STAT 311: Elements of Statistical Methods

Prince Allotey

Autumn 2022 Course Syllabus

Instructor: Prince Allotey  
E-mail: pallotey@uw.edu

Class Hours: MW 2:30 - 3:50pm  
Classroom: GWN 301

Office Hours: WF 1:00 - 2:00pm  
Location: PDL B-316

Teaching Assistants (TAs)

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Sections</th>
<th>TA Office Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jess Phillips</td>
<td><a href="mailto:jephill@uw.edu">jephill@uw.edu</a></td>
<td>AA and AB</td>
<td>MW 12:15 - 1:15pm</td>
</tr>
<tr>
<td>Andrea Boskovic</td>
<td><a href="mailto:abosko26@uw.edu">abosko26@uw.edu</a></td>
<td>AC and AD</td>
<td>TT 2:15 - 3:15pm</td>
</tr>
<tr>
<td>Saksham Jain</td>
<td><a href="mailto:sj305@uw.edu">sj305@uw.edu</a></td>
<td>AE and AF</td>
<td>TT 12:30 - 1:30pm</td>
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- Zoom links and location for weekly tutoring and office hours can be found on Canvas

Course Description

STAT 311 is a modern introduction to the discipline of statistics. This course is intended as a first course in statistics for students in many different disciplines. This course is also appropriate for students who need a statistics course as a prerequisite for applying to graduate school, or for individuals who want a better command of elementary statistical methods for use at work. 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 in the R programming language, and finally, good old-fashioned common sense. Topics include exploratory data analysis, correlation and linear regression, probability distributions, and inference for means and proportions.

Required Materials

- **Text:** Open Intro Statistics, 4th ed.: Diez, D.M.; Cetinkaya-Rundel, M.; Barr, C.D. A free pdf copy of the book can be found here.

- **Calculator:** No specific calculator is needed for this course. A simple calculator that can take square roots should be fine. However, graphing calculators are not allowed.

- **Laptop:** All students are encouraged to install R and R Studio on their personal devices. R is a free software that is available for many platforms. Please contact UW Student Technology Loan Program (https://stlp.uw.edu) if you do not have a reliable personal laptop.

Prerequisites

A minimum prerequisite of pre-calculus is required.
Course Objectives

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

- Identify limitations in data collection methods and explain how this limits the scope of inference.
- Summarize patterns in data visually and numerically using R software.
- Apply estimation and testing methods to analyze single variables, and also the relationship between a numerical response and a binary predictor.
- Perform simple linear regression analysis, including finding the equation of the regression line, as well as conducting inference related to the regression slope parameter.
- Use statistical software for graphical and numerical summaries, correlation and regression, various forms of inference, and make data-based decisions.

Course Structure

The course is organized into seven units from the text:

1. Introduction to data
2. Summarizing data
3. Introduction to linear regression
4. Probability distributions
5. Foundations for inference
6. Inference for categorical data
7. Inference for numerical data

Each unit will be covered over the course of a week, with some units taking more time. Roughly speaking, Monday/Wednesday classes will involve presentation of new material, and guided problem solving. Tuesday/Thursday sections held by TAs will involve computer instruction in R.

Office Hours

Office hours are optional but strongly encouraged. Please feel free to attend any of the office hours, no appointment required. The TAs have office hours, please feel free to attend those as well. All office hours zoom links are posted on Canvas. Need to register with uw.edu to join the meeting.
Email Policy

During the week, we will make every effort to respond to emails within 24 hours. The weekends may be different. However, if there is an answer to your question in the syllabus, then we will point you to the syllabus. If you have not gotten a response to an email within 24 hours, please email again as it is possible that we missed your email as it moved further down the queue. If you would like to get your answer faster, please come to class or office hours. When emailing either the instructor or grader, please include “[STAT 311]” at the beginning of the email header and also state your discussion section number in the subject line. It will help us respond to you faster.

