Overview

Course Preview

- 10 Lessons
- Online assignments as part of almost every lesson
- R Assignments
- Quizzes
- Group Project

This course provides an introduction to the use of statistical methods from the points of view of both consumers and producers of statistics. We begin with definitions and examples to get you thinking about statistical reasoning and the concept of uncertainty. This is followed by introducing types of data, data collection methods, methods for data visualization and the use of descriptive statistics. The course then moves on to parameter estimation and several inferential methods. Specific topics include graphical displays for qualitative and quantitative data; calculation and interpretation of summary statistics; elementary concepts of probability and sampling; random variables and probability distributions; basic concepts of hypothesis testing, estimation, and confidence intervals; \textit{t}-tests; and correlation and simple linear regression.

Course Objectives

By the end of the course, you will be able to

- summarize single variable data sets by computing summary statistics and by creating appropriate graphs such as histograms, stem-and-leaf plots, and boxplots;
- interpret summary statistics and visual displays created either by yourself or others;
- use computed means and standard deviations to apply normal approximation methods;
- relate data to a standard normal distribution or percentiles when appropriate;
- plot points and lines to look at relationships between two quantitative variables;
- compute correlation coefficients and relate the correlation coefficient to the effect of regression;
- perform simple linear regression analysis, including finding the equation of the regression line, as well as conducting inference related to the regression slope parameter;
- distinguish between estimation and prediction with respect to linear regression and be able to create and interpret confidence and prediction intervals;
- explain elementary probability rules, and extend these concepts to setting up correct chance models in order to make a statistical inference;
• define the concept of uncertainty;
• compute standard errors and confidence intervals as measures of reliability for parameter estimation;
• interpret confidence intervals;
• set up and interpret hypothesis tests, using z-tests, t-tests and chi-square tests, in order to make inferences about populations based on information from samples; and
• discuss the assumptions for the various tests and when it is appropriate to use each type of test.

About the Course

The ten lessons in this course covers much of the material in Chapters 1 - 12 of Openstax Introductory Statistics. There will be nine online Sapling homework assignments, five R assignments, three quizzes and one final group project. Lectures, as mp4 PowerPoint lectures, are part of Lessons 1 - 9. Lesson 10 will be wrapping up the group project. Your final grade for this course will be determined from your overall weighted percentage of the homework, R assignments, quizzes and group project.

Recommended/Reference Reading Assignments

The textbooks are meant to supplement the lectures. For some topics, it may be important for you to carefully read the textbook to gain more in-depth understanding. Many of the chapters contain examples other than those worked through in the lectures. Going through examples can help further your understanding of the various topics. Each lesson will outline the main points for each topic, providing further explanations and examples for more difficult topics. Each student will need to figure out what works best for their learning style. Some will find it better to listen to the lectures first and then go to the book. Others may find it better to go through the book and then listen to the lectures. To avoid undue frustration, listen to the lectures and at least scan through the chapters before attempting the assignments. I have chosen this text for the variety of examples it offers, and for its clear approach to many topics.

Lessons will generally follow the content in the texts; however, some chapters and sections will be skipped and examples not in the text will be presented. Readings other than from the textbooks may also be recommended.

Graded Assignments

There will be online auto-graded assignments through Sapling Learning (our homework software). The online assignments will be accessed via Canvas—specific instructions are provided via a link on the Canvas "Syllabus" page. The purpose of these online problems is to give you sufficient practice with the essential computations and interpretations that are introduced within each chapter. The R Assignments will have a Canvas upload and Canvas "quiz" component. The Canvas "quiz" component are not quizzes; rather, you will upload some of the R assignment answers in Canvas for auto-grading. More on this later.

About the Lessons

You can stop and start the online lecture presentations when you need to, and easily find where you left off if you need to close out and return at a later time. Each lesson includes mp4
PowerPoint online lectures recorded by your instructor. The lesson material is designed so that you apply new skills as you learn them to complete the homework and to prepare you for the exams. Some students may find it helpful to read the assigned pages from your text, then listen to the lecture.

The lessons emphasize understanding the material and the interpretation of results. Example problems are presented to illustrate concepts and problem-solving. Lessons generally follow the text; however, some chapters and sections are skipped and examples not in the text are presented. Also, for a few topics the lectures provide more detail than the text.

