PS 811: Introduction to Statistical Computing in PS

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Fall, 2022

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Course Website: NA
Class Hours: Monday 1:20-3:00 PM CST
Class Room: Social Sciences RM 3218

Lab Room: NA

Lab Hours: NA

Course Description

PS 811 is a one-credit hour, pass/fail course taught to incoming Ph.D. students in the political science department. This course will be taught remotely; however, RM 3218 in the Social Sciences building has been reserved if you would like to listen to lecture and work on the problem sets together in the room during the class time window.

In modern political science, you will be required to perform or understand quantitative research. Often this research is conducted using one of several programming languages. The language most often used is **R**. R is a special-purpose programming language designed for statistical and mathematical computing, though it can function similarly to a general-purpose language. In addition to R, the typesetting language LaTeXis often used in academia to write and submit articles. Data management can take many forms, but the reproducibility of your research must always be considered. This course will provide you with data management/hygiene techniques and tools that will provide a useful starting point for your own organizational style.

In your academic career, you will also find it necessary to produce papers, presentations, websites, and reproducible research. This course is intended to give you a brief but sound footing to start your academic journey with the tools necessary to accomplish these tasks. In addition to R, we will cover Markdown, LaTeX, presentation styles, Git, and will touch on other programming, computing, and research-related topics that are relevant to this core material[1].

Required Materials

- Base R: download

[1] A special thanks to a previous instructor of this course Marcy Shieh for sharing her materials with me.

- RStudio: download
- Git: download
- Latex: download

Prerequisites

Prerequisites: Graduate or Professional Standing

Course Objectives

1. Learn and become proficient in the R programming language
2. Learn and become proficient using LaTeXand R Markdown
3. Learn and become proficient using Git and other project management utilities
4. Learn and become proficient in good data hygiene and reproduction skills
5. Become familiar with Shiny and other presentation styles
6. Basic familiarity with SQL and other tools that may be useful
7. Basic familiarity with coding norms, programming techniques, paradigms, and computing-related topics one is likely to encounter in their academic career

Course Structure

Class Structure

This class meets once per week over the fall semester and carries the expectation that students will work on course learning activities (problem sets) for about 1 hour out of the classroom for every class period. Each class period will be a lecture followed by time to ask questions and work on the materials presented during the lecture. The syllabus includes additional information about meeting times and expectations for student work.

Assessments

5 Problem Sets

Lecture

Lectures will be conducted via the course Zoom and will cover the material for the course.

Lab

The lab is intended for students to work through the problem sets in this course and in other courses where the material from PS 811 is relevant. There is no actual lab time, but the second half of each class period could be considered your "lab" period.

Final Exam and Class Project

There will be a Research Project associated with this course. There is no final exam for this course.

Grading Policy

- **50%** of your grade will be on the Problem Sets (10% each)
- **50%** of your grade will be determined by the Research Project

Course Policies

Attendance

Attendance is not required but strongly recommended. If you cannot attend class synchronously, you should watch the video recordings of the lectures in your own time. The advantage of attending class synchronously is that you will be encouraged to ask questions as you learn the concepts. However, if it is not possible at all for you to attend lecture synchronously (e.g., life circumstances, time zone differences), please let me know as soon as possible, and we can discuss accommodation options.

Academic Integrity

Academic integrity is important to the University of Wisconsin–Madison. As such, please do not plagiarize, use unauthorized materials or fabricated data, tamper with another student's work, or assist any students in these acts. If you collaborated with your colleagues (i.e., worked on the assignment together), do not copy and paste their code and pass them as your own. To keep yourself honest, you may also link to the website(s) or forum post(s) that helped you to the answer. Type out the code and credit them for their help. Explain the code in ways that you understand and can reference in the future. If you fail to follow best practices, you can face disciplinary action, which includes failing the assignment, failing the course, or facing other disciplinary action by the department or the university. I will report substantial or repeated cases of misconduct to the Office of Student Conduct Community Standards for further review. Refer to https://conduct.students.wisc.edu/misconduct/academic-integrity/ for more information.

Diversity and Inclusion

From diversity.wisc.edu: Diversity is a source of strength, creativity, and innovation for UW–Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin–Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background — people who as students, faculty, and staff serve Wisconsin and the world.

Accommodations

From https://mcburney.wisc.edu/instructor/: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with the student you or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. If you observe any religious holidays, please let me know as soon as possible, and we can discuss accommodations. Sudden life circumstances can certainly impact class performance. There are various resources on campus to help you navigate difficult times, such as the Dean of Students Office and the Division of Student Life. Please let me know as soon as possible if you require any accommodations, including anything that I did not mention. I want to ensure that this course contributes to your knowledge base rather hinder your success.

Schedule and weekly learning goals

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each week.

Week 1, 9/12: Intro and Getting Started

- Get R, RStudio, LaTeX, and Git Installed

Week 2, 9/19: Data and Project Basics

- Work with real data and tools for project management
- PS-1

Week 3, 9/26: Analysis Workflow and Bibliography

- What is your workflow when performing analysis
- Bibliography tools and tips

Week 4, 10/3: Branching and Coding Norms

- Git branching/Collaboration techniques
- Coding norms and styles

Week 5, 10/10: LaTeXand R Markdown

- Using LaTeXand R Markdown to write your papers and problem sets
- PS-2

Week 6, 10/17: Base R and Tidyverse

- Comparison of Base R and Tidyverse

Week 7, 10/24: Functions and Loops

- Writing functions and loops
- PS-3

Week 8, 10/31: Data Manipulation

- Data manipulation in base R and dyplr/tidy

Week 9, TBD: Graphics

- Building graphics with ggplot and other libraries
- PS-4

Week 10, 11/14: Regressions and Other Models

- Analyzing some real data
- PS-5

Week 11, 11/21: More Data Manipulation + SQL

- Extended data manipulation and analysis.
- Introduction to use of SQL.

Week 12, 11/28: Libraries

- Overview of useful libraries and where to find additional resources.
- How and when to use library functions vs writing your own.

Week 13, 12/5: Programming Techniques, Shiny, and Other Presentation Forms

- Programming techniques, problem-solving, efficiency.
- Intro to using Shiny and other presentation/dashboarding techniques.

Week 14, 12/12: Project Presentations