

# POLI 311: Introduction to Quantitative Political Science

Professor Aaron Erlich

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Class Room: Rutherford 112

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## 1 Course Description

This course is designed to introduce students to the new and exciting world of data driven political analysis. The course employs examples from across political science sub-disciplines to discuss questions such as whether government spending helps reduce poverty and whether contact with canvassers can change voters' minds. The course also provides students with real world skills that they can put on their resumés when applying for jobs. Data science is one of the fastest growing industries out there! And political scientists are playing a major role in the field.

### 1.1 Who this course is for?

- This is your first semester-long course on quantitative methods for data analysis in political science. POLI 210 (or equivalent) is a pre-requisite.
- You want to be able to better read and interpret quantitative research in political science (even if you only intend to do qualitative work yourself).
- You are willing to spend time outside of the classroom to learn the course materials, as data analysis is a skill learned through actual practice.
- You want to be able to apply quantitative methods to your papers and future career.

## 2 Course Objectives

1. Learn the basic tools of empirical research in political science.
2. Obtain skills in R, a highly powerful and FREE programming language used extensively by academics in political science across the world, as well as the open source and data science community.
3. Gain real world skills that will help you obtain jobs in careers of the future.

## 3 Textbook

The textbook for this course will be:

Kosuke Imai, *Quantitative Social Science: An Introduction* (Princeton University Press, 2018).

I have requested this book be put on reserve!

There is a version of the book that uses the `tidyverse`, which is a set of libraries used by many data scientists. You can purchase this version of the textbook if you prefer!

Kosuke Imai and Nora Webb Williams, *Quantitative Social Science: An Introduction in Tidyverse* (Princeton University Press, 2022).

For a more lighthearted approach I recommend (totally optional):

Larry Gonick and Woollcott Smith, *Cartoon Guide to Statistics*, Illustrated edition (New York, NY: William Morrow Paperbacks, 1993).

## 4 Online Resources

Other resources include:

- [OpenIntro Stats \(free\)](#)
- [Online Statistics Education: An Interactive Multimedia Course of Study](#)
- [Statistical Reasoning Course](#)
- [Khan Academy, stats and probability videos](#)
- [Statistics Gone Wrong](#)

## 5 R and R-Studio

R is a FREE open source programming language used by data scientists and statisticians across the world. We will be using a FREE graphical user interface (GUI) called **RStudio** that makes learning R easier. There is an online version of Rstudio (Rstudio cloud). It is not possible to have a McGill account with [Rstudio Cloud](#), but you can sign up on your own. There is also Rstudio Server. You will be given an account through the Geographic Information Centre (GIC). While the learning curve in R is steeper than expensive programs, there is much more you can do with it!

There are many free online tutorial for downloading and installing R and RStudio.

If you would like a Data camp account, which is a free resource for you, please contact me.

R will also be available on the conference computers.

## 6 Evaluation Policy

A description of the means of evaluation to be used in the course.

- Unless you meet an exception criteria, **NO LATE ASSIGNMENTS ARE ACCEPTED.**
- For final grades, there will be **NO** rounding up or down. So 84.7 is an A-, etc.
- See below for policy on generativeAI and chatGPT

There are 1000 points available in the class. Therefore, for each 10% of the grade, 100 points are allotted.

- **5%.** Completion of Swirl programming assignments. **50 points.** There will be four Swirl assignments. Each will be worth 12.5 points. These are pass/fail
- **5%.** Completion of in-class polling **50 points.** If you attend 80% of lectures you can still get full credit. **DO NOT SEND ME EXCUSES FOR MISSING CLASS** unless you have a documented set of absences that total more than 20% of all classes.
- **30%.** *Problem sets.* Please see the problem sets section. While you may talk generally with other students about these assignments, these problems sets must be done individually. See the computer code section on academic integrity. Each problem set is worth **100 points.** There will be three assigned problem sets.
- **20%.** *In-class quizzes.* Each in-class quiz is **100 points.** Both in-class quizzes will be coding quizzes that will ask you to write some code and then comment on it. You will only have access to Rstudio and no other program.
- **30% Group project.** This project will consist of a poster and 10-15 page write-up of your findings. The group project is comprised of two sub-components. The individual score and the group score. You will receive more information about this as the course goes along. Each individual in the group will be given an individual grade worth **200 points**, based on the evaluation of the work they did on the project, what they learned, and their ranking of other group members' participation. Everyone in the group will be assigned a group grade worth **100 points.** The distribution of the group grade is 2/3 paper and 1/3 poster.
- **10%.** *Final Exam.* The final exam will be a substantive exam worth 100 points. This will be an entirely substantive multiple choice exam.

