POLS 7012: Introduction to Political Methodology

Fall 2020

Professor:	Joe Ornstein	**Time:**	W 6:30 – 9:15pm
Email:	jornstein@uga.edu	**Place:**	102 Baldwin Hall
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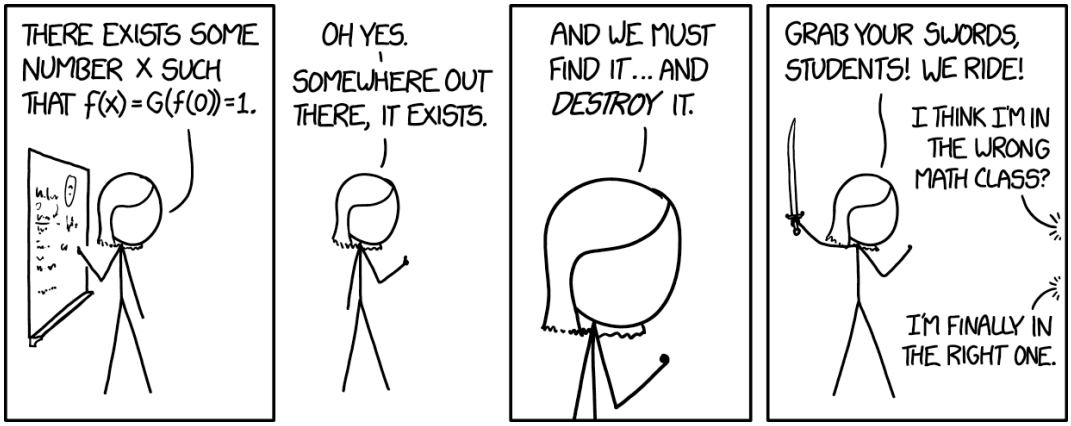

So you want to be a political scientist? Cool! It's a fun and fulfilling profession. But before you can eat your cake, you need to eat your vegetables. In this analogy, cake is political science, and vegetables is math. Because a lot of modern political science is heavily quantitative, and in order to fruitfully engage with the ongoing scientific conversation, you will need to understand the language.

This will be no ordinary math class. I intend it to be a very *practical* introduction to the mathematical and computational skills you'll want to have as a professional political scientist. You'll learn how to manipulate, describe, and visualize data. You'll learn how to tell the difference between patterns in data and random noise. You'll learn how to fit models and make predictions. And when we're done, you'll have the fundamentals you need to tackle the advanced stuff that makes up the rest of the methods sequence.

Course Objectives

By the end of this course, you will be able to:

- Confidently work with data and create beautiful visualizations using the `R` programming language
- Organize your work so that it is transparent and reproducible
- Explain the fundamental mathematics behind the statistical methods we use in political science (probability and inference, matrix algebra, and optimization).

Assignments & Grading

Each week, I will assign a problem set. Feel free to work with your classmates, but please submit your answers individually. 70% of your grade will come from these problem sets, and 15% each from a midterm and final exam.

Office Hours

Every Wednesday from noon to 1pm I will hold Virtual Office Hours over Zoom. I will put a sign-up spreadsheet on the course website. I'm also available before and after class to chat.

Recommended Books

I will not require you to purchase any books for this class, but here is a list of books you might find very useful:

- Wickham, H., & Grolemund, G. (2016). *R For Data Science: import, tidy, transform, visualize, and model data.* O'Reilly Media, Inc.
- Wasserman, L. (2013). *All of Statistics: A Concise Course in Statistical Inference.* Springer Science & Business Media.
- Simon, C. P., & Blume, L. (1994). *Mathematics for Economists.* New York: Norton.
- Tufte, Edward (2001). *The Visual Display of Quantitative Information*
- Healy, Kieran (2018). *Data Visualization: A Practical Introduction.* Princeton University Press.

Tentative Course Outline

Von Moltke writes that no battle plan survives first contact with the enemy. The same is true for syllabi. The following schedule is a rough outline that I may need to adjust on the fly. For instance, can I teach you everything you need to know about calculus in one week? Maybe! But if not, I've built in some Bonus Weeks towards the end of the semester that we can use for catch up. If everything goes according to plan, then we can cover extra topics during those weeks by populat demand.

Week 1: Getting Started

Pre-Class Survey, Overcoming Fear, Notation, Setting up R and RStudio, Tidy Data, Basic Programming

Week 2: Visualizing Data

ggplot2, Tufte's Principles, Distributions, Correlations, Faceting

Week 3: Tools for Reproducible Research

Workflow, Documentation, File Structure, RMarkdown, LaTeX, Zotero/Mendeley, `git` *and GitHub*

Week 4: Tidying, Transforming, and Describing Data

`tidyverse`*, Merging, Filtering, Grouping*

Week 5: Functions

Summation, Products, Logarithms, Exponentials, Writing Better Code, Flow Control

Week 6: All The Calculus You Need

Limits, Derivatives, Optimization, Integrals, Fundamental Theorem of Calculus

Week 7: Probability

Combinatorics, Random Variables, Expectation, Variance, Covariance, Conditional Probability, Bayes Rule, Law of Large Numbers

Week 8: Inference

PDFs and CDFs, Central Limit Theorem, Hypothesis Testing

Week 9: Review & Catchup

Midterm Exam

Week 10: Matrix Algebra and OLS

Regression, Systems of Linear Equations, Independence, Matrix Multiplication, Matrix Inversion

Week 11: Models and Prediction

Fitting Models, Machine Learning, Overfitting, Cross-Validation, Regularization, Ensembles

Week 12: Bonus Week 1

Possible Topics: *Causal Inference, Text-As-Data, Big Data, Machine Learning, Networks, Spatial Data,* `blogdown`, `bookdown`, *Advanced Reproducible Research*

Week 13: Bonus Week 2

Possible Topics: *Causal Inference, Text-As-Data, Big Data, Machine Learning, Networks, Spatial Data,* `blogdown`, `bookdown`, *Advanced Reproducible Research*

Week 14: Bonus Week 3

Possible Topics: *Causal Inference, Text-As-Data, Big Data, Machine Learning, Networks, Spatial Data,* `blogdown`, `bookdown`, *Advanced Reproducible Research*

Week 15: Review & Catchup

Final Exam

Academic Honesty

Remember that when you joined the University of Georgia community, you agreed to abide by a code of conduct outlined in the academic honesty policy called *A Culture of Honesty*. COVID-19 hasn't changed any of that. Problem sets may be completed in groups, but I expect your responses to be individual, and the midterm and final must be completed individually.