Intro to Stats for Psych Science w/ Lab

PSYC 158
Lecture: M/W 1:15-2:30pm, Lincoln 1125
Lab: M/W 2:45-4:00pm, Lincoln 2116

Instructor: Dr. Shannon Burns
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Office hours: M/T 2:30-4pm
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Course Description

Psychology is a science of collecting and analyzing data. As a part of the fundamental course sequence in Psychological Science, this course will train you in the introductory theory and methods of analyzing data in behavioral and psychological research. Topics include understanding and managing datasets; understanding different types of data; plotting figures and calculating summary statistics; building statistical models; and evaluating the quality of statistical evidence and conclusions. Emphasis is placed on understanding data through the general linear model framework, and conducting analyses with the coding language R. Students are required to also attend the associated lab period.

Course Goals

1. Understand how data represents the world, including its limitations.
2. Summarizing data visually and numerically for others to grasp the major takeaways.
3. Ability to model and estimate the data generation process in order to contribute to psychological theory-building.
4. Critical evaluation of how statistics are performed and reported in published research.

Class Texts

All assigned readings will be provided in the form of interactive notebooks hosted online. Links to the online repository holding all the chapters will be provided under "Resources" on Sakai.

Course Grading

Below is the distribution of points for grades in this class. There are 100 percentage points total in the course, so adding up your course total will give you your course percentage grade.

Reading questions: 10% (half point each - need 20/22 chapters total, completion grade)
Exams: 45% (3 total – 20% to best score, 15% to middle, 10% to lowest score)
Labs: 20% (1 point each - only top 20/22 will count towards grade)
Final project: 25%
Extra credit: up to 3% (1% for each acceptable article submission/explanation)

There will be no grades bumps or curving up at the end of the semester.

Assignments:

1. **Homework reading & prep questions:** Before each class period, a chapter of the online textbook will be assigned (linked under "Resources" on Sakai). Each chapter is interactive, and you will learn best if you use the code windows embedded within the chapters to try out new code as you learn it and change things around to see how they work. After reading each chapter, there are questions on Sakai (posted under "Tests & Quizzes" on Sakai) that are meant to help you prepare for the next class. Submit your answers to these by **8am the morning of class**. This allows the professor time to review everyone's answers before class and see where students may be struggling. As these questions are for your preparedness, they are graded on completion. There are 22 chapters total, and you must submit at least 20 sets of reading questions over the course of the semester for full credit. No late question sets will be accepted.

2. **Exams:** Three times during the semester we will have exams on the course content taken in the computer lab. The lecture before each exam will consist of a review and question period. The exams are open-note, but closed Internet and will assess your conceptual understanding of the course content. You may use RStudio to assist in thinking through a problem if necessary, but there will be minimal coding on the exam. Your top exam score will count for 20% of your course grade, the middle one for 15%, and your worst exam score will only count for 10%. Anyone who needs to reschedule an exam must consult with the professor *before* the exam period – makeups without advance notice will only be allowed in the event of serious injury/sickness or family tragedy.

3. **Labs:** During lab period you will be given coding assignments to complete that help you practice and build on content from the textbook and lecture. You may work collaboratively on labs, but each student must individually submit your own work and it must be in your own words. Students copying each other's labs will be treated as plagiarism. If you don't finish during the lab period, you may come back to the computer lab any time in the remainder of the week or you may save and transmit the file to your own computer to finish. Labs are **due by 8am the Monday after the week they were assigned** (so before the first class of the next week). Labs will be graded for correct answers, with partial credit possible. However if I can't understand your intentions in your code, there will be no partial credit given (so provide lots of comments in your code!) Only your grades on the best 20 labs out of 22 total will count towards your final grade.

4. **Final project:** In lieu of a final exam, you will complete and submit a final project for this course. This project will be a research report based on your choice of an open dataset collected from a real-world psychology experiment to do analyses with. This report will be in three parts:
    1) Write about what the authors of the study did and why, and replicate the results of the main finding from the published paper. Reproduce any accompanying visualization.
    2) Analyze and critique the paper's stats approach and/or their reporting, and describe how it could be improved.
    3) Make a prediction for your own, new analysis that's a separate approach from anything reported in the published paper. You should specify the hypothesis, why it's

important, and test it using some of the statistical tools learned in this class. Also include a visualization for your analysis and discussion of your results.