### 6.1 Re-Grading

Students who wish to contest a grade for an assignment or exam must do so in writing (by email, sent to me) providing the reasoning behind their challenge to the grade received within two weeks of the day on which the assignments are returned. The TA who graded the assignment will re-grade your assignment, and may **raise or lower the grade.** If you are still unsatisfied after the re-assessment, you can re-submit the assignment to me (original copy with TA comments), along with your justification. I will then re-evaluate the paper, but also reserve the right to **raise or lower the grade.** Please also see the departments policy [here](#).

## 7 Assignment Submission

1. Problem sets must be submitted to *MyCourses* the day the problem set is due by 11:59 PM. You must use `.Rmd` otherwise known as `rmarkdown` files to complete your homework. You will then “Knit” these `Rmd` files to a PDF (Don’t worry we’ll teach you how to do this). Do not submit your homework using Microsoft Word or any other document editor. It will not be graded. Any resubmission of such a homework will incur a 10 point penalty.
2. The final poster (in PDF format) and the final group write up in PDF format compiled from `.Rmd` must be submitted via *MyCourses*. All group members names be put on each of these assignments with a **SIGNED statement** testifying that everyone participated. One student for each group should be designated to turn in the poster and paper.
3. The final individual evaluation of the group project must be submitted individually to *MyCourses*.

## 8 Labs/Conferences/Group Office Hours

Labs are entirely optional. There is no grade associated with labs. We recommend you attend to succeed in the course, as you will have both programming quizzes and assignments. We have regular group office hours where student can get help in a group setting. Pending TA availability and student interest, we may have two special groups—Minorities in data science (Women and racialized/visible minorities), and French language. Individual OH online can be made via appointment at <https://calendly.com/aaron-erlich/office-hours>.

## 9 Group Project

I have created a Group discussion on **MyCourses** to facilitate you finding group members. Once you have a group, you will submit your paper check-in with all members of your groups. More on the group project soon.

### 9.1 Interim Data Set and Check-in

All groups must submit a one page write up of the data set they are going to use and the research question they are going to ask by **Thursday, Feb 08**. This should be a one page write up in `rmarkdown` explaining the data set which you are going to use and the question you will ask. You should also highlight your outcome variable.

### 9.2 Poster

Each group will present a poster the last day of class. Depending on their availability, faculty may be invited to judge the poster. You may also invite your friends. A team of faculty members will judge the best poster. You need to print your posters. While there is no specific size requirement, it should be poster size. I will provide some examples. One option to print your posters is through WSR Graphics. You can contact Stewart Creagh at WSR Graphics: [stewgc@videotron.ca](mailto:stewgc@videotron.ca). You send him what you want printed.

### 9.3 Paper

All groups will submit a final paper that is approximately 10-15 pages in length. This will be done via *MyCourses*.

## 10 Polling

- During a class there will be polling questions for credit to help me get feedback and ensure that students are meeting the objective learning goals. You may respond to questions from the instructor from a personal device (smartphone, tablet, or laptop), which can only be taken out and used for this specific purpose. I prefer you use your phone.
- Students should come to class with their devices charged and connected to the Internet.
- Polling will be available through Slide – [www.mcgill.ca/polling](http://www.mcgill.ca/polling).
- For any technical problems with polling, please contact the IT Service Desk: <http://www.mcgill.ca/it/get-started-it/need-help>.

## 11 Class Discussion List and E-mail Policy

I have set up a class discussion list on *MyCourses*. I encourage you to use this mailing list to ask questions you may have. *NEVER* post your code or specific homework questions on the course list server. Please post general questions! If you post homework code on the website, it will be taken down and your grade may be lowered.