The following list overviews the lessons:

- "Lesson 1. Data, Experiments, Observational Studies and Sampling Methods" covers introductory ideas to get you thinking statistically, including definitions of some key terms used throughout the course, as well as types of data. Provides background in observational studies and experiments that are used to collect/generate data.
- "Lesson 2. Describing Data with Graphs and Numerical Measures" presents various graphical and numerical summaries used to describe univariate data.
- "Lesson 3. Describing Bivariate Data, Including Correlation, Covariance and the Least Squares Regression Line, and Probability I" covers statistical methods appropriate for summarizing some bivariate qualitative and quantitative data. This Lesson also has the first probability Lesson. Lesson 4 is a very heavy lesson, so the initial probability lecture was moved from Lesson 4 to Lesson 3.
- "Lesson 4. Probability II, Randomness, and Probability Distributions" continues with probability concepts that form the basis for the statistical inference techniques covered later in the course. We also introduce the notion of probability distributions and cover some specific discrete and continuous distributions.
- "Lesson 5. Sampling Distributions" presents the notion of sampling variability and covers the very important concept of sampling distributions. Sampling distributions are important in the development of the statistical inference techniques covered in later lessons. This lesson also provides general information and tips for taking the midterm exam.
- "Lesson 6. Large Sample Estimation for the Big-5 Parameters" introduces inference in the form of confidence intervals for the Big-5 parameters and for working with large samples.
- "Lesson 7. Large Sample Hypothesis Testing for the Big-5 Parameters and Small Sample HTs and CIs for Means" introduces hypothesis testing for the Big-5 parameters and for working with large and small samples, including CIs for small samples. Includes notion of Type I and Type II errors and power.
- "Lesson 8. Simple Linear Regression and Inference for Regression" revisits the least squares regression line introduced in Lesson 3, extending the methods to include inference for the regression slope and interval estimates for expected y-values given x. Also covers regression diagnostics.
- "Lesson 9. Analysis of Categorical Data/Inference for Count Data" expands the analysis of count data introduced in Lesson 3 to hypothesis testing (chi-square tests for categorical data).
- "Lesson 10. Preparing Your Final Project Report" provides general information and tips for the report. There is no new material this week although you will likely be finishing up homework from Lesson 9.
Course Policies

Grades

The online Sapling homework counts for 25% of your course grade and the R assignments together count for 20%. The quizzes are 30% of your overall course grade and the final group project is 25%. The weighted average of these four components will be used to assign the final course grade. You need an overall weighted percentage of $\geq 70\%$ to receive a 2.0 in this course. You must participate in the final group project to get credit for this course.

Notes on Studying

It takes time to learn mathematics. According to the estimates for UW courses, it should take about $165$ hours of work to complete a five-credit class. This course should take a similar amount of time. You will need to make a plan, set goals and start without delay. The responsibility lies with you to manage your time. This will include budgeting time for not understanding a topic at first exposure. It often takes several attempts before a new idea really sinks in, even at the research level; it is perfectly natural. When reading the text, try to concentrate. You do not always have to work for three hours at a stretch but attempt to put in quality time at regular intervals.

Many students fall into the habit of working online homework without writing out steps (or just using scratch paper that gets tossed); it is not surprising that tests intimidate these students. Try working homework problems like you would do for a written assignment--show steps and think about the process and not just the final answer. Take the time to attempt and re-attempt an elusive problem. When you penetrate it, the confidence you gain is very great.

Contacting Your Instructor

Active interaction is strongly encouraged; please feel free to ask questions or make comments via the Discussion Forum. Try to post your questions under the appropriate thread (by Lesson) unless you have a general question, which can be posted under the General Discussion Forum thread. For personal questions attend office hours, request an appointment, or send an email.

Student Conduct Code

The University of Washington's Student Conduct Code (Links to an external site.) applies to all students. Students are expected to maintain the highest standards of academic responsibility (Links to an external site.). Plagiarism and other kinds of academic misconduct are considered serious offenses at the UW. Plagiarism is using someone else’s words or ideas without proper citation. It can range from failure to credit a single sentence or paragraph to passing off an entire article, speech or another student’s paper as one’s own.