Later in the course we will discuss this project in more depth, and you will be able to look through the possible datasets to choose from. At different points in the course, you will need to submit your project topic choice and your plan for step 3. At some point before the step 3 plan is due, you MUST meet with the professor in office hours to discuss it.

5. **Extra credit:** In the last meeting of class, we will discuss the pitfalls of using statistics incorrectly as well as the dangers of using statistics to lie or mislead. At any time **before** this class period, you may find published research articles or news articles that you believe are using statistics incorrectly, and submit them for extra credit. When you do, you must link to the article and provide a 1-page double-spaced write-up about what statistics are being performed, why you believe they are done inappropriately, and what a correct approach could be. Each submission can count for up to 1% additional credit on top of your final grade, and you may submit up to 3 articles (so you can earn a maximum of 3% extra credit).

Course Policies

Grading your Best Work
As we've seen over the last couple years, life doesn't always give you the optimal space for learning. In acknowledgement of this, grades in this course will consider your best work rather than all your work. There are several points in the grading scheme where you don't need to submit everything, and some assignments can be dropped or down-weighted if you don't perform at your best. The purpose of this policy is to provide you with the flexibility to learn despite complications outside the classroom, and to provide that flexibility equitably for all students. Beyond this policy, no extra extensions or makeups will be allowed outside of exceptional circumstances. Thus it is good to save your "free passes" for times when you unexpectedly need them.

Masks in Class
The Psychological Science Department at Pomona College views protecting the health and safety of our campus, families, communities, and loved ones as our highest responsibility. This includes protecting those with medical conditions, older staff and family members, those with young children, and others who may not fully benefit from Covid vaccines and available treatments. As such, the Department will continue to observe an indoor masking policy through Fall of 2022. After that point we will re-evaluate the policy based on the best practices. This means that all students must wear a high quality (N95 or KN95) mask covering the nose and mouth at all times, including evening hours, when in the Psychology building, classrooms, laboratories, offices, or study spaces, and refrain from extended eating or drinking indoors during meetings. Refusal to do so will result in ejection from the classroom.

Attendance
There is no grade for attendance. Though beware, missing class means you miss the discussions that help elaborate and solidify the course content.

Course Communication
Official communication about this course will occur over email, so you are expected to check your email to receive important information. If you have questions about the course, please refer to this syllabus first for the answer. If you are still unsure about something, you may email me, the professor, at Shannon.Burns@pomona.edu. I will respond by the end of the next business day (so don't expect a response when emailing an hour before a deadline or over the weekend).

Late Work
Because this class depends heavily on incremental learning, late or missing assignments will hold back your progress. Therefore, reading questions cannot be submitted after the 8pm deadline. Labs will accrue a 0.2 point deduction for being up to a week late, and a 0.5 point deduction if submitted more than a week late. No extensions will be given except in the case of prior medical or emergency documentation.

Office Hours
I will have office hours available every week at the times and location stated at the top of the syllabus. If for some reason I need to reschedule for a week, I will notify the class via email. If you cannot attend the listed office hours, email me to set up another meeting appointment that works with both of our schedules.

Grade Disputes
Every once in a while it's possible that I may make a mistake in grading an assignment of yours. If you notice this and think your grade should be different, please send me an email with 1) exact location of the error, and 2) explanation of how you think you should be graded on that section, and why. If I think your dispute requires a longer conversation I may ask you to come to office hours.

Accommodations
The time for asking for help with an issue is before it becomes a problem for you. If you need accommodations or learn about a disruption to your ability to attend class/work, please contact ARS (https://www.pomona.edu/accessibility/student-accessibility) or me as soon as possible to sort out a solution. I will not allow make-up work or grade bumps post-hoc.

Academic Dishonesty and Plagiarism
Every assignment submitted in this course must be written in your own words and reflect your own work. Any student who plagiarizes will lose one letter grade on their course total for a first offense, and will fail the class on a second offense. Plagiarism will also be reported to the Dean of Students for disciplinary action.

Syllabus Updates
I reserve the right to make changes to this syllabus, course schedule, and/or course grading during the semester should the need arise. In the event this happens, an announcement will be made both in class and through email, and an updated syllabus will be posted on Sakai.

Resources

Research Support
The Claremont Colleges library has many resources and consultation times available for all stages of the research process (https://library.claremont.edu/ask-us/)

Accessibility Resources & Services
This is an equal opportunity classroom. If you need accommodations, please contact ARS as soon as possible (https://www.pomona.edu/accessibility/student-accessibility). I will work with ARS to provide equal education access for all students.