## 12 Make-Up Work Policy

- If you are absent for documented emergency medical or family reasons, an alternative quiz date or homework submission date will be arranged. The alternative arrangement is only open to those who can provide a valid medical/family reason for missing the quizzes. If you cannot provide a valid reason for your absence, you will receive 0 points for the missed quiz or homework submission.
- I do not need to see your excuses for not coming to class. There are NO excuses for the polling since you can miss 20% and still get full credit.
- I reserve the right to have oral quizzes as make-up quizzes if you miss the in-class quiz.
- I also reserve the right to assign different HW assignments if you miss the homework assignment.
- Students who need to miss a class due to a religious holiday should notify me at least fourteen days prior to the holiday. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holiday, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

## 13 Technology Policy

### 13.1 Screens in the Classroom Policy

Mobile computer, telephone and table (MC) is strictly limited in this class. The current [literature](#) recognizes that MCs inhibit learning. I have found that computers distract the student using the

computer as well as her peers. So no computers, tablets or phones are allowed to be used in the classroom unless specified by the instructor. Currently, MC computing is allowed when there is an interactive quiz or I specifically state it can be used.

The conference sections are reserved specifically for practicing coding. Feel free to bring your own computer to these sessions.

## 13.2 Recording Policy

- No audio or video recording of any kind is allowed in class without the explicit permission of the instructor.
- Mobile Computing devices are not to be used for voice communication without the explicit permission of the instructor.

## 14 Academic Integrity

### 14.1 Course Policy on Computer Code

Just like writing a paper, copying other people's computer code constitutes plagiarism. Moreover data programming is learned through trial and error. **Please do not under any circumstances copy another student's code.** If you are found to have done so, you may be referred to the appropriate Dean. The instructors reserve the right to use software to compare the code that has been written by different students.

### 14.2 Course Policy on Computer Code

GenerativeAI is part of a modern toolkit. My policy is that you can use it to help you on your assignments, but you must report how you use it. Here are instructions for chatGPT: <https://help.openai.com/en/articles/7925741-chatgpt-shared-links-faq>. Remember that you have a coding quiz and if you have not learned to code you will likely score 0 on this quiz.

### 14.3 McGill Policy

"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures" (see [www.mcgill.ca/students/srr/honest/](http://www.mcgill.ca/students/srr/honest/) for more information).

### 14.4 Clickers

Since polling records may be used to compute a portion of course grades, responding as someone other than yourself is **considered an academic offense**. During class, possession of more than one response device or using the credentials of another student will be interpreted as intent to commit an academic offense. Please refer to McGill's policy on Academic Integrity and Code of Conduct.

## 15 Other Policies

### 15.1 Children in Class (adapted from Guy Grossman)

- Babies are welcome in class as often as is necessary to support feeding relationship (breast-feeding or via bottle). Because not everyone can pump sufficient milk, and not all babies will take a bottle, students should not feel like they have to choose between feeding their baby and continuing their education. Students and their babies are welcome in class anytime.
- For all children and babies, minor illnesses and unforeseen disruptions in childcare often put parents in the position of having to choose between missing class to stay home with a child. While this is not meant to be a long-term childcare solution, occasionally bringing a child to class in order to cover gaps in care is perfectly acceptable.
- I ask that all students work with me to create a welcoming environment that is respectful of all forms of diversity, including diversity in parenting status.
- In all cases where babies and children come to class, I ask that you sit close to the door so that if your little one needs special attention and is disrupting learning for other students, you may step outside until their need has been met. Non-parents in the class, please reserve seats near the door for your parenting classmates.
- Finally, I understand that often the largest barrier to completing your coursework once you become a parent is the tiredness many parents feel in the evening once children have finally gone to sleep. The struggles of balancing school and childcare are exhausting! I hope that you will feel comfortable disclosing your student-parent status to me. This is the first step in me being able to accommodate any special needs that arise. While I maintain the same high expectations for all students in my classes regardless of parenting status, I am happy to problem solve with you in a way that makes you feel supported as you strive for school-parenting balance.

### 15.2 Language of Submission:

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

### 15.3 Disabilities Policy

As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Students with Disabilities, 514-398-6009.

### 15.4 End of Course Evaluations

End-of-course evaluations are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.

