POL SCI 702
Advanced Techniques of Political Science Research

Spring 2022
Bolton 293
Mondays, 4:30 pm – 7:10 pm

Instructor Information

Professor:	Patrick Kraft, PhD
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Office Hours:	Mondays, 2:00 pm – 4:00 pm, or by appointment.

I Course Description

This class is a second graduate course for political methodology that builds explicitly on the foundation laid in POL SCI 701. In that class, you learned the nuts and bolts behind statistical inference as well as the statistical software R. In this course, we extend those tools to cover various linear and non-linear models. Therefore, the main goal for this semester is not only to become a proficient *consumer* of quantitative research, but also to set the groundwork to pursue your own projects using advanced statistical modeling techniques. The topics that we will intensively discuss include:

1. Ordinary Least Squared (OLS)
2. OLS diagnostics
3. Maximum Likelihood Estimation (MLE)
4. Generalized linear models
5. Model visualization and interpretation
6. Causal inference.

II Textbook and Additional Material

Required

There is one required textbook for the course and it is available at the bookstore:
Gelman, Andrew, Jennifer Hill, and Aki Vehtari. 2020. *Regression and other stories*. Cambridge University Press

Any additional required readings will be available electronically on Canvas.

Furthermore, I recommend the following resources that are available online:

- The Plain Person's Guide to Plain Text Social Science: `http://plain-text.co`
- Math Prefresher for Political Scientists: `https://iqss.github.io/prefresher`
- R for Data Science (Wickham and Grolemund, 2016): `https://r4ds.had.co.nz`
- Data Visualization (Healy, 2018): `https://socviz.co`
- Fundamentals of Data Visualization (Wilke, 2019): `https://clauswilke.com/dataviz/`

We will be using RStudio Cloud for the programming portion of the course. Get started by creating your own (free) account at `https://rstudio.cloud` and (if you are new to R) work through their primers. These interactive tutorials will help you familiarize yourself with basic programming concepts and R. On Canvas, you will find more information about how to join our shared RStudio Cloud workspace for the course.

There are countless other resources available online, but I want to highlight a great set of YouTube videos in case you want to learn more about specific topics covered in our course. You'll find links to these videos on Canvas as well:

- Gary King's lecture videos on quantitative social science methods:
  `https://www.youtube.com/channel/UCtrwX29xpuWc9y0-0PKrHSQ/playlists`
  `https://projects.iq.harvard.edu/gov2001`

Additional Readings (Optional)

King, Gary. 1998. *Unifying political methodology: The likelihood theory of statistical inference*. University of Michigan Press

Gailmard, Sean. 2014. *Statistical modeling and inference for social science*. Cambridge University Press

Fox, John. 2015. *Applied regression analysis and generalized linear models*. 3 ed. Sage Publications (older edition is fine)

Fox, John, and Sanford Weisberg. 2018. *An R companion to applied regression*. 3 ed. Sage Publications

Wooldridge, Jeffrey M. 2013. *Introductory econometrics: a modern approach*. Cengage Learning

Angrist, Joshua D, and Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press

Long, J Scott. 1997. *Regression models for categorical and limited dependent variables.* Thousand Oaks: Sage Publications (newer version using Stata is also available).

III Schedule

Date	Topics	Textbook	Assignments due
01/24	Course Logistics & Tidyverse Intro		
01/31	Introduction: Data Visualization & Measurement	ch. 1-2	
02/07	Probability Theory & Statistical Inference	ch. 3-5	PS 1
02/14	Linear Regression Review	ch. 6-8	
02/21	Linear Regression & Bayesian Inference	ch. 9-10	PS 2
02/28	Assumptions, Diagnostics, & Model Evaluation	ch. 11	
03/07	Transformations & Other Topics	ch. 12	PS 3
03/14	*Replication Proposal Session*		In-class presentation
03/21	**Spring Break – No Class**		
03/28	OLS Review Session	no readings	Technical replication
04/04	Logistic Regression I	ch. 13	
04/11	Logistic Regression II	ch. 14	PS 4
04/18	Generalized Linear Models	ch. 15	
04/25	Statistical Power, Poststratification, & Imputation	ch. 16-17	PS 5
05/02	Causal Inference I	ch. 18-19	
05/09	Causal Inference II	ch. 20-22	PS 6
05/16	**Final Replication Due – No Class**		

Note: Schedule may be subject to change depending on our progress during the semester.
Additional required and/or recommended readings will be available on Canvas

IV Grading and Work Load

Your final grade will be determined based on the following three components:

1. **Bi-Weekly problem sets ($50\% = 5 * 10\%$):** The main focus of this course will be your bi-weekly assignments. I strongly encourage you to work in groups and discuss each question with your peers. However, each student must write up and submit their own original solution. Problem sets have to be submitted via Canvas by the end of the specified due date (usually by midnight on Mondays). *Of the 6 problem sets, I will take the average of the 5 highest grades*, meaning that you can do poorly on 1 assignment without it impacting your grade.
2. **Technical replication report (20%):** Throughout the semester, you will work on a replication of a published research paper in your area of interest (see King, 2006, for details and tips). After spring break, you have to submit a first report that consists of a direct replication. This report should be written using R-markdown and has to include all necessary R code to produce the results. The goal is to fully reproduce and explain each step in the published analysis.
3. **Full replication paper (30%):** At the end of the semester, you are expected to submit a full replication paper, which builds on your initial technical report but extends the analysis and/or improves the result presentation. This paper should have the format of a journal article (or class paper) and therefore does not include code chunks etc. Further details will be discussed in class.

