# Psy 611: Data Analysis I

#### Department of Psychology, University of Oregon

Fall 2019. Instructor: Sara J. Weston

# Overview

This course is the first in a 3-term sequence of classes designed to provide a thorough grounding in statistical concepts, methods, and applications of relevance to psychological science and related sciences. The aim of the course is to help students develop skills in the analysis and interpretation of real psychological data. Our focus will be both conceputual and mathematical – that is, understanding the underlying mathematical principals of statistics enhances ones' ability to interpret and think critically about the use of statistics. Students will also learn the basics of the R language and use this program to wrangle, visualize, summarize, and test hypotheses with data.

Website: https://uopsych.github.io/psy611 (https://uopsych.github.io/psy611/)

### Meeting times and locations

Lecture: Tuesdays and Thursdays, 10 - 11:20am, McKenzie Hall Rm 121

Lab: Friday, 9-10:20am or 10:30-11:50am, Straub Hall Rm 008

### Instructors

**Sara Weston** – sweston2@uoregon.edu (mailto:sweston2@uoregon.edu) Office Hours: Thursday 11:30am-1:30pm, Straub 325

**Cameron Kay** – ckay@uoregon.edu (mailto:ckay@uoregon.edu) Office Hours: Monday 12:00pm-2:00pm, Straub 461

**Brendan Cullen** – bcullen@uoregon.edu (mailto:bcullen@uoregon.edu) Office Hours: Tuesday 2-4pm, [LOCATION]

# Materials

# Textbook

We will primarily be referring to chapters in *Learning Statistics with R* (https://learningstatisticswithrbookdown.netlify.com/index.html) by Danielle Navarro. This textbook is available for free online. You may choose to purchase a paper copy if you wish, but it is not required. Additional readings assignments will be posted here.

### R and RStudio

Students must have the latest version of R, which can be downloaded here (https://ftp.osuosl.org/pub/cran/). It is strongly recommended that students also download the RStudio GUI, available here (https://www.rstudio.com/products/rstudio/download/#download). Both softwares are free.

### **Resources for R and RStudio**

While we will be covering the use of R and RStudio extensively in both lecture and lab, one of the key skills required to use R is the ability to find answers on the Internet. The R community (sometimes referred to as the useR community) tends to be friendly and helpful and enjoys solving R-related problems in their spare time. For that reason, many common questions or problems have been posted to spaces online and answered by smart people. Finding and deciphering those answers is the key skill you should seek to hone this year. It's much more important than remembering function names.

Here are some sites where you can find the answers to many R questions and learn new tricks:

#### For learning the basics

- YaRrr, the Pirate's Guide to R (https://bookdown.org/ndphillips/YaRrr/) by Nathaniel Phillips
- R for Data Science (https://r4ds.had.co.nz/) by Hadley Wickham
- R Cookbook (http://www.cookbook-r.com/) by Winston Chang
- An Introduction to Statistical Learning (http://www-bcf.usc.edu/~gareth/ISL) by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani

#### For plotting

• The Graphs chapter of R Cookbook (http://www.cookbook-r.com/Graphs/) by Winston Chang

#### Quick resources

- · Cheat Sheets (https://www.rstudio.com/resources/cheatsheets)
- Quick-R (https://www.statmethods.net)

#### **Online forums**

- Stack Overflow (https://stackoverflow.com)
- Cross Validated (https://stats.stackexchange.com)

# Weekly schedule

LSR readings can be found in the free, online textbook, *Learning Statistics with R* (https://learningstatisticswithrbookdown.netlify.com/index.html) by Danielle Navarro. For those interested in taking notes, I recommend the use of the Hypothes.is (http://Hypothes.is) app to annotate webpages. I will note that the formatting of the book online is wonky in a few places. If this bothers you, or you prefer to work offline, you can download a PDF version (https://learningstatisticswithr.com/lsr-0.6.pdf) of the book.

Week	Date	Торіс	Readings	Quiz	Homework
1	10/01	Introduction and overview	LSR Ch 1 & 3		
-	10/03	Threats to measurement validity	LSR CH 2 & 4, Cronbach & Meehl (1955) (readings/Cronbach_Meehl_1955.pdf)		
-	10/04	Lab: Introduction to R			

