POS 6933 – Fall 2020

Topics in Political Methodology:
Maximum Likelihood Estimation (MLE)
Department of Political Science,
University of Florida

Monday: Periods 5-7; Room: Zoom

Instructor: Prof. Badredine Arfi
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              Or: by appointment

COURSE DESCRIPTION AND OBJECTIVES

The linear model is a useful but limited tool for statistically studying most political and social phenomena. The dependent variables of interest to social scientists do not usually fit the assumptions of the Classical Linear Regression Model (CLRM). Methodologists/statisticians have developed sophisticated methods to address many important failures of the CLRM. To analyze, for example, data with qualitative and ordinal dependent variables, count models as well as situations where there is a selection bias, we need to go beyond the limitations of the CLRM. The maximum likelihood estimation – MLE – methodology as applied in Generalized Linear Models – GLMs – is a general approach that enables researchers to estimate models addressing such difficulties. The maximum likelihood is a methodology that refers to a general estimation strategy, which means that it refers to a different way for thinking about data and parameters.

The students are expected to understand the theory of maximum likelihood estimation and how it has been used to develop a number of important GLMs that political scientists use to study politics. The students are also expected to use these powerful statistical models to research problems that interest them.

The course consists of two parts. The first one deals with a number of models suited for analyzing problems with categorical and limited dependent variables. The second part consists of an introduction to the methodology of event history modeling also known as survival analysis in which the dependent variable is duration or time-to-event.

RECOMMENDED TEXTS

Generalized Linear Models, MLE, and more …
- Michael Smithson and Edgar C. Merkle. 2014. Generalized Linear Models for Categorical and Continuous Limited Dependent Variables. CRC Press.
- Alan Agresti. 2015. Foundations of Linear and Generalized Linear Models. Wiley Press.
- Peter K. Dunn and Gordon K. Smyth. 2018. Generalized Linear Models with Examples in R. Springer.
- Gerhard Tutz. 2012. Regression for Categorical Data. Cambridge University Press.
- Jonathon D. Brown. 2018. Advanced Statistics for the Behavioral Sciences: A Computational Approach with R. Springer.

Survival Analysis
- Dirk F. Moore. 2016. Applied Survival Analysis Using R. Springer.
- David D. Hanagal. 2019. Modeling Survival Data Using Frailty Models. Second Edition. Springer.

R Introductory Books
- John Maindonald and W. John Braun. 2010. Data Analysis and Graphics Using R – An Example-Based Approach. Third Edition. Cambridge University Press.
- Quan Li. 2018. Using R for Data Analysis in Social Sciences A Research Project-Oriented Approach.
- John Verzani. simpleR: Using R for Introductory Statistics.
- Tilman M. Davies. 2016. The Book of R: A First Course in Programming and Statistics. No Starch Press.
- James E. Monogan III. 2015. Political Analysis Using R. Springer.
- Peter Dalgaard. 2008. Introductory Statistics with R. Second Edition. Springer.

Other Relevant Texts
- Will H. Moore & David A. Siegel. 2013. A Mathematics Course for Political and Social Research. Princeton University Press.

ADDITIONAL MATERIAL ON CONVAS

- Additional readings and materials will be posted on canvas site for the course at appropriate times during the semester.

REQUIREMENTS AND ASSESSMENT

The requirement for this course is simple (as always): work diligently and persistently. This includes attending classes, doing the readings carefully before the seminar meets, and working regularly on the computer applications, the extra readings, and the research paper. Each student should expect to be spending many hours learning how to excel in using the R software commonly used to estimate the models discussed in class.

There will be a number of homework assignments that the students must complete and turn in. The homework assignments are due on the specified dates; no late submission is acceptable. All materials related to a specific homework (e.g., write-up, R script, log file, figures) should collected together in a zip folder and uploaded to canvas. There will also be a final take-home exam, the specifics of which will be discussed in class. Roughly speaking, it will consist in answering a number of questions by analyzing a dataset that will be provided to you with the questions.

A major component of the course evaluation will be a term research paper. Each student will produce a manuscript of high quality using an appropriate modelling strategy (specifics of the paper are discussed down below).

DISTRIBUTION OF GRADES

10%: Weekly homework exercises. All assignments are to be uploaded to canvas before the beginning of class on their respective due dates. No late submission will be accepted for any reason (except when justified with university sanctioned documentation). The problem sets will be assigned at the end of the lectures depending on what we cover in the lecture sessions.

10%: Each student will be assigned "presentations" for the R and exercises practice session of the course which will consist in presenting the weekly assigned homework (this will be fully explained on the first day of class). A schedule of these presentations will be created on the first day of class.