Grading Scheme

I am planning to use the following grading scheme. Adjustments may only be made to improve grades:

93-100	A	77-79	C+	60-62	D-
90-92	A-	73-76	C	0-59	F
87-89	B+	70-72	C-		
83-86	B	67-69	D+		
80-82	B-	63-66	D		

Percentages ending in a decimal of .5 or greater will be rounded up to the next whole number.

Pass/Fail: Students who take this course under the Pass/Fail option must receive a grade of C or higher in order to obtain a Pass on their final grade. A final grade of "Incomplete" will only be given under exceptional circumstances and is solely at the discretion of Professor Kraft.

Late submission policy: Problem sets submitted after their respective due dates will only be graded for partial credit. For each day after the deadline, I will reduce the score by one grade point. I will make exceptions to this policy only in the most severe and rare circumstances (severe illness, etc.).

Campus network or Canvas outage: Due dates for assignments will be changed to the next day (due by midnight) if access to Canvas is not available for an extended period of time (greater than one entire evening, i.e., 6pm – 11pm).

Work Load: This is a full credit course (3 credits), so the expected time commitment from students is 144 hours throughout the semester, which amounts to approximately 10 hours per week. Students will spend 40% of their time reviewing the course material (completing assigned readings, watching lecture videos, taking notes). 30% will be spent working on coding assignments and problem sets. A further 30% will be spent working on the replication project.

Activity	**Estimated Time Commitment**
Reviewing course material	58 hours
Completing bi-weekly problem sets	43 hours
Working on replication project	43 hours

V Acknowledgements

I have adapted the ideas and language from the work of several educators for this syllabus and the course material. For example, I have borrowed liberally from other courses on social science research methods and statistics, as taught by Andrew Gelman, Gary King, Michael Peress, Thomas Gschwend, and others. I appreciate their contributions to the discipline and thank all educators who make their teaching material available to others. To pay it forward, I will share my own material with anyone who is interested.

VI COVID Policies

Panther Community Health and Safety Standards

UWM has implemented reasonable health and safety protocols, taking into account recommendations by local, state and national public health authorities, in response to the COVID-19 pandemic. As a member of our campus community, you are expected to abide by the Panther Interim COVID-Related Health & Safety Rules, which were developed in accordance with public health guidelines. These standards apply to anyone who is physically present on campus, UWM grounds, or participating in a UWM-sponsored activity:

- All individuals visiting UWM facilities must wear face coverings while indoors;
- Unvaccinated students coming to campus are required to test weekly for COVID-19; and,
- You should check daily for COVID-19 symptoms and not come to campus if you are feeling sick.

Additional details about student and staff expectations can be found on the UWM COVID-19 webpage as well as in the full online version of the COVID-19 syllabus statements.

VII University Policies

Drop and Add dates

Please see the following website for full details on the types of withdrawals that are available: https://uwm.edu/onestop/dates-and-deadlines/interactive-adddrop-calendar/

Academic Integrity

No form of academic dishonesty will be tolerated. The University of Wisconsin-Milwaukee has detailed its policies on academic integrity (http://uwm.edu/academicaffairs/facultystaff/policies/academic-misconduct/). You should acquaint yourself with policies concerning cheating, fabrication, plagiarism, and academic interference. Any submission of work in this course constitutes a certificate that the work complies with university policies on academic integrity.

Student Disabilities

The University of Wisconsin-Milwaukee 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) 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 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 you or in coordination with the Accessibility Resource 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. Please also see http://uwm.edu/arc/ for further information.

Other Policies

The University of Wisconsin-Milwaukee has several additional policies concerning issues such as accommodations for religious observances, students called to active military duty, discriminatory conduct,

or sexual harassment available for you here: https://uwm.edu/secu/syllabus-links/. I strongly encourage you to access this link and familiarize yourself with these policies and procedures.

References

Angrist, Joshua D, and Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Fox, John. 2015. *Applied regression analysis and generalized linear models*. 3 ed. Sage Publications.

Fox, John, and Sanford Weisberg. 2018. *An R companion to applied regression*. 3 ed. Sage Publications.

Gailmard, Sean. 2014. *Statistical modeling and inference for social science*. Cambridge University Press.

Gelman, Andrew, Jennifer Hill, and Aki Vehtari. 2020. *Regression and other stories*. Cambridge University Press.

Healy, Kieran. 2018. *Data visualization: a practical introduction*. Princeton University Press.

King, Gary. 1998. *Unifying political methodology: The likelihood theory of statistical inference*. University of Michigan Press.

King, Gary. 2006. "Publication, publication." *PS: Political Science & Politics* 39 (01): 119–125.

Long, J Scott. 1997. *Regression models for categorical and limited dependent variables*. Thousand Oaks: Sage Publications.

Wickham, Hadley, and Garrett Grolemund. 2016. *R for data science: import, tidy, transform, visualize, and model data*. O'Reilly Media, Inc.

Wilke, Claus O. 2019. *Fundamentals of data visualization: a primer on making informative and compelling figures*. O'Reilly Media.

Wooldridge, Jeffrey M. 2013. *Introductory econometrics: a modern approach*. Cengage Learning.