For non-credit courses, instances of academic dishonesty are handled by the University of Washington Professional & Continuing Education Committee on Academic Conduct. If evidence of academic misconduct is established, the student will be given a failing grade for the course and any request for a refund of course or other fees will be denied.
Statistics Tutor and Study Center

Statistics Tutor and Study Center (STSC) will be offering 1 on 1 tutoring appointments fall quarter. Click on the link below to schedule an appointment.

Statistics Study Center Weekly Schedule--Click Here to Schedule (Links to an external site.).

Course Discussion Forum

The Course Discussion forum allows you to communicate with other currently enrolled students, as well as your instructor and TAs. You can use the forum to exchange ideas, resources, and comments about your coursework with other students in this course. Please post course-related questions to the forum, rather than using e-mail, so that your we can respond for the benefit of all.

Note that the Discussion Forum is organized by threads. Please post questions or comments to the appropriate thread--this will make it easier for everyone to read through the posts and is especially important for questions that are specific to a given Lesson. At this point there are threads for General Questions, each Lesson, Forming a Study Group, as well as for the Final Group Project. Don't, however, hesitate to start a new thread with a different label, if appropriate.

Click here to go to the Discussion area.

E-mail

Please use e-mail to communicate with your instructor or TA's regarding personal questions about your grade or comments about your assignments. However, for technical questions or help, please contact UW IT. You will get the fastest results if you include the url (address displaying in your browser) to any Web-related site or page you are trying to reach. For Sapling technical issues, contact information listed under the Sapling Learning section of Modules.

UW Library Services

As an online student, you have access to a wealth of Web resources compiled to provide fast, easy access to information that supports your online learning experience. Organized by subjects, UW Library Services links you to sites with help for writing and research, study skills, language learning, and library reference materials. All links have been assessed for credibility and reliability, and they are regularly monitored to ensure their usability.

Materials

About the Textbooks

The four books listed below will be referenced for this class. All books have freely available pdf or online versions. All books are available for purchase as well, but this is not necessary. Additionally, one other reference for R is also listed.


Links to the free text are found at https://openstax.org/details/books/introductory-statistics?Book%20details (Links to an external site.).
Statistical Inference via Data Science: A ModernDive into R and the Tidyverse. ISBN: 978-0-367-40982-1

The free text is available to read online at https:// moderndive.com/index.html (Links to an external site.)

OpenIntro 4th Edition, which can be found here: https://www.openintro.org/book/os/ (Links to an external site.)

Introductory Statistics with Randomization and Simulation, which can be found here: https://www.openintro.org/book/isrs/ (Links to an external site.)

Additional Reference for R that you might find useful: R for Data Science, which can be found here: http://r4ds.had.co.nz/ (Links to an external site.)

Calculator

No particular calculator is needed for this course as you can use R as a calculator for homework and quizzes.

Many of the problems can be (and should be) done by hand. Working problems by hand may help students develop intuition around the methods. If asked to show your work on a quiz, calculator or R function calls do not count—you must be able to show your work.

Online Homework Assignments (Sapling Learning)

We will be using Sapling Learning for our online homework. You must set up your Sapling account via Canvas. Click on Modules and find the "Sapling Learning Access" module just under the "Course Overview" module. Click on the "Sapling Home" link and follow directions. You will eventually need to purchase Sapling access, but you can get started with a 14-day trial. If you are out of the country and have trouble with the purchase, you may need to use the PayPal. If you have problems, please contact MacMillan Customer Support (the link is in this module). Above the "Sapling Home" link is a link with registration instructions if you are having problems.

You will be able to access all Sapling assignments via Canvas. You can also login via saplinglearning.com once your account is created. This will give you access to the assignments and other non-graded content (statistical tables, eBook link, etc.).

There will be nine Sapling assignments that are equally weighted plus two getting started assignments (Practice assignment and Math Review). The nine main lesson assignments have unlimited attempts but there is a 5% penalty for each wrong answer—so, take your time and try not to just guess. For each assignment, there is a due date, but you are allowed a three-day automatic extension if you need it. There is a flat 1% penalty for late assignments. Both the Practice assignment and the Math Review are unpenalized. These assignments will help you get familiar with Sapling. Also, if you log directly into Sapling you will find a getting started video that you can watch if you think it will be helpful.
R Assignments

There will be five R Assignments that will introduce you to R, a Statistical Programming Language, and RStudio (a GUI interface for R). We will use the Statistical Inference via Data Science text as our guide for learning R.