30%: Take-Home Final Examination
The final exam is a take-home and open-book, open-computer, open-anything-but-another-human-being (physical or virtual).

40%: A Replication Paper
Each student is required to choose in consultation with the instructor (see down below) a paper (published in the last 5 years) using an MLE methodology **and a software other than R**. The student is required to replicate the results of the paper and go beyond (see down blow for details) **using the R software**. The goal is to produce a high-quality, potentially publishable manuscript, using a model (or models) discussed in the course.

10%: Paper Presentation.
Each student will present his/her paper on the last day of classe**s** of the semester. The presentation will consist of a ppt presentation for about 10 minutes followed by 5 minutes of Q & A.

COMPUTER REQUIREMENTS

All works done in this course will be using the R software package. The software R is freely available online at https://cran.r-project.org . Students are thus required to install the R software on their laptops as well as an editor for R; many scholars use RStudio (free open source edition) available at
https://rstudio.com/products/rstudio/download/#download
(this will be explained on the first day of classes). The CRAN website has a lot of information on how to apply R in all sorts of analyses, including GLMs, MLE, Survival Analysis, etc. Every R package in CRAN – and there is a huge number of R packages – has information with it that explains how to use the package, sometimes with many examples.

SPECIFICS ON THE REPLICATION PAPER

In order for the instructor to provide guidance in the preparation of the paper, you will be required to turn in various brief intermediate papers throughout the semester.

Each student must:

1. Find a published paper that interests you and that applies a statistical method that falls within the scope of the material covered in this course.
   Due Date: September 21

2. Obtain the data from a databank or the author(s).
   Due Date: October 5

3. Replicate the published results as nearly as possible.
   Due Date: November 2

4. You **must extend** the analysis in some way. You could, for example,

- Suggest a more appropriate functional form for the estimation and re-estimate.
- Argue that one or a set of important variables were omitted and conduct the analysis anew.
- Argue that the results are likely to be sensitive to sample selection or variable measurement etc. and then conduct appropriate analyses to address that possibility.
- Extend the data or use a different data set to test the theory.
- Any other good idea that you might have.

The final paper should be 15-20 pages long, including the bibliography.
Due Date: December 8.

5. **Note on the Final Submission of the Paper**:

Students are required to submit to canvas a **zip** folder that contains the paper (written in a professional format suitable for an academic journal), an annotated log life displaying their complete analysis, an annotated R script file containing the R code that one would need to replicate the analysis of the paper from beginning to end, and the final data file used for the paper (including both replication and extension works) as well as (if needed) supplementary materials that are deemed important to understand the paper and its analysis.

IMPORTANT DATES

Class Begins	Monday, August 31
Holidays: No classes	September 7: Labor Day October 2 - 3: Homecoming November 11: Veterans Day November 25 - 28: Thanksgiving
Class Ends	Wed, December 7

Session	TOPIC
1	Introduction and Overview: GLMs & MLE
2	Deeper into MLE & Model Diagnostics
3	Binary Models: Logit and Probit
4	Ordinal Outcomes: Ordered Logit and Ordered Probit Analysis
5	Nominal Outcomes: Multinomial Logit and Related Models
6	Limited Outcomes: Tobit Model
7	Heckman Model and Other Sample Selection Models
8	Count Outcomes: Regression Models for Counts
9	The Logic of Survival Analysis
10	Parametric Models for Single-Spell Duration Data
11	The Cox Proportional Hazards Model
12	Diagnostic Methods for Survival Models
13	Inclusion of Time-Varying Covariates
14	Some Modeling Strategies for Unobserved Heterogeneity
15	Models for Multiple Events
16	Models for Discrete Data
	Presentations of students' replication papers

IMPORTANT NOTES:

- Incomplete grades may be granted under very special circumstances as supported by valid official documentation (in accordance with the university regulations). Any student seeking such accommodation must request it prior to the deadline for the specific assignment.

- Retroactive extensions/incompletes will not be granted under any circumstances.

- The instructor reserves the right to change any part or aspect of this document should a need for doing so emerge at any point in time during the semester.

- **Online course evaluation process**: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available from the Gatorevals website. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via the evaluation system. Summaries of course evaluation results are available to students at the public results website.

- Per university rules there is a zero-percent tolerance on cheating, plagiarism, bribery, misrepresentation, conspiracy, fabrication (see university definitions down below).

- The Writing Studio (352-846-1138) can assist UF students with academic writing through one-on-one consultations either in person or online. Consultations can be scheduled through their website. English language learners can request general writing help or can get help with a specific assignment. are available for students who cannot visit the Writing Studio in person.

