9591B: Quantitative Methods in Political Science

9:30AM-12:30PM, Thursday (1/10/20-4/9/20), SSC 4105

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This course is designed to get you thinking about how quantitative models work, what assumptions we need to make to use them appropriately and exactly what they might be good for. Further, you will also be asked to apply these new skills to answer social scientific questions. An ancillary goal of the course is to enable you to be critical consumers of quantitative work. Often times, these two goals go hand-in-hand and as you get more comfortable with doing statistical analyses and you learn how to understand, implement and interpret more and more complicated methods, you almost necessarily become more savvy consumers of quantitative work.

The course will be taught from a more applied, rather than mathematical, point of view. While there will certainly be some math in the course, I will approach these concepts assuming no comfort with mathematics aside from basic arithmetic (and even then, we will go over, important mathematical results and formulae). If you are having trouble with the concepts, please ask questions in class. Others will likely be confused by some of the same issues. If you continue to have trouble in the course, please see me during office hours or make an appointment and we can clear up any problems as they arise. DO NOT wait until right before the test to try to clear up all of your accumulated problems. Statistics is a cumulative enterprise, so a lack of understanding early can compound itself as the class moves forward.

As you are all graduate students, I expect that you will take this class seriously regardless of your inherent interest in the subject matter. I expect that you will attend class regularly, do the readings and ask questions when something is confusing. You are ultimately responsible for knowing the material. I will do my best to teach it in a way that is likely to make sense, but if you do not understand something, you need to take responsibility for figuring it out by asking questions, either in or outside of class. If you miss class, you are responsible for learning the material you missed in a manner that proves least distracting for the other participants in the course. Also, the late work policy is that make-up exams are not given to graduate students and late papers are not accepted (rare exceptions may be allowed on a case-by-case basis when arrangements are made before the due date).

Computing

This class has both theoretical and applied aspects. Thus, you will not only learn the reasoning behind statistical analysis, you will also learn how to analyze data yourselves using **R**. R is open-source and as such, is freely available. Students who took the first semester course have had some experience with R aleady and we will transition from a GUI to code-based interaction with R. We will try to put aside an hour each class to work on data examples.

When you have work using the computer that needs to be turned in, it should be done in such a way that facilitates easy reading and evaluation. I will provide templates for homework in an effort to unify the visual aesthetic.

Grading

You final grade in the course will depend on the following:

Homework	50%
Short Data Papers (2)	25%
Final Paper	25%

Homework

You will get assignments each class of various lengths and types some of the questions can/should be answered with pencil and paper while others will utilize the computer. You should consider your colleagues a resource and I encourage you to discuss the problem sets with your them. That said, each person must turn in their own, original answers to the homework problems.

Final Paper

The class culminates in a final paper that will be written in the form of published papers you have read. You will need to do some analysis and justify the analytical process, interpret the analyses and answer the question you posed. There is no formal requirement for length, but let me suggest a couple of things. First, your literature review shouldn't be more than three or four pages. Separately from the literature review, you should present your theory - the way in which you think the conceptual pieces fit together. Part of this discussion should be a formal presentation of hypotheses that will be tested. You should describe the data you're using - where you go it, what you did to it after you got it and how you think the variables you are using match the concepts they are meant to measure. You should talk about the procedure you use for testing the hypotheses along with the strengths and possible weaknesses of the procedure for this purpose. You need to discuss the results and then conclude by putting the results back in context and highlighting the most important results.

Textbook

There are lots of required readings for this course. They will be posted on OWL.

Miscellaneous

For those interested, there are some "popular" media outlets that try to make sense of numbers (i.e., increase your numeracy). Some of these are more "social sciency" while others are aimed more squarely at statistics in general. They are all interesting, though. If you're interested, but not a blog follower, google reader (`http://google.com/reader`) is a good way to follow this sort of information.

- *The Numbers Guy* (a Wall Street Journal blog): `http://blogs.wsj.com/numbersguy/`
- *Freakonomics* (blog and podcast): `http://www.freakonomics.com/blog/`
- *Numbers Rule Your World*: `http://junkcharts.typepad.com/numbersruleyourworld/`
- *Understanding Uncertainty*: `http://understandinguncertainty.org/`
- *Probability and Statistics Blog* (perhaps a bit technical, but still interesting stuff): `http://www.statisticsblog.com/start-here/`
- *Significance* (blog and magazine): `http://www.statslife.org.uk/significance`
- *Flowing Data* (mostly about visualization, but neat stuff): `http://flowingdata.com/`
- *More or Less* (great podcast, $\sim$ 20 minutes/week, about numeracy and numbers): `http://www.bbc.co.uk/programmes/b006qshd`