R and RStudio are both free and are available for a number of operating systems. R is a statistical software and programming language that is powerful, flexible, available for most operating systems (Windows, Macs and *nix) and free. You can download it at the "Comprehensive R Archive Network" or CRAN (as it's known). There are many benefits to learning and using R, especially if you plan to use statistics in your future academic studies, or for work.

RStudio is an interface to R that provides simple interactive access to R's functionality, with menus and buttons that automate many common tasks. For new users, this makes it much easier to use R. For more advanced users, RStudio also provides seamless integration with other tools for reproducible research (like markdown and GitHub) and software development.

Installation links are provided in the R and RStudio Module found via the Modules link at the left.

Quizzes

There will be three quizzes throughout the quarter and one final group project. The quizzes will be online, but some problems may require you to upload your work.

Group Project

The final in this class will be a written report associated with the group project. There will be intermittent draft deadlines that will be uploaded to Canvas--these will only be roughly graded on a scale of 1 - 5 based on apparent effort and completion of tasks. We will not specifically grade them for correctness. We will, however, have other students peer review your answers to provide some feedback. If you stay on track with the project, you should have plenty of time to produce a great final report. These projects will be carefully graded.

Grading

Overall weighted percentages will be calculated as follows: Sapling homework (25%), R Assignments (20%), Quizzes (30%), and Group Project (25%). Final grades will be determined from the overall weighted percentages.

Access and Accommodations

Your experience in this class is important to us, and it is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. The Disability Services Office (DSO) provides accommodation, referral information, and assistance for professional and continuing education students with a documented physical, mental, or sensory disability.

If you have already established accommodations with DSO, please communicate your approved accommodations to your instructor at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DSO, but have a temporary or
permanent disability that requires accommodations (this can include but is not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DSO at 206-543-6450 or dso@uw.edu or via their Contacts pageLinks to an external site.

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/) (Links to an external site.). 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/) (Links to an external site.).

Mental Health Resources

Any member of the UW community can call SafeCampus (Links to an external site.) anytime to anonymously discuss safety and well-being concerns for yourself or others. Caring, trained professionals will talk you through options and connect you with additional resources if you want them. Available 24/7 by phone at 206-685-7233, or M-F, 8am-5pm at safecampus@uw.edu.

Crisis Connections (Links to an external site.) provides immediate help to individuals, families, and friends of people in emotional crisis, dealing with addiction, or struggling to meet basic needs. Anyone in Washington State can receive support and resource referrals 24/7 through their crisis line at 866-4CRISIS (866-427-4747 or TTY 206-461-3219).

UW Diversity Statement

Diverse backgrounds, embodiments, and experiences are essential to the critical thinking endeavor at the heart of university education. Therefore, I expect you to follow the UW Student Conduct Code in your interactions with your colleagues and me in this course by respecting the many social and cultural differences among us, which may include, but are not limited to: age, cultural background, disability, ethnicity, family status, gender identity and presentation, citizenship and immigration status, national origin, race, religious and political beliefs, sex, sexual orientation, socioeconomic status, and veteran status.

Guidance to Students Taking Courses Outside the US

Faculty members at U.S. universities – including the University of Washington – have the right to academic freedom which includes presenting and exploring topics and content that other governments may consider to be illegal and, therefore, choose to censor. Examples may include topics and content involving religion, gender and sexuality, human rights, democracy and representative government, and historic events.

If, as a UW student, you are living outside of the United States while taking courses remotely, you are subject to the laws of your local jurisdiction. Local authorities may limit your access to course material and take punitive action towards you. Unfortunately, the University of
Washington has no authority over the laws in your jurisdictions or how local authorities enforce those laws.

If you are taking UW courses outside of the United States, you have reason to exercise caution when enrolling in courses that cover topics and issues censored in your jurisdiction. If you have concerns regarding a course or courses that you have registered for, please contact your academic advisor who will assist you in exploring options.

**Academic Integrity**

The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you’re uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have.

Acts of academic misconduct may include but are not limited to:

- Cheating (working collaboratively on quizzes/exams and discussion submissions, sharing answers and previewing quizzes/exams)
- Plagiarism (representing the work of others as your own without giving appropriate credit to the original author(s))
- Unauthorized collaboration (working with each other on assignments)

Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by (include information for specific campus office).

Students found to have engaged in academic misconduct may receive a zero on the assignment (or other possible outcome).