STAT 220 A: Statistical Reasoning

Autumn 2021

MEETING DAYS, TIMES, AND LOCATIONS

- UW Autumn 2021 quarter dates of instruction: Wednesday 29 September - Friday 10 December 2021
- Finals Week: 11-17 December 2021
- University holidays (no lecture, quiz section meetings, or office hours):
  - Thursday 11 November 2021 - Veterans Day
  - Thursday - Friday 25-26 November 2021 - Thanksgiving break
- Lectures: Mondays, Wednesdays, and Fridays 8:30 -9:20 am

Locations

MWF Lecture Meetings: Johnson Hall 102

Quiz sections

- AA: Thomson 335, 12:30-1:20 pm
- AB: Thomson 335, 1:30-2:20 pm
- AC: Thomson 119, 12:30-1:20 pm
- AD: Thomson 119, 1:30-2:20 pm
- AE: Zoom - See Zoom Tab, 12:30-1:20 pm
- AF: Zoom - See Zoom Tab, 1:30-2:20 pm

All lectures will be recorded using Panopto. These recordings will be made available shortly after they have been recorded. While I encourage students to attend lecture meetings in real time, I understand that many members of the UW community continue to be concerned with maintaining social distance during the COVID-19 pandemic. Consequently, those who would prefer to watch lecture recordings are allowed to do so.

TEACHING TEAM

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

- Pronouns: he/him/his
- Email: brownw@uw.edu
- Office hours: Tuesdays and Thursdays 10:00-11:00 am, or by appointment
- Office hour link: https://washington.zoom.us/j/99847768830
COURSE OVERVIEW

Course description

Statistics is the science of variability and includes a body of applied mathematical tools for describing and modeling such variability wherever we may encounter it in our world, whether in the physical, biological, or behavioral and social sciences. This course focuses on statistical reasoning, the "what" and "why" of statistics rather than the "how." The goal of this course is to introduce you with the underlying rationale of statistics, including the ability to distinguish between best practices in, as well as misuses of, statistics. While some of the concepts underlying statistical practice are relatively straightforward and intuitive, others are counterintuitive and require a bit of mental practice to grasp. This course will aim to give you such practice. More generally, this course aims to improve your critical thinking skills, using statistical reasoning as an example.

Course objectives

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

- Understand the importance of producing data in a systematic fashion, serving as a point of entry into understanding patterns of variability in our world (Part I of the textbook)
• Summarize effective numerical and graphical ways of exploring and describing data once we have collected them, as well as identify limitations on different modes of data description (Part II of the textbook)
• Grasp the concept of probability and understand how this helps us to model and explore recurring patterns in variability, including in relationships between variables (Part III of the textbook)
• Understand how we can combine probability models with the patterns of variability we observe in data to make inferences about the larger populations from which such data come (Part IV of the textbook)

ACADEMIC CONDUCT

Collaborative learning and diversity statement

Acquiring new knowledge 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 opportunity for knowledge acquisition, but to enjoy the full rewards of 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 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/

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 and 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 attribution; 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

All lectures will be recorded via Panopto. Attending lectures in real time allows students to ask questions of the instructor. If you are not able to attend, you are still expected to watch the recorded lecture once it becomes available via Panopto on the course website.

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, http://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/

REQUIRED MATERIALS


*Note: you are strongly encouraged to read the chapter assigned for every lecture unit before that unit has begun. We will focus on the readings. You might find the exercises at the end of every section and chapter useful, but these will not be used for assigned coursework.*

A simple calculator, capable of addition, subtraction, multiplication, division, squaring, and taking square roots. (Graphing calculators and calculator apps on electronic devices with access to the internet such as smartphones, laptops, and tablets are not permitted as "simple calculators.")

ASSIGNMENTS AND ASSESSMENT (GRADING)

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Eight reading quizzes</td>
<td>24% (3% x 8)</td>
</tr>
<tr>
<td>Eight participation reports based on quiz section exercises</td>
<td>8% (1% x 8)</td>
</tr>
<tr>
<td>Four problem sets (drop the lowest)</td>
<td>20% (5% x 4)</td>
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<tr>
<td>Four non-cumulative mini exams</td>
<td>48% (12% x 4)</td>
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</tbody>
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Assignments

- *Reading quizzes* (*n*=8; *QZ1* through *QZ8*): To encouraging you to engage with your textbook, reading quizzes will be open-book, covering approximately 4-5 chapters of your textbook (two quizzes per "Part" in your textbook). These will be administered online through the course website. Do not collaborate with your peers while you complete these assignments. Quizzes will be completed online on the course website, under the "Quizzes" hyperlink.

- *Participation Reports* (*PR1* through *PR8*): Participation reports will be low-stakes assignments, encouraging you attend your quiz sections or to watch them once recordings have become available. Starting Week 2, there are 19 quiz sections. For eight of these, you will need to provide brief synopses of the exercises and discussions you had during the section. These will be assigned and submitted online on the course website, under the "Assignments" hyperlink.
Problem sets (n=4; PS1 through PS4): These are medium-stakes assignments and will be based on practice problems throughout the textbook. These are intended as practice opportunities leading up to each mini exam (one PS per EX). These will be assigned and submitted online on the course website, under the "Assignments" hyperlink.

Mini exams (n=4; EX1 through EX4): Each mini exam is noncumulative. It will cover one Part of your textbook and will be conducted online. The goal of these exams is the evaluate your mastery of the content we cover in lectures, readings, and quiz sections. Mini exams will be completed online on the course website, under the "Quizzes" hyperlink.