## 16 Class Schedule

### Week 01, 01/01 - 01/05: Introduction, Intro to R

- FIRST CLASS: Thursday, Jan 04
- READING: Ch. 1
- SWIRL ASSIGNMENT 1 OUT Thursday, Jan 04
  - Tutorial 0: Introduction to R

### Week 02, 01/08 - 01/12: Causality 1

- TOPIC: Randomized experiments
- READING: Ch. 2.1-2.4
- SWIRL ASSIGNMENT 2 OUT Thursday, Jan 11
  - Tutorial 1: Causality 1
- LAB 1

### Week 03, 01/15 - 01/19: Causality 2

- TOPIC: Observational Studies
- READING: Ch. 2.5-2.7
- SWIRL ASSIGNMENT 1 & 2 DUE: Thursday, Jan 18
- SWIRL ASSIGNMENT 3 OUT Thursday, Jan 18:
  - Tutorial 3: Measurement 1
- PROBLEM SET 1 ASSIGNED: Thursday, Jan 18
- LAB 2

### Week 04, 01/22 - 01/26: Measurement 1

- TOPIC: Visualizing Univariate and Bivariate Relationships
- READING: Ch 3.1-3.3, 3.5-3.6
- SWIRL ASSIGNMENT 3 DUE: Thursday, Jan 25
- SWIRL ASSIGNMENT 4 OUT: Thursday, Jan 25
  - Tutorial 4: Measurement II
- LAB 3

### Week 05, 01/29 - 02/02: Measurement 2

- TOPIC: Survey sampling
- READING: 3.2, 3.4,
- SWIRL ASSIGNMENT 4 DUE: Thursday, Feb 01
- PROBLEM SET 1 DUE: Sunday, Feb 04
- PROBLEM SET 2 ASSIGNED: Thursday, Feb 01
- LAB 4



**Week 06, 02/05 - 02/09: Prediction 1**

- TOPIC: Prediction and Iteration (Looping)
- READING: 4.1
- **PAPER CHECK IN : Thursday, Feb 08**
- LAB 5

**Week 07, 02/12 - 02/16: Prediction 2**

- TOPIC: Regression
- READING: Ch. 4.2 and 4.3 (optional 4.3.4)
- PROBLEM SET 2 DUE: Sunday, Feb 18
- PROBLEM SET 3 ASSIGNED: Friday, Feb 16
- LAB 6

**Week 08, 02/19 - 02/23: Review and Quiz**

- **IN-CLASS QUIZ 1 : Thursday, Feb 22**  
– YOU MUST HAVE A LAPTOP - DO NOT FORGET TO CHARGE IT
- **QUIZ CLASS HAS FULL 1.5 HRS**
- LAB 7

**Week 09, 02/26 - 03/01: Probability 1**

- TOPIC: Probability and conditional probability
- READING: Ch. 6.1–6.3
- LAB 8

**Week 10, 03/04 - 03/08 READING WEEK. NO CLASS**

**Week 11, 03/11 - 03/15: Probability 2**

- TOPIC: Random variables and their distributions, Large sample theorems
- READING: Ch. 6.4–6.5
- PROBLEM SET 3 DUE: Sunday, Mar 17
- LAB 9

**Week 12, 03/18 - 03/22: Uncertainty 1**

- TOPIC: Estimation
- READING: Ch. 7.1
- LAB 10

**Week 13, 03/25 - 03/29: Uncertainty 2**

- TOPIC: Hypothesis tests and regression with uncertainty
- READING: Ch. 7.2

- TA will lead review session
- LAB 11

**Week 14, 04/01 - 04/05: Posters**

- **POSTER PDF DUE TO MY COURSES BY 9:00 AM MONDAY ON MYCOURSES FOR ALL STUDENTS**
- **COURSE LASTS FULL 1.5 hours**
- **POSTER IN-CLASS: BOTH DAYS CLASS IS SPLIT. ATTENDANCE MANDATORY**

**Week 15, 04/08 - 04/12: Quiz 2**

- **IN-CLASS QUIZ 2 : Friday, Apr 12**
- **YOU MUST HAVE A LAPTOP. DON'T FORGET TO CHARGE IT**
- **COURSES LAST FULL 1.5 hours**
- **LAST DAY OF CLASS IS Tuesday, Apr 09**

**16.01 FINAL PAPER**

An automatic 2-week extension past the end of Term is giving for FINAL-PAPER: DUE APRIL 23: 11:59 PM