Assessments

• There will be about 7-9 homework assignments evenly spaced throughout the quarter. The due dates will vary but there will be an assignment due after every unit covered. Each assignment will include an R computing component and you will be required to upload a pdf file of your code when submitting your work. You will use R Markdown to write up all assignments. For deadlines, please see the Canvas site.

• In addition, you will have four in-class tests: three quizzes and a final exam. The quizzes will include R and non-R problems. You can use a formula sheet for in-class tests. Quizzes are not cumulative, but the final exam is.

• The upcoming dates are as follows:

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Date</th>
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<tbody>
<tr>
<td>Quiz 1</td>
<td>Wednesday, October 26</td>
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<tr>
<td>Quiz 2</td>
<td>Wednesday, November 16</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>Wednesday, November 30</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Tuesday, December 13</td>
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</tbody>
</table>

• On randomly selected lectures on M/W, you will be assigned an application exercise to assess your understanding of the material just covered. This low stakes assessment is to encourage attendance and participation, will be counted as extra credit (maximum points 5%).

• Due to any unforeseen circumstances, the lowest quiz and lowest homework assignment will be dropped when computing final grades.

• Homework Graders

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Grading</th>
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<tbody>
<tr>
<td>Ziqiong Xie</td>
<td><a href="mailto:zx0122@uw.edu">zx0122@uw.edu</a></td>
<td>Homeworks 1, 3, 5, and 7</td>
</tr>
<tr>
<td>Eric Kumar</td>
<td><a href="mailto:ekumar3@uw.edu">ekumar3@uw.edu</a></td>
<td>Homeworks 2, 4, 6, and 8</td>
</tr>
</tbody>
</table>

All questions regarding homework scores must be emailed to the grader within 72 hours after the scores are released. No further exceptions will be made past the 72-hour mark.
Grading

Your final grade will be weighted as follows:

- 30% Quizzes (we will drop the worst grade in any quiz)
- 35% Homework’s (we will drop the worst grade in any homework)
- 15% Labs and Participation (we will drop the worst grade in any lab)
- 20% Final Exam

You need to take two of three quizzes and the final to pass this course. You may skip two-three assignments/labs and still pass. Final grades may be based on curved weighted percentages and the UW undergraduate grading scale will be used.

I reserve the right to curve the scale dependent on overall class scores at the end of the quarter. Usually, I do curve grades at the end of the quarter. For instance, in the past, if you complete all assignments/tests and you obtain 60% or higher according to the grading scheme above, you are guaranteed a 2.0. With 97% or higher you are guaranteed a 4.0.

- No extra credit in this course please. Consider your in-class assignments, and labs as extra credit work. I expect you to get full or close to full credit for these course components, regardless of your math background.

Course Policies

- Class
  - I understand that electronic note-taking may be important for some in the class and so computers will be allowed in class. Please refrain from using computers and phones for anything but activities related to the class. Eating and drinking are allowed in class but try not to eat your lunch in class as the classes are typically active.
  - Please keep in mind that if you have a question, it is very likely that others do as well. I encourage you to participate during lectures by asking questions and making comments.
  - Attendance is strongly encouraged and expected in all lecture and sections. You must be physically present in class to receive credit for an in-class assessment exercise.

- Assessments
  - CANVAS assignments must be uploaded before midnight on the due date specified. The dropbox 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 as much as 50%. No further exceptions will be made past the 12-hour mark.
  - Please be aware that unexpected problems with laptops or internet connections do not qualify as valid excuses. You are expected to take the due dates very seriously and begin working on problems as soon as the material is covered. Pace yourself.
− In accordance with university policy, a student may be given the opportunity to re-take a quiz in the following circumstances: death or serious illness in the immediate family, illness of the student, and provided previous notification is given, observance of regularly scheduled religious obligations and might possibly include attendance at academic conferences or field trips, or participation in university-sponsored activities such as debating contests or athletic competition.

− 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.

− 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 consider the difficulty of the test as well. The same policy applies to missing homework assignments.

− **Final Exam** All students must take the final exam at the regularly scheduled time. **No make-up or early final exams will be given.**

- **Academic Integrity and Honesty** 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. Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by the Office of Community Standards and Student Conduct.

