Mon: One sample means with the $t$ distribution (§7.1)
- Tue: TBD
- Wed: Paired difference (§7.2)
- Thu: TBD
- Fri: TBD

Grading

Your final grade will be weighted as follows:

- 60% quizzes (3 quizzes, 20% each)
- 10% labs (no lab will be dropped)
- 30% homework (no homework will be dropped)

If you obtain a 60% or higher according to the grading scheme above, you are guaranteed a 2.0.

Course Policies

- **Attendance** is strongly encouraged and expected. All sessions are conducted “live”, but will be recorded. However, if you prefer asynchronous classes, please consider STAT 311 B. STAT 311 A is structured very differently in terms of the expectations of due dates, assignment times, office hours, and response times. It will work best for students who are able to participate despite remote instruction.

- Lab check-ins and homework must be submitted online by midnight on the due date. The drop box will remain open for 12 hours past the due date/time. Any submissions made during this time will be graded, but subject to a lateness penalty of AT LEAST 20% and may be as much as 50%. No further exceptions will be made past the 12 hour mark.
• Late assignments will only be accepted provided the instructor is notified in advance of the due date and it is approved. Please note that extension requests will typically not be approved during weeks in which there is a quiz.

• **Missing a quiz** In the event of illness, please contact the instructor as soon as possible. There will be no re-takes, however, I can estimate your score using your average on the other quizzes. I may take into account the difficulty of the test as well. The same policy applies to missing homework assignments.

• **Academic Accommodations:** Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

• **Academic integrity** is essential to this course and to your learning. Violations of the academic integrity policy include but are not limited to: copying from a peer, collaborating where it is not allowed, copying from an online resource, using a solutions manual, and using resources from a previous iteration of the course. If you are unsure about whether a particular action would be construed as academic misconduct, please ask. Anything found in violation of this policy will be automatically given a score of 0 with no exceptions. If the situation merits, it will also be reported to the Office of Community Standards and Student Conduct for investigation.

• Winter 2021 has also been designated as an **extraordinary circumstance** quarter. This means you can switch to S/NS grading at any time, even after your grade has been posted. Please consult this page for the official University policy.

• **Religious Accommodations:** 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/)

• **Safety and Health** Take care of yourself. Do your best to maintain a healthy lifestyle this quarter by eating well, exercising, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us can benefit from support during these times of struggle. You are not alone. Asking for support sooner rather than later is often helpful.