Late work policy: Due dates for all graded assignments are clearly posted on the course website, so there are few good reasons not to submit them on time. As a matter of fairness to your fellow students and to the graders, late work will be accepted but reduced by 25% of the original assignment point value for each full or partial day beyond the due date that the assignment is submitted. Exceptions to this policy may be considered in the case of documented emergencies or other extenuating circumstances, but you must communicate with your instructor (Will Brown) if you believe such exceptions are warranted.

Percent grade to grade point translation: The table below identifies the grade points corresponding with every tenth percent grade. Your grades will be posted to the grade book on the course website.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade point</th>
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<tbody>
<tr>
<td>10%</td>
<td>0.0</td>
</tr>
<tr>
<td>20%</td>
<td>0.8</td>
</tr>
<tr>
<td>30%</td>
<td>1.2</td>
</tr>
<tr>
<td>40%</td>
<td>1.6</td>
</tr>
<tr>
<td>50%</td>
<td>2.0</td>
</tr>
<tr>
<td>60%</td>
<td>2.4</td>
</tr>
<tr>
<td>70%</td>
<td>2.8</td>
</tr>
<tr>
<td>80%</td>
<td>3.2</td>
</tr>
<tr>
<td>90%</td>
<td>3.6</td>
</tr>
<tr>
<td>&gt;98%</td>
<td>4.0</td>
</tr>
</tbody>
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EMAIL POLICY

When you contact any member of the teaching team by email, please present yourself in a professional manner. **Be sure to do the following:**
• You are strongly encouraged to use your UW email accounts rather than personal email accounts when emailing the teaching team. Alternatively, you are strongly encouraged to use the Canvas email function.
• Address your instructor or TA by their preferred names and titles.
• Include a subject with "STAT 220" somewhere in the title.
• Be sure to write a clear email, identifying the questions or topics for which you wish a response.
• If your question cannot be easily answered in a short email, consider meeting us during our office hours instead or requesting a one-on-one appointment.
• Don't forget to sign off with your name as you would prefer to be addressed.
• Be sure to acknowledge our response if appropriate, for example by responding to any follow-up questions we may have for you.
• Please allow up to 48 hours for a response.
• If you disagree with the interpretation of any scored assignment, please submit a request for a re-evaluation to your instructor (Will Brown) via email. You must submit this request 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, but I will respond to your request in either case.
• The teaching team will not accept any graded coursework submitted via email.

COURSE SCHEDULE

Week 1

Wed 29 September: No class

Thurs 30 September: No quiz section meetings

Friday 1 October: Course overview

Week 2

Monday 4 October: Unit 1---Populations, variability, representative data, and variables

Tuesday 5 October: Overview of key concepts in statistics

Wednesday 6 October: Unit 1---Different types of variables

Thursday 7 October: Research questions
Friday 8 October: Unit 1---Different types of variables; relationship between research questions & data collection

**Week 3**

Monday 11 October: Unit 1---Relationship between research questions & data collection; intro to data collection strategies: observational studies

Tuesday 12 October: Types of variables

Wednesday 13 October: Unit 1

Thursday 14 October: How observational studies go wrong

Friday 15 October: Unit 1; **Reading quiz 1 due (covers Chapters 1 through 5)**

**Week 4**

Monday 18 October: Unit 1

Tuesday 19 October: Research ethics

Wednesday 20 October: Unit 2

Thursday 21 October: A real-world example of an experiment from fish virology

Friday 22 October: Unit 2; **Reading quiz 2 due (covers Chapters 6 through 9)**

**Week 5**

Monday 25 October: Unit 2

Tuesday 26 October: Mini exam 1 study session; **Problem Set 1 due**

Wednesday 27 October: **Mini exam 1 (Unit 1) opens at 12:01 am**

Thursday 28 October: **No quiz section meetings; Mini exam 1 (Unit 1) closes at 11:59 pm**

Friday 29 October: Unit 2
Week 6

Monday 1 November: Unit 2; **Reading quiz 3 due (covers Chapters 10 through 13) [revised due date]**

Tuesday 2 November:

Wednesday 3 November: Unit 2

Thursday 4 November:

Friday 5 November: Unit 2; **Reading quiz 4 due (covers Chapters 14 through 16)**

Week 7

Monday 8 November: Unit 3; **Problem set 2 due**

Tuesday 9 November: Mini exam 2 study session

Wednesday 10 November: **Mini exam 2 (Unit 2)**

Thursday 11 November: **NO CLASS (VETERANS DAY)**

Friday 12 November: Unit 3; **Reading quiz 5 due (covers Chapters 17 through 18)**

Week 8

Monday 15 November: Unit 3

Tuesday 16 November:

Wednesday 17 November: Unit 3

Thursday 18 November:

Friday 19 November: Unit 3; **Reading quiz 6 due (covers Chapters 19 through 20)**

Week 9
Monday 22 November: Unit 3
Tuesday 23 November:
Wednesday 24 November: Unit 3
Thursday 25 November: NO CLASS (THANKSGIVING WEEKEND)
Friday 26 November: NO CLASS (THANKSGIVING WEEKEND)

**Week 10**

Monday 29 November: Unit 4; **Problem set 3 due**
Tuesday 30 November: Mini exam 3 study session
Wednesday 1 December: **Mini exam 3 (Unit 3)**
Thursday 2 December:
Friday 3 December: Unit 4; **Reading quiz 7 due (covers Chapters 21 through 22)**

**Week 11**

Monday 6 December: Unit 4
Tuesday 7 December:
Wednesday 8 December: Unit 4
Thursday 9 December: Mini exam 4 study session
Friday 10 December: Unit 4; **Reading quiz 8 due (covers Chapters 23 through 24)**

**Finals Week**

Monday 13 December: (no lecture); **Problem set 4 due**
Tuesday 14 December: **Mini exam 4 (Unit 4)**