- **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. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), please contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu

- **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/

- **Disability Services for Students** To request disability accommodation, contact the Disability Services Office at: 206.543.6450 (voice), 206.543.6452 (TTY), 206.685.7264 (fax), or email at dso@u.washington.edu. The University of Washington makes every effort to honor disability accommodation requests. Requests can be responded to most effectively if received as far in advance of the event as possible, preferably at least 10 days. (http://hr.uw.edu/dso/)
• **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. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Please call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus’s team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

**Tips for Success**

STAT 311 is a fast-paced course which covers a lot of material quickly. What makes this class difficult is that we expect you to go beyond recipes and instead think for yourself. You will likely spend about 5-10 hours every week on STAT 311 outside of the 4 class meetings.

- Attend every class and section with a desire to learn. Ask questions in class, on the discussion board in CANVAS, during office hours. Be an active participant.

- Doing is an integral part of learning mathematical subjects. Statistics is no exception. Put pen to paper during the in-class exercises.

- Attend office hours if you need clarifications on the material. Do not put this off. The topics build on each other, and minor misinterpretations can become big problems.

- For each homework assignment, write all answers in complete sentences. We are looking for thoughtful answers/interpretations. More is not always better, so think about what you write. RStudio has a spell checker–use it!

- You are encouraged to collaborate on your homework assignments and group problem sets; ensure submitted documents represent your own understanding of the material.

**Disclaimer**

The instructor reserves the right to make changes to the syllabus as necessitated by circumstances.
Tentative Course Schedule

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concept you should grasp by the end of each week. The scope of each test will be announced in class. The most of to date version of the schedule will be available on Canvas.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
<th>Assessments</th>
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<tbody>
<tr>
<td>01</td>
<td>09/28 - 10/02</td>
<td>Introduction to data</td>
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<tr>
<td>02</td>
<td>10/03 - 10/09</td>
<td>Introduction to data</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Summarizing data</td>
<td>Lab 1</td>
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<tr>
<td>03</td>
<td>10/10 - 10/16</td>
<td>Summarizing data</td>
<td>Homework 1</td>
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<td>Correlation and linear regression</td>
<td>Lab 2</td>
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<tr>
<td>04</td>
<td>10/17 - 10/23</td>
<td>Introduction to linear regression</td>
<td>Homework 2</td>
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<td></td>
<td>Introduction to linear regression</td>
<td>Lab 3</td>
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<tr>
<td>05</td>
<td>10/24 - 10/30</td>
<td>Probability distributions</td>
<td>Homework 3/Quiz 1</td>
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<td>Probability distributions</td>
<td>Lab 4</td>
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<td>06</td>
<td>10/31 - 11/06</td>
<td>Probability distributions</td>
<td>Homework 4</td>
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<td>Foundations for inference</td>
<td>Lab 5</td>
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<tr>
<td>07</td>
<td>11/07 - 11/13</td>
<td>Foundations for inference</td>
<td>Homework 5</td>
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<td>Foundations for inference</td>
<td>Lab 6</td>
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<td>08</td>
<td>11/14 - 11/20</td>
<td>Inference for categorical data</td>
<td>Homework 6/Quiz 2</td>
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<td>Inference for categorical data</td>
<td>Lab 7</td>
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<td>09</td>
<td>11/21 - 11/27</td>
<td>Inference for numerical data</td>
<td>Homework 7</td>
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<td>Inference for numerical data</td>
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<tr>
<td>10</td>
<td>11/28 - 12/04</td>
<td>Inference for numerical data</td>
<td>Homework 8/Quiz 3</td>
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<tr>
<td></td>
<td></td>
<td>Inference for numerical data</td>
<td>Lab 8</td>
</tr>
<tr>
<td>11</td>
<td>12/05 - 12/09</td>
<td>Review Session</td>
<td>Lab 9/Homework 9</td>
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<td></td>
<td>Final Exam</td>
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