

POLSCI 489-007

Introduction to Computational Political Science

Winter 2021

Department of Political Science
University of Michigan

Computational/quantitative methods are increasingly utilized in political science and policy research. Do political leaders matter? Does canvassing change people's political attitudes? How can you find election fraud? This course will teach students computational skills for addressing these questions using quantitative data. The course will require students to work on a number of hands-on exercises in programming language **R** with real-world data. The goal is to provide students with basic knowledge on how to implement data analysis as well as how to visualize their results to effectively convey their evidence-based arguments.

1 Who Should Take This Course

Here is a checklist to consider when deciding whether to take this course:

- I am a political science major (other students who are interested in quantitative social science are welcome too).
- In addition to developing my knowledge of statistical concepts, I want to learn the computational skills needed to manipulate and analyze data.
- I am willing to spend considerable time *outside* of classroom each week in order to keep up with the course materials.
- (Those who have some familiarity with **R**) I want to see and work on many political science examples/exercises.

2 Contact Information

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3 Logistics and Teaching Format

- Video Lectures:
 - Posted by 8:30am on Monday at Perusall.
 - In the video lectures, the instructor explains **R** syntax and statistical concepts in 30 minutes to one hour.

- Students are strongly encouraged to post questions and answer others’ questions in **Conversations** on the video lectures.
- Synchronous group coding exercises:
 - 8:30–9:50am on Wednesday via **Zoom**.
 - In the coding exercise sessions, students are randomly paired and work on assigned coding tasks in **Zoom** breakout rooms.
 - The exercises will be graded purely based on completion (see Section 4).
- *CoderSpace Office Hours*:
 - Thursday, 3:00–5:00pm
 - <https://datascience.isr.umich.edu/events/coderspaces/>
 - See Section 10 for the details

4 Course Requirements

The final grades are based on the following items:

- **Participation (10%)**: The level of engagement in Perusall and Piazza discussions.
- **In-class group exercises (24%)**: There will be weekly in-class group programming exercises (see Section 3). No letter or point grades are given, but completion of each exercise is 2% of the course grade.
- **Online programming assignments (24%)**: There will be weekly online programming review assignments beginning from Week 1 (for course schedule, see Section 12). These assignments will not be graded. However, students are expected to complete them on time, or lose 2% of the course credit for missing each assignment. **Collaboration is permitted**. These assignments are directly based on the textbook and are designed to check whether you understood the materials covered in the textbook.
- **Problem sets (24%)**: There will be four problem sets during the semester. The problem sets provide an opportunity for students to conduct data analysis and learn important statistical concepts. Each Problem set will be graded as $\checkmark -$ (unsatisfactory), \checkmark (satisfactory), or $\checkmark +$ (excellent), and constitutes 6% of the course grade. **Collaboration is permitted**, but students must write up the code and answers on their own.
- **Take-home exams (18%)**: There will be two open-book take-home exams, one during the midterm week and the other during the final week of the semester. **No collaboration is allowed**, and students should not discuss their contents with anyone before submission. Each take-home exam is equally weighted.
- **Incomplete Policy**: No incompletes will be given.

5 Submission of the Computer Code via Canvas

For the problem sets and take-home exams, students are required to submit an **Rmarkdown** file *and* a pdf copy of a printout produced using the **Rmarkdown** file via **Canvas**. The names of the respective files must be `xxx.pdf` and `xxx.Rmd` where `xxx` is your unique name.

6 Problem Set Collaboration Policy

Problem sets for this course present opportunities for students to discuss questions and collaborate to find a solution together. At the same time, as with any class that includes analytical exercises and computer programming, there is a clear distinction between permissible collaboration and unacceptable plagiarism. This course will follow the standard the University of Michigan Academic Misconduct policy (see Section 11).

Programming necessitates that you reach your own understanding of the problem and discover a path to its solution. During this time, discussions with other people (whether via the Internet or in person) are permitted and encouraged. However, when the time comes to write code that solves the problem, such discussions (except with course staff members) are no longer appropriate: the code must be your own work.

DO NOT, UNDER ANY CIRCUMSTANCES, COPY ANOTHER PERSON’S CODE. Incorporating someone else’s code into your program in any form is a violation of academic regulations. Abetting plagiarism or unauthorized collaboration by sharing your code is also prohibited. Sharing code in digital form is an especially egregious violation: do not e-mail your code to anyone.

Novices often have the misconception that copying and mechanically transforming a program (by rearranging independent code, renaming variables, or similar operations) makes it something different. Actually, identifying plagiarized source code is easier than you might think. For example, there exists computer software that can detect plagiarism.

7 Questions and Announcements

Please use the Piazza Discussion Board when asking questions about lectures, problem sets, and other course materials. This allows all students to benefit from the discussion and to help each other understand the materials. Students are encouraged to participate in discussions and answer any questions that are posted. Engagement in Piazza discussions is part of course requirements (see Section 4). In addition, all class announcements will be made through Piazza. Canvas will still be used for hosting all class materials.

You should have been received an invitation to the POLSCI 489-007 Piazza site. Once you create your account, the Piazza course page can also be accessed by logging in from <https://piazza.com> or its mobile apps.

8 Textbook

This course uses the following textbook:

Kosuke Imai. *Quantitative Social Science: An Introduction*. Princeton University Press, Princeton, 2017.

9 Statistical Software

In this course we use the open-source statistical software **R** (<https://www.r-project.org>). **R** can be more powerful than other statistical software such as **SPSS**, **STATA** and **SAS**, but it can also be more difficult to learn. A variety of resources will be made available for students in order to learn **R** as efficiently as possible. To help make using **R** easier, using **RStudio** (<https://www.rstudio.com/>)—a user interface that simplifies many common operations—is also recommended.

