STAT 311: Elements of Statistical Methods
Ranjini Grove
Winter 2022

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Office Hours: TBD
Class Hours: M/W 2:30 p.m. - 3:50 p.m.

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 numerical and categorical predictors.

Required Materials

- **Intro to Modern Statistics, 1st edition** (available as a free PDF)
- Laptop with reliable internet access
  - The **Student Loan Tech 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.
- An updated version of the **Zoom** application. Please see here for more details.

Course Structure

The course will cover six themed units as detailed below:

- Introduction to data
• Summarizing data
• Linear Regression
• Foundations for inference
• Inference for categorical data
• Inference for numerical data

Roughly speaking, each Mon/Wed class will involve presentation of new material by the instructor followed by guided practice or live coding. The Tue/Thur sections will be run as computer labs facilitated by the TAs. **Students are expected to attend section in person so they can meet their peers and get an early start on forming groups for the final project.**

The Mon/Wed classes will be taught synchronously online via Zoom. They will also be recorded for later viewing. **There will be a participation activity during one lecture each week. Students will be given through the weekend to complete the activity to accommodate those who are unable to attend.**

**Course Communication**

Given the large number of students in this class, I ask that you contact the TA in charge of your section whenever possible with questions. Contact information for the TAs is below.

• AA/AB: Megha Agarwal (meghaaga@uw.edu)
• AC/AD: Harshil Desai (hhdesai@uw.edu)
• AE/AF: Jillian Fisher (jrfish@uw.edu)

Questions asking for clarification on the course material should be posted on the Ed Discussion Board accessible through CANVAS. The TAs and I will monitor the discussion board and will be happy to answer your questions there.

**Tentative Course Schedule**

**Week 01, 01/03 - 01/07: Preliminaries**

• Mon: Introductions/Diagnostic quiz
• Tue: Lab 1: Hello World!
• Wed: Data Basics (whickham-confounding)
• Thur: Lab 2: Data Basics (arbuthnot)

**Week 02, 01/10 - 01/14: Introduction to Data**

• Mon: A grammar of data wrangling (gapminder)
  – labs 1, 2 due
• Tue: Lab 3: What will you major in? (college_recent_grads)
• Wed: More on grammar of data wrangling (back to gapminder)
• Thu: Lab 4: Data Wrangling Application Exercise (lego_sales)

**Week 03, 01/17 - 01/21: Exploring Data**

• Mon: MLK Day
• Tue: Lab 4 contd.
  – labs 3, 4 due
• Wed: Visualizing numerical data (ggplot2 tutorial)
• Thur: Lab 5: NYC flights (nycflights)
Week 04, 01/24 - 01/28: Summarizing Data

- Mon: Summarizing numerical data (gapminder)
  - lab 5 due
- Tue: Lab 6: Airbnb listings in Edinburgh (airbnb)
- Wed: Considering categorical data (accidents tutorial)
- Thur: Lab 7: Building a spam filter (email)

Week 05, 01/31 - 02/04: Linear regression

- Mon: Regression modeling: single predictor (pp tutorial)
  - labs 6, 7 due
- Tue: Lab 8: Human freedom index (hfi)
- Wed: Regression modeling: multiple predictors (evals)
- Thur: Lab 9: Votes and IMDb ratings (office_data)

Week 06, 02/07 - 02/11: Linear Regression

- Mon: Two numerical predictors (dcbikeshare)
  - labs 8, 9 due
- Tue: Lab 10: Zagat and Italian restaurants (nyc_italian)
- Wed: Model Validation (airbnb)
- Thur: Lab 11: The Office: model validation

Week 07, 02/14 - 02/18: Foundations of Inference

- Mon: Bootstrap confidence intervals (bootstrapgss)
  - labs 10, 11 due
- Tue: Lab 12: Smoking while pregnant (ncbirths)
- Wed: Hypothesis testing with simulation (gss)
- Thur: Lab 13: Still smoking while pregnant (ncbirths)

Week 08, 02/21 - 02/25: Foundations of Inference

- Mon: HOLIDAY
- Tue: Lab 13 contd.
  - labs 12, 13 due
- Wed: Hypothesis testing with randomization (gss)
- Thur: Lab 14: Boomerang kids (custom data)

Week 09, 02/28 - 03/04: Statistical Inference

- Mon: Inference for means
  - lab 14 due
- Tue: Lab 15: TBD
- Wed: Inference for slopes
- Thur: Lab 16: TBD

Week 10, 03/07 - 03/11: Project week

Grading

There will be no timed tests in this class. Your grades will instead be determined by your performance on the lab assignments (70%), in class participation (10%) and a group project (20%). Note
that lab assignments will become increasingly open ended as we progress through the quarter, and students will need to stretch their technical skills and creativity in order to earn full credit.

All questions regarding grading of lab assignments should be brought to your TA within a week after they are graded. You can request to have a submitted assignment regraded, however, the new grade will be used even if it ends up being lower.

Final grades are determined based on the following interpolated scale: 4.0 \geq 97\%, 3.5 \geq 90\%, 3.0 \geq 85\%, 2.5 \geq 80\%, 2.0 \geq 75\%, 1.5 \geq 70\%, 1.0 \geq 65\%, 0.7 \geq 60\%, 0.0 \leq 59\%.

**Course Policies**

- **Attendance** is strongly encouraged and expected. In class participation counts for 10% of your course grade. 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.

- Late assignments will only be accepted provided the instructor is notified in advance of the due date and it is approved.

- **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, using resources from a previous iteration of the course, and **not contributing equally to the group project**. 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.

- **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](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/](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.