Week	Date	Торіс	Readings	Quiz	Homework
2	10/08	Describing data	LSR Ch 5 & 6	Quiz 1	
-	10/10	Describing data	Ozer & Funder (2019) (readings/Ozer_Funder_2019.pdf)		
-	10/11	Lab: R basics and descriptives			
3	10/15	Matrix algebra		Quiz 2	
-	10/17	Probability	LSR Intro to Part IV and Ch 9.1-9.3		
-	10/18	Lab: Matrix multiplication			
4	10/22	Probability	LSR Ch 9.4	Quiz 3	
-	10/24	Probability	LSR Ch 9.5-9.6, Wetzels et al. (2011) (readings/Wetzels_etal_2011.pdf)		
-	10/25	Lab: Probability distributions			
5	10/29	Sampling	LSR Ch 10	Quiz 4	
-	10/31	Hypothesis testing	LSR Ch 11		
-	11/01	Lab: Data wrangling			
6	11/05	Hypothesis testing	Sainani (2012) (readings/Sainani_2012.pdf)	Quiz 5	
-	11/07	Critiques of hypothesis testing	Simmons et al. (2011) (readings/Simmons_etal_2011.pdf) Cumming (2014) (readings/Cumming_2014.pdf) Hullman (2019) (https://www.scientificamerican.com/article/how- to-get-better-at-embracing-unknowns/)		
-	11/08	Lab: Graphing with ggplot2			
7	11/12	Open Science	Five Thirty Eight (https://fivethirtyeight.com/features/science-isnt- broken/)	Quiz 6	
-	11/14	Categorical data analysis	LSR Ch 12		
-	11/15	Lab: Chi-square tests			
8	11/19	One-sample tests and GLM	LSR Ch 13.1-13.2	Quiz 7	
-	11/21	Comparing two means	LSR Ch 13.3-13.11		

Week	Date	Торіс	Readings	Quiz	Homework
-	11/22	Lab: One- and indepedent sample t- tests			
9	11/26	Comparing two means		Quiz 8	
-	11/28	Thanksgiving			
-	11/29	Lab: No Lab			
10	12/03	Comparing two means			
-	12/05	Comparing two means		Quiz 9	
-	12/06	Lab: Paired sample t- tests			

Final: Oral exam will take place the week of December 10.

## **Graded materials**

Your final grade is comprised of three components:

- Quizzes: 40%
- Homework: 40%
- Oral exam: 20%

### Quizzes

Quizzes are intended to assess your understanding of the theoretical principles underlying statistics. There will be a quiz every Tuesday, with the exception of the first week, when there will be no quiz, and the final week, when the quiz will be on Thursday.

Quizzes may be resubmitted with corrections and receive full credit. To resubmit a quiz, attach a separate piece of paper to your quiz; for each question that was answered incorrectly, identify the correct answer and explain why this is the correct answer. Only if the explaination sufficiently conveys understanding of the theoretical principles will credit be given. There are no limits to the number of times a quiz may be resubmitted.

### Homework assignments

Homework assignments are intended to gauge your ability to apply the topics covered in class to the practice of data analysis. Homework assignments are to be done using R and RMarkdown; completed assignments should be emailed to Dr. Weston and students must attach both the .Rmd file and the compiled HTML file.

Homework assignments are due at the time class starts on the day the assignment is listed. Homework assignments may be resubmitted with corrections and receive full credit. Please note, however, that corrections can only be made to problems that were answered at initial submission. There is no limit to the number of times a homework assignment may be resubmitted.

Late assignments will receive 50% of the points earned. For example, if you correctly answer questions totalling 28 points, the assignment will receive 14 points. If you resubmit this assignment with corrected answers (a total of 30 points), the assignment will receive 15 points.

You may discuss homework assignments with your classmates; however, it is important that you complete each assignment on your own and do not simply copy someone else's code. If we believe one student has copied another's work, both students will receive a 0 on the homework assignment and will not be allowed to resubmit the assignment for points.

### Oral exam

The oral exam will take place during finals week. About two weeks prior, you will be asked to schedule a time to complete the exam. The exam will take roughly 15 minutes. You will be asked to explain basic and elemental concepts, as if you were teaching an advanced undergraduate or new graduate student.

# Materials needed

We will be using R for all data wrangling, visulaization, and analysis. You may not use another statistical program in this course. Students must have the latest version of R, which can be downloaded here (https://ftp.osuosl.org/pub/cran/). It is strongly recommended that students also download the RStudio GUI, available here (https://www.rstudio.com/products/rstudio/download/#download). Both softwares are free.

All reading assignments will be posted online.

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# Policies

**Cheating and plagarism.** Any student caught cheating on an assignment, quiz, or exam will receive a 0 on that assignment. Frankly, you're in graduate school, and the purpose of work is to create opportunities to learn and improve. Even if cheating helps you in the short term, you'll quickly find yourself ill-prepared for the career you have chosen. If you find yourself tempted to cheat, please come speak to Dr. Weston about an extension and developing tools to improve your success.

**Students with special needs.** The UO works to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in disability-related barriers to your participation, please notify me as soon as possible. You may also wish to contact Disability Services in 164 Oregon Hall at 541-346-1155 or disabsrv@uoregon.edu (mailto:disabsrv@uoregon.edu).