Colorado State University

RESEARCH DESIGN & ANALYSIS IN ANTHROPOLOGY
Fall 2022 ANTH 674-001 (4 credits)

LECTURE TIME AND PLACE: MONDAY, 2:00–4:30PM ANIMAL SCIENCE, ROOM 31
LAB TIME AND PLACE: WEDNESDAY, 2:00–3:40PM WAGAR, ROOM 107

INSTRUCTOR INFORMATION

Instructor: Andrew Du, Ph.D.
Email: Andrew.Du2@colostate.edu
Pronouns: he, him, his

Office Location: Clark B-225
Office Hours: Thursday 9:00am–12:00pm in General Services Building 312 or on Teams: https://tinyurl.com/F22ANTH674

COURSE DESCRIPTION

The primary purpose of this course is to provide you with the confidence and skillset to (1) develop an addressable research question, (2) collect and organize data, (3) analyze data, and (4) visualize data and statistical results, as all this pertains to your research goals. To this end, the course provides a survey of these topics, with an emphasis on the statistical techniques used in (biological) anthropology from an applied perspective. A significant portion of this course will be dedicated to you learning how to code in R in order to operationalize the analytical methods you learn in lecture.

LEARNING OBJECTIVES

- Move away from the "cookbook" mentality of statistics to a more nuanced, philosophical approach to scientific inference.
- Be able to translate a research question into a statistical one that can be addressed with the proper statistical methods.
- Be able to collect and organize data in a manner that is suitable for data analysis.
- Be able to choose the right way to visualize data and results, in a way that is clear and impactful.
- Develop a working knowledge of the breadth of statistical techniques in anthropology.
- Be able to critically evaluate the statistical methods used and reported in the published literature.
- Build a strong enough statistical knowledge base so that you can teach yourself more advanced methods.
- Get hands-on experience analyzing data, and become a proficient and confident coder in R, one of the most widely used software tools for data analysis.

READINGS

There is one required textbook for the course:

A Primer of Ecological Statistics (2ND Edition). Gotelli, N.J., and Ellison, A.M. ISBN: 978-1605350646

There will also occasionally be additional readings from journal articles, book chapters, etc., which are posted on Canvas.

COURSE FORMAT

Each week will consist of a lecture on Monday and a lab on Wednesday. Each lab involves you completing an R tutorial that I program. The R tutorials will reinforce and operationalize what you learn in lecture, improve your coding skills, and allow you to ask me questions in real time if you get stuck. Please also post any R coding questions on the Canvas discussion board, as it is highly likely that your fellow classmates have the same question(s). On a related note, my office hours can act as an open Q&A forum for lecture and R tutorial material and homework assignments (almost like a tutor session), so please attend! It is also expected that you complete the assigned readings (see above) **prior** to class, so you can maximize your understanding of the lecture and R tutorial material.

GRADING

ASSIGNMENT	GRADE PERCENTAGE
In-class participation	15%
Weekly homework assignments	60%
Term paper	15%
Term paper presentation	10%

IN-CLASS PARTICIPATION (15%)

This will primarily consist of you doing the lab R tutorials, as well as participating in any discussion activity that arises. I also encourage you to ask questions whenever something does not make sense (most likely because I am not explaining it clearly).

WEEKLY HOMEWORK (60%)

You will receive weekly homework assignments that operationalize what you learned in that week's lecture and R tutorial. Homework is submitted as an R Markdown html file, and instructions on how to do so are provided in Canvas. You are allowed to collaborate on homework assignments, but copying answers from someone else constitutes cheating (see Academic Integrity Policy below). This is the type of class where you get out just as much as you put in, so I *strongly* encourage you to make sure you understand the homework assignment even when collaborating. Homework assignments are due at **10pm the following Sunday** and will be submitted through Canvas. **I will drop your lowest homework grade, so there are no excuses for late/missed homework.**

TERM PAPER AND PRESENTATION (15% & 10%)

Term paper

You will write a ~5-page paper that will apply everything you learned in this class, as it relates to a topic of your choice (can be related to your own research). The paper will be written like the end of the *Introduction* and all of the *Materials and Methods* sections of an academic article. That is, you will introduce your research question, translate it into a statistical question, state what the mode of inference is (e.g., exploratory, confirmatory), say whether the imaginary data are experimental or observational, describe the imaginary dataset, and describe the statistical methods used and why they are optimal for your dataset and research question.

The final paper is due on **December 12th at 10 pm** and will be submitted through Canvas.

Presentation

You will make a ~10-minute presentation of your term paper, which will be followed by a ~5-minute Q&A. This will take place on **December 5th**.

ACADEMIC INTEGRITY POLICY

This course adheres to the Academic Integrity Policy of the Colorado State University General Catalog and the Student Conduct Code. Any breach of these policies and codes will be taken very seriously. For more details visit https://catalog.colostate.edu/general-catalog/academic-standards/academic-policies/

UNIVERSAL DESIGN FOR LEARNING

I am committed to the principle of universal learning. This means that our classroom, our virtual spaces, our practices, and our interactions be as inclusive as possible. Mutual respect, civility, and the ability to listen and observe others carefully are crucial to universal learning.

If you need accommodations in this class, please contact the Student Disability Center (https://disabilitycenter.colostate.edu) to discuss your individual needs. Any accommodation must be discussed in a timely manner prior to implementation. A verifying memo from SDC may be required before any accommodation is provided.

LECTURE SCHEDULE

Changes may be made to this schedule as necessary and will be announced in class or through Canvas.

Week	Topic
Week 1: 8/22	Scientific inference & statistical goals
Week 2: 8/29	Data wrangling & visualization

Week 3: 9/5*	Data types, transformations, & summary statistics *No class on 9/5 (Labor Day). Will lecture on 9/7, lab done on own time
Week 4: 9/12	Frequentism, Monte Carlo methods, null hypothesis tests, power, & P-values
Week 5: 9/19	Ordinary least squares as an introduction to General Linear Models
Week 6: 9/26	Statistical paradigms: exploration, confirmation, & prediction
Week 7: 10/3	Multiple linear regression, collinearity, interactions, & variance partitioning
Week 8: 10/10	General(ized) Linear Models (e.g., t-test, ANOVA, logistic regression)
Week 9: 10/17	Watch *Moneyball* & modern regression [a,c]
Week 10: 10/24	Experimental design & observational data [b]
Week 11: 10/31	Non-independence, generalized least squares, & mixed-effects models
Week 12: 11/7	Multivariate statistics: Part 1
Week 13: 11/14	Multivariate statistics: Part 2
Week 14: 11/21	**No class (Fall Break)** [a,b,c]
Week 15: 11/28	Probability theory and primer on likelihood and Bayesian methods [c]
Week 16: 12/5	Class presentations [a,b,c]
Week 17: 12/12	**Final paper due at 10pm (no class)**

a. No readings
b. No tutorial
c. No homework