

Quantitative Research Methods PSCI 2075

Instructor Info —

Damon C. Roberts

Office Hours: Monday, Wednesday, and Friday 2 - 3 PM MT

Zoom

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Course Info -

Prereq: None

Day: Asynchronous

Time: When you would like!

Cocation: Canvas

Overview

Data are everywhere. In politics, data might help us understand where to invest campaign money, public support for policies, security threats, differences between political systems and the effects of institutional designs, and more! Jobs requiring such skills are on the rise. While lauded as objective and hard to argue with, as we will see in this course, the decisions we make about representing, modeling, and interpreting data show that they are anything but "raw, cold hard, facts". In this course, we will work together to learn about the fundamentals of using and representing political data. The course has four main parts: (1) course introduction, developing a quantitative scientist's mind; (2) how do (should) we represent raw data and their simple relationships; (3) using data with the scientific method; (4) advanced approaches.

This is an online summer course condensed into 5 weeks. This has benefits but also drawbacks. The advantage is that you can do the course when and where you want, and the drawbacks are that it reduces the opportunity to interact with peers and me. The course is also short, and there is much material to cover. Therefore, I will use a few features for the course that hopefully make this a positive experience for you all. Nevertheless, please do keep in mind that this course will take up quite a bit of time - as most summer courses do. So please be prepared to budget for it. I will, however, do my best not to waste your time with material that will not put you in a better position for a job and to be a consumer of quantitative political science.

There will be about 20 topics. We should cover about 5 topics per week. Each of these topics will have a couple of videos. Some of these videos will explain the concepts, and the rest will cover how you apply these ideas by running analyses in R (a statistical programming language). Keep in mind that this is a pretty fast pace. As you will not get the same psychological benefit of having some of this information spread throughout the week over a 16-week semester, I recommend you help yourself and spread out your time watching the lectures and demos and working on assignments throughout the week. Let the content percolate in your mind rather than cram it.

I realize a number of you may be nervous about the course as it asks a lot of you. It is a lot of material given to you in a short time, AND you are learning math and coding, and I do this stuff for a living. We come from two very different perspectives. As I recognize this, I will take a less-than-conventional approach to this course. While I still want you to learn the material and meet course objectives and goals, this should be a collaborative effort between you and I to help you become a better producer and consumer of analyses of political data. As a result, I will offer several opportunities for you to give me feedback throughout the course, just as I will do that for you (i.e., exams).

There will be readings for each topic. Some of these readings may be challenging. The point of this is to force you to really try to engage seriously with these ideas, understand how they are applied and used, and get better at reading material that relies on quantitative analyses. If you do the readings before watching the lectures, then it should make the lecture material much easier to comprehend - nice!

We will be doing 3 small assignments that build up into one large project. Both you and I will grade the assignment. When you submit an assignment, I will ask you to provide a self-assessment, and I will give some suggestions about where to go next with your project. There will also be a midterm and final exam. These are graded conventionally - but for the most part, they will be multiple choice and short answer. So the exams should not take you too much time. I want your focus on grappling with these ideas rather than just pure memorization.

Learning Objectives

- Learn how to produce and communicate analyses from data effectively
- Learn how to use statistical software to analyze data
- · Gain a critical eye for when data can effectively tell us patterns in our world

¹See www.amstat.org/ASA/News/New-Report-Highlights-Growing-Demand- for-Data-Science-Analytics-Talent.aspx.

Material

Required Texts - DO NOT NEED TO PURCHASE

- Bueno de Mesquita, Ethan and Anthony Fowler. 2021. *Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis*. Princeton University Press.
- Cunningham, Scott. 2021. Causal Inference: The Mixtape. Yale University Press.
- · Other readings will be posted to canvas.

Recommended texts - Useful for self-study:

- Pollock III, Philip H. 2016. The Essentials of Political Analysis. CQ Press, 5^{th} edition.
- Agresti, Alan and Barbara Finlay. 2009. Statistical Methods for the Social Sciences. Pearson. 4th edition. NOTE: This one might be bit more complicated.

A note about R and coding

In this course, you will be running statistical analyses using R, a statistical programming language. For those interested in an analyst-oriented role, R and Python are in high demand. The assignments will include a coding component to encourage you all to learn those skills. R and Python can be tricky to understand at first. But remember, some of the best coders are just the best at googling things (and may know a little bit of technical jargon).

Traditionally, you can run this code "locally," where you have an Interactive Developer's Environment (IDE), which essentially is an application that allows you to feed code to your computer to digest and spit out a result. Becoming more common in the private sector is to use Notebooks, which are kind of like GoogleDocs but for code. Often companies have their analysts write their code in a notebook and run it with a portion of the data they need it for. They then send this code "off to production," where either they or their data engineers will often apply that code and run it on the company's computers/servers.

For this class, to make your life easier and to ensure accessibility for those who may be worried about the technical specifications needed to run this kind of code, I will post the weekly coding demos to GoogleColab (a notebook environment) and will share the notebook with you via a shareable link on Canvas. To submit your assignments, I will ask you to submit the assignment on canvas, but I ask that you include a shareable link to the code you used to complete the assignment.

In the first week of class, I will provide some information about how to work in GoogleColab.

Grading Scheme

10% First week office hours

20% Midterm Exam

30% Weekly progress reports

20% Topic brief

20% Final Exam

Grades will follow the standard scale: A = 94 - 100; A - = 90 - 93.9; B + = 87 - 89.9; B = 83 - 86.9; B - = 80 - 82.9; C + = 77 - 79.9; C = 73 - 76.9; C - = 70 - 72.9; D + = 67 - 69.9; D = 63 - 66.9; D - = 60 - 62.9; F < 59.9.