10 *CoderSpace* Office Hours

In this class, we will explore a new type of office hours, called *CoderSpace* office hours. Instead of standard one-on-one meetings at my office, we are going to engage in weekly hackathons to create an open, inviting and supportive space for computational social science programming. The weekly hackathons will convene at **3:00–5:00pm on Thursday** during Winter 2021. To successfully participate in these weekly hackathons, students should bring their own laptops and identify the programming tasks they intend to work on. As the instructor accompanying our hackathons, I will offer assistance with regard to data analysis including, but not limited to, assignments for this course. While the instructor is available for help, participating students are more than welcome to help each other. In addition, this *CoderSpace* will be open to attend for anyone in the Institute for Social Research (ISR) community at the University of Michigan. Our objective is to engage students, research fellows, and faculty to share their expertise via peer programming as well as to receive assistance in their own data-intensive projects. As such, this weekly *CoderSpace* is designed to benefit anyone in the ISR community who engages in computational social science projects and seeks to advance their programming skills, be it with regard to parallel computing in **R**, **OpenMP** and **Rcpp**, web scraping using **Python**, using high performance computing clusters, and other computational methods.

11 Other Course Policies

- **Student Sexual Misconduct Policy:** Title IX prohibits sex discrimination to include sexual misconduct: harassment, domestic and dating violence, sexual assault, and stalking. If you or someone you know has been harassed or assaulted, you can receive confidential support and academic advocacy at the Sexual Assault Prevention and Awareness Center (SAPAC). SAPAC can be contacted on their 24-hour crisis line, 734-936-3333 and online at sapac.umich.edu. Alleged violations can be reported non-confidentially to the Office for Institutional Equity (OIE) at institutional.equity@umich.edu. Reports to law enforcement can be made to University of Michigan Police Department at 734-763-3434.¹
- **Accommodations for Students with Disabilities:** If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations. SSD (734-763-3000; <http://ssd.umich.edu>) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is private and confidential and will be treated as such.²
- **Religious-Academic Conflicts:** While the university does not observe religious holidays, it is the policy of the University of Michigan to make every reasonable effort to allow members of the university community to observe their religious holidays without academic penalty. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes as a consequence of their religious observance shall be provided with

¹This statement is taken from: <https://sapac.umich.edu/article/faculty-resources-sample-syllabus-language>.

²This statement is taken from: <https://ssd.umich.edu/article/syllabus-statement>.

a reasonable alternative opportunity to make-up missed academic work. It is the obligation of students to provide faculty with reasonable notice of the dates on which they will be absent. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the respective class.³

- **Academic Misconduct:** The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. The college promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct. All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the college. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see <https://lsa.umich.edu/lsa/academics/academic-integrity.html>.⁴
- **Student Mental Health and Wellbeing:** The University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact *Counseling and Psychological Services (CAPS)* at (734) 764-8312 and <https://caps.umich.edu/> during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult *University Health Service (UHS)* at (734) 764-8320 and <https://www.uhs.umich.edu/mentalhealthsvcs>, or for alcohol or drug concerns, see <https://www.uhs.umich.edu/aodresources>. For a listing of other mental health resources available on and off campus, visit: <http://umich.edu/~health>.⁵

12 Course Outline

The course schedule below is subject to change based on class progress.

Week 0 OVERVIEW OF THE COURSE

Week 1 INTRODUCTION TO R I

- QSS, Ch. 1
- *Swirl* assignment INTRO1 due Jan. 29

Week 2 INTRODUCTION TO R II

- QSS, Ch. 1, cont.
- *Swirl* assignment INTRO2 due Feb. 5

Week 3 CAUSALITY I

- QSS, 2.1–2.4
- *Swirl* assignment CAUSALITY1 due Feb. 12

³This statement is taken from: *Handbook for Faculty and Instructional Staff 2018*, p. 17.

⁴This statement is taken from: *Handbook for Faculty and Instructional Staff 2018*, p. 16.

⁵This statement is taken from: *Handbook for Faculty and Instructional Staff 2018*, p. 16.

Problem Set 1 Handed out on Feb. 12 and due Feb. 22

Week 4 CAUSALITY II

- QSS, 2.5–2.7
- *Swirl* assignment CAUSALITY2 due Feb. 19

Break Week: Feb. 24 “Well-being Break Day”

Problem Set 2 Handed out on Feb. 26 and due Mar. 8

Week 5 MEASUREMENT I

- QSS, 3.1–3.4
- *Swirl* assignment MEASUREMENT1 due Mar. 5

Week 6 MEASUREMENT II

- QSS, 3.5–3.7
- *Swirl* assignment MEASUREMENT2 due Mar. 12

Midterm Exam Handed out on Mar. 12 and due Mar. 22

Week 7 PREDICTION I

- QSS, 4.1
- *Swirl* assignment PREDICTION1 due Mar. 19

Week 8 PREDICTION II

- QSS, 4.2
- *Swirl* assignment PREDICTION2 due Mar. 26

Problem Set 3 Handed out on Mar. 26 and due Apr. 5

Week 9 PREDICTION III

- QSS, 4.3
- *Swirl* assignment PREDICTION3 due Apr. 2

Week 10 DISCOVERY I

- QSS, 5.1
- *Swirl* assignment DISCOVERY1 due Apr. 9

Problem Set 4 Handed out on Apr. 9 and due Apr. 19

Week 11 DISCOVERY II

- QSS, 5.2
- *Swirl* assignment DISCOVERY2 due Apr. 16

Week 12 DISCOVERY III

- QSS, 5.3
- *Swirl* assignment DISCOVERY3 due Apr. 23

Final Exam Handed out on Apr. 16 and due Apr. 26