Outline

1. Introduction (1/10)
2. Linear Regression: Linearity and Interactions (1/9-16)
    - Interactions: Fox "Applied Regression" (Chapter 7, esp section 7.3)
    - Interactions: Fox and Weisberg "Companion to Applied Regression" (Chapter 4, sections 4.1-4.4)
    - Application: Berry, Golder and Milton (Journal of Politics)
    - Non-linearity: Fox "Applied Regression" (Chapter 4, Chapter 17, sections 17.1-17.3)
    - Non-linearity: Fox and Weisberg "Companion to Applied Regression" (Chapter 3)

3. Maximum Likelihood Estimation I: Likelihood and Simple Models (1/23)

    - King "Unifying Political Methodology" (pp. 59-67)
    - Fox "Applied Regression" (Appendix, D.6.1-D.6.2)

4. Class Cancelled 1/30

5. MLE II: Binary DV Models (2/6)

    - Fox "Applied Regression" (Chapter 14, section 14.1)
    - Fox and Weisberg "Companion to Applied Regression" (Chapter 5, sections 5.1-5.3)
    - Faraway "Extending the Linear Model with R" (Chapter 2)
    - Application: Fred Cutler "Political Conditions for Electoral Accountability in Frederalism" (*CJPS*, 2017)
    - Application: Jaroslav Tir and Doug Stinnett "Weathering climate change: Can institutions mitigate international water conflict?" (*JPR*, 2012)

6. MLE III: Multiple Category DV Models (2/13)

    - Fox "Applied Regression" (Chapter 14, section 14.2)
    - Fox and Weisberg "Companion to Applied Regression" (Chapter 5, sections 5.7 and 5.9)
    - Faraway "Extending the Linear Model with R" (Chapter 7, sections 7.1 and 7.4)
    - Application: Jennifer Merolla, Laura Stephenson and Elizabeth Zechmeister "Can Canadians Take a Hint? The (In)Effectiveness of Party Labels as Information Shortcuts in Canada" (*CJPS*, 2008)
    - Application: Cameron Anderson and Laura Stephenson "Environmentalism and Party Support in Canada: Recent Trends outside Quebec" (*CJPS*, 2011)

7. Spring Reading Week (2/20)

8. MLE IV: Count and Survival Models (2/27)

    - Faraway "Extending the Linear Model with R" (Chapter 5)
    - Moore "Applied Survival Analysis Using R" (Chapters 2,3 and 5)
    - Diez "OpenIntro: Survival Analysis in R" (`https://www.openintro.org/download.php?file=survival_analysis_in_R`)
    - Application: Paul Thomas, Peter Loewen and Michael MacKenzie, "Fair Isn't Always Equal: Constituency Population and the Quality of Representation in Canada" (*CJPS*, 2013)

- Application: Stephen Ferris and Marcel-Cristian Voia, "What Determines the Length of a Typical Canadian Parliamentary Government?" (*CJPS*, 2009)

9. Space and Time I (3/5)

   - Pickup "Introduction to Time Series Analysis" (2015, Chapters 1-4)
   - Bell and Jones "Explaining Fixed Effects: Random Effects Modeling of Time-Series Corss-Sectional and Panel Data" (*PSRM*, 2014)
   - Clark and Linzer "Should I Use Fixed or Random Effects" (*PSRM*, 2015)
   - Croissant and Millo "Panel Data Econometrics in R: the plm package" (*JSS*, 2008)

10. Class Cancelled 3/12

11. Space and Time II (3/19)

    - Lovelace "Introduction to Visualizing Spatial Data in R" (`https://github.com/Robinlovelace/Creating-maps-in-R`)
    - Bivand et al "Applied Spatial Data Analysis with R" (Chapter 9)
    - "Spatial Regression Models" (`http://rspatial.org/analysis/rst/7-spregression.html`)

12. Dealing with Text (3/26)

    - Grimmer and Stewart "Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Text" (*Political Analysis*, 2013)
    - Denny and Spirling "Text preprocessing for Unsupervised Learning: Why It Matters, When It Misleads, and What To Do ABout It" (*Political Analysis*, forthcoming)
    - Feinerer et al "Text Mining Infrastructure in R" (*JSS*, 2008)
    - "Downloading and Analyzing Twitter data with rtweet" (`https://earthdatascience.org/courses/earth-analytics/get-data-using-apis/use-twitter-api-r/`)

13. Missing Data and Multiple Imputation (4/2)

    - Fox "Applied Regression" (Chapter 20)
    - van Buuren and Groothuis-Oudshoorn "mice: Multivariate Imputation by Chained Equations in R" (*JSS*, 2011)

14. Measurement and Scaling (4/9)

    - Readings TBA