Weekly progress reports

3 times this semester, you will turn in a progress report. I will provide specific details about what I would like to see, but each of these reports should encourage you to work on and think about how to apply the topics from the week to study a subject in political science that you are interested in. In the weekly progress report, you will also be asked some conceptual questions related to the topic you are interested in, asked to write some R code and interpret the results, ask you to provide a

self-assessment of your progress in the course, and I will ask about what material you are still struggling with. This will help me figure out what concepts I should provide more resources on or provide a review of.

Topic brief

This will be the cumulative paper for the course, and I will provide further details about it later. Overall, the topic brief should look like a report you would distribute with a team at work or with your editors. The goal is for you to identify a question related to political science that interests you, collect data on it, analyze the data, and make an argument about what we should think about the phenomenon. For inspiration, you can look at the reports issued by PEW. We will not be doing anything too "fancy," but it will ask you to think deeply about this question you've identified. You should locate a question early as you will have weekly progress reports building up to this. We can talk about this at our meeting the first week.

Late Policy

This course is short. If you fall behind, it will be hard to finish. I do not have a late policy for the course; we all have things going on. Due to their nature, weekly progress reports should be submitted on time, even if that is to write that you are treading water and having difficulty keeping up. If you need to submit it late, I will still accept it.

Office Hours

My scheduled office hours are there to help you. During my office hours, you can feel free to schedule an appointment with me to chat on zoom. We can discuss clarifying questions you have about the material for the course and come up with ideas for the topic brief. They are also there for us to talk about things you would like to do with your degree, about plans and goals, and to help give you general advice or point you in the direction of others who might be helpful to talk to.

You can schedule an appointment for my office hours by following this link to my Calendly page. Once you schedule an appointment, you should receive an email with a google calendar invite that you can "accept" to put on your calendar, and the meeting details will contain information with the zoom link.

I will set up a discussion board if you have specific questions about how to solve a coding challenge. On the discussion board, you can post your inquiry so that other students can see, respond, and see my and other students' responses. The hope is that this will fit with my broader goal of this being a collaborative learning experience. Additionally, with coding challenges, you can often solve them by googling and finding responses to other people's questions on discussion forums. The most popular is called StackOverflow. I know that StackOverflow can be full of jargon and sometimes intimidating. So we will have a discussion board that we will treat as our StackOverflow. But this will hopefully get you in the habit of working with others to answer each other's questions. I recommend, however, that you get into the habit of finding answers to your questions using google before posting to the discussion board. This will give you lots of tremendous experience. This is the primary way I learned how to write R code myself! There is also a version of StackOverflow for questions about statistics called CrossValidated. But again, we can use our discussion board here for this class. I still encourage you to wander around CrossValidated and StackOverflow to get used to it. Another helpful resource for learning about this material is Medium.com. I will provide more resources on the canvas page that you can look into, but these are what the discussion board will hopefully emulate as they are ubiquitous among coders and analysts.

Class Schedule

Week 1:	Course Introduction; Developing the Quantitative	Scientist's mind
Topic 1.1	Course Introduction	Bueno de Mesquita and Fowler, Chap- ter 1
Topic 1.2	What is open science?	Scoggins and Robertson, 2022
Topic 1.3	Are we all applied statisticians?	Clarke and Primo, 2007 AND Cunning ham, Chapter 2.1 - 2.6
Topic 1.4	What is a sample?	
Topic 1.5	What is a unit of analysis?	
Weekly Progress Report	Due	July $8^{th} \ @\ 11:59\ pm\ MT$
Meeting	Due	Schedule zoom appointment here!
Week 2: I	How do (should) we represent raw data and their	simple relationships
Topic 2.1	How do we describe data?	
Topic 2.2	How do we engage in inference?	
Topic 2.3	What does it mean for something to covary?	Bueno de Mesquita and Fowler, Chap ter 2
Topic 2.4	Ways we assess correlation?	
Topic 2.5	What is ANOVA?	
Weekly Progress Report	Due	July $15^{th} \ @\ 11:59\ pm\ MT$
Midterm Exam	Due	July $15^{th} \ @\ 11:59\ pm\ MT$
Week 3: I	Jsing data with the scientific method	
Topic 3.1	What is causal inference?	Bueno de Mesquita and Fowler, Chap ter 3
Topic 3.2	What is regression?	Bueno de Mesquita and Fowler, Chap ter 5
Topic 3.3	What assumptions do we use in regression?	Bueno de Mesquita and Fowler, Chap ter 6
Topic 3.4	How can we diagnose problems with regression?	
Topic 3.5	What are the limitations of regression?	

Weekly Progress Report	Due	July $22^{nd} \ @ \ 11:59$ pm MT
Week 4: A	Advanced topics	
Topic 4.1	What is a main effect, a moderating effect, and a mediating effect?	Bueno de Mesquita and Fowler, Chapter 14
Topic 4.2	What do randomized experiments do for causal inference?	Bueno de Mesquita and Fowler, Chapter 11
Topic 4.3	How can we leverage time series and panel data for causal inference?	
Topic 4.4	What can we do without randomization of treatment?	
Topic 4.5	What do we do if we have missing data?	Roberts, 2022
Week 5: 7	opic brief and Final Exam	
Topic brief	Due	August $2^{nd} \ @ \ 11:59 \ pm \ MT$
Final exam	Due	August $5^{th} \ @\ 11:59\ pm\ MT$

University mandated statements

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy.

For more information, see the policies on classroom behavior and the Student Conduct Conflict Resolution policies.

Requirements for COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu).

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations

based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website. Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name. Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code website.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and the support resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options. To learn more about reporting and support options for a variety of concerns, visit Don't Ignore It.