UF POLICIES:

- **University Policy on Accommodating Students with Disabilities:** Students with disabilities requesting accommodations should first register with the UF Disability Resource Center (352.392.8565) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.

- **Workload**: As a Carnegie I, research-intensive university, UF is required by federal law to assign at least 2 hours of work outside of class for every contact hour. Work done in these hours may include reading/viewing assigned material and doing explicitly assigned individual or group work, as well as reviewing notes from class, synthesizing information in advance of exams or papers, and other self-determined study tasks.

- **Statement Regarding Course Recording:** As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

- **UF policy on the student computer requirement**: Access to and on-going use of a computer is required for all students. The University of Florida expects each student entering a UF Online program, to acquire computer hardware and software appropriate to his or her degree program. Competency in the basic use of a computer is required. Course work will require use of a computer and a broadband connection to the internet, academic advising and registration can be done by computer, official university correspondence is often sent via e-mail and other services are provided that require access through the Internet. While the university offers limited access to computer software through its virtual computer lab and software licensing office, most students will be expected to purchase or lease a computer. The cost of meeting this requirement may be included in financial aid considerations.

- **University Policy on Academic Misconduct:** Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php.

LEGAL DEFINITIONS

(a) **Cheating** – The improper taking or tendering of any information or material which shall be used to determine academic credit. Taking of information includes, but is not limited to, copying graded homework assignments from another student; working together with another individual(s) on a take-home test or homework when not specifically permitted by the teacher; looking or attempting to look at another student's paper during an examination; looking or attempting to look at text or notes during an examination when not permitted. Tendering of information includes, but is not limited to, giving your work to another student to be used or copied; giving someone answers to exam questions either when the exam is being given or after having taken an exam; giving or selling a term paper or other written materials to another student; sharing information on a graded assignment.

(b) **Plagiarism** – The attempt to and/or act of representing the work of another as the product of one's own thought, whether the other's work is published or unpublished, or simply the work of a fellow student. Plagiarism includes, but is not limited to, quoting oral or written materials without citation on an exam, term paper, homework, or other written materials or oral presentations for an academic requirement; submitting a paper which was purchased from a term paper service as your own work; submitting anyone else's paper as your own work.

(c) **Bribery** – The offering, giving, receiving or soliciting of any materials, items or services of value to gain academic advantage for yourself or another.

(d)   **Misrepresentation** — Any act or omission of information to deceive a teacher for academic advantage. Misrepresentation includes using computer programs generated by another and handing it in as your own work unless expressly allowed by the teacher; lying to a teacher to increase your grade; lying or misrepresenting facts when confronted with an allegation of academic dishonesty.

(e)   **Conspiracy** — The planning or acting with one or more persons to commit any form of academic dishonesty to gain academic advantage for yourself or another.

(f)   **Fabrication** — The use of invented or fabricated information, or the falsification of research or other findings with the intent to deceive for academic or professional advantage.

UF Resources

University Police
The UF police are together for a safe campus. 392-1111 (or 9-1-1 for emergencies) http://www.police.ufl.edu/.

Career Connections Center
Career Connections Center (352-392-1601 | CareerCenterMarketing@ufsa.ufl.edu) connects job seekers with employers and offers guidance to enrich your collegiate experience and prepare you for life after graduation.

Counseling and Wellness Center
Counseling and Wellness Center (352-392-1575) provides counseling and support as well as crisis and wellness services including a variety of workshops throughout the semester (e.g., Yappy Hour, Relaxation and Resilience).

Dean of Students Office
Dean of Students Office (352-392-1261) provides a variety of services to students and families, including Field and Fork (UF's food pantry) and New Student and Family programs

Multicultural and Diversity Affairs
Multicultural and Diversity Affairs (352-294-7850) celebrates and empowers diverse communities and advocates for an inclusive campus.

Office of Student Veteran Services
Office of Student Veteran Services (352-294-2948 | vacounselor@ufl.edu) assists student military veterans with access to benefits.

ONE.UF
ONE.UF is the home of all the student self-service applications, including access to:
- Advising
- Bursar (352-392-0181)

- [Financial Aid](#) (352-392-1275)
- [Registrar](#) (352-392-1374)

Official Sources of Rules and Regulations

The official source of rules and regulations for UF students is the [Undergraduate Catalog](#) and [Graduate Catalog](#). Quick links to other information have also been provided below.

- [Student Handbook](#)
- [Student Responsibilities](#), including academic honesty and student conduct code
- [e-Learning Supported Services Policies](#) includes links to relevant policies including Acceptable Use, Privacy, and many more
- [Accessibility](#), including the Electronic Information Technology Accessibility Policy and ADA Compliance
- [Student Computing Requirements](#), including minimum and recommended technology requirements and competencies