Quantitative Skills Center
Tutoring, study sessions, and workshops in quantitative skills like statistics are available from the QSC on campus (https://www.pomona.edu/administration/quantitative-skills-center). These appointments are free to all students and can help you with any problem or question you have with understanding stats or coding. I highly encourage you to make an appointment here at some point in your academic career just to see where you can improve.

Course Schedule:

UNIT 1: DESCRIBING DATA

Week 1

Monday, August 29th	**Wednesday, August 31st**
Due: n/a Lecture: Intro to class Lab: no lab	Due: chapter 1 questions Lecture: intro to coding Lab 1: coding in R part 1

Week 2

Monday, September 5th	**Wednesday, September 7th**
Due: lab 1 *No class, Labor Day*	Due: chapter 2 questions Lecture: statistical reasoning Lab 2: coding in R part 2

Week 3

Monday, September 12th	**Wednesday, September 14th**
Due: lab 2, chapter 3 questions Lecture: what are data Lab 3: vectors & data mutation	Due: chapter 4 questions Lecture: organizing data Lab 4: data frames

Week 4

Monday, September 19th	**Wednesday, September 21st**
Due: labs 3 & 4 *No class, professor out*	Due: chapter 5 questions Lecture: describing data Lab 5: summary & variance functions

Week 5

Monday, September 26th	**Wednesday, September 28th**
Due: lab 5, chapter 6 questions Lecture: variation in multiple variables Lab 6: visualizing data	Due: chapter 7 questions Lecture: principles of data visualization Lab 7: more data viz

UNIT 2: MODELING DATA

Week 6

Monday, October 3rd	**Wednesday, October 5th**
Due: labs 6 & 7 Lecture: review session (bring questions) Lab : EXAM 1	Due: chapter 8 questions Lecture: the data generation process Lab 8: simulating new data

Week 7

Monday, October 10th	**Wednesday, October 12th**
Due: lab 8, chapter 9 questions Lecture: intro to modeling Lab 9: the linear model	Due: chapter 10 questions Lecture: quantifying error in a model; mid-semester eval Lab 10: error measures

Week 8

Monday, October 17th	**Wednesday, October 19th**
Due: labs 9 & 10 *No class, fall break*	Due: chapter 11 questions Lecture: adding an explanatory variable Lab 11: group comparisons

Week 9

Monday, October 24th	**Wednesday, October 26th**
Due: lab 11, chapter 12 questions Lecture: quantitative predictors Lab 12: correlations	Due: chapter 13 questions Lecture: multivariable models Lab 13: independent predictors

Week 10

Monday, October 31st	**Wednesday, November 2nd**
Due: labs 12 & 13, chapter 14 questions Lecture: nonlinear models Lab 14: interactions	Due: chapter 15 questions Lecture: models with categorical outcomes Lab 15: logistic regression

UNIT 3: EVALUATING MODELS

Week 11

Monday, November 7th	**Wednesday, November 9th**
Due: labs 14 & 15 Lecture: review session (bring questions) Lab: EXAM 2	Due: chapter 16 questions Lecture: final project info; extrapolating to populations Lab 16: sampling distributions

Week 12

Monday, November 14th	**Wednesday, November 16th**
Due: lab 16, chapter 17 questions Lecture: statistical significance Lab 17: hypothesis testing	Due: chapter 18 questions Lecture: model comparison Lab 18: model selection

Week 13

Monday, November 21st	**Wednesday, November 23rd**
Due: labs 17 & 18, chapter 19 questions Lecture: effect sizes & power Lab 19: power planning	*Thanksgiving break, no class*

Week 14

Monday, November 28th	**Wednesday, November 30th**
Due: lab 19, chapter 20 questions Lecture: sources of model bias Lab 20: simulating bias	Due: chapter 21 questions Lecture: Bayesian stats Lab 21: Bayes package

Week 15

Monday, December 5th	**Wednesday, December 7th**
Due: labs 20 & 21, chapter 22 questions, extra credit Lecture: bad statistics Lab 22: being reviewer 2	Due: final project plan meeting Lecture: review session (bring questions) Lab: EXAM 3

Finals Week:
No class meeting!
Lab 22 due **Monday, December 12th by 8am**
Final project due **Tuesday, December 13th by 5pm** (end of assigned finals period)