PSC 604: Applied Data Analysis III

Fall 2015
Lecture: MW 11am-12:30pm
Course website: https://sites.google.com/a/stonybrook.edu/mperess/teaching/mle2015

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Overview: In this course, we will study nonlinear statistical models. Because the linear regression model is inappropriate for data that arises in many interesting areas of political science, students need additional statistical tools to conduct rigorous empirical research. In this course, we will learn methods for analyzing models and data for multinomial ordered/unordered categories, event counts, durations, truncation, sample selection, and missing data. We will also cover a number of advanced topics as time permits.

Recommended Textbooks:

William Greene–Econometric Analysis, Any Edition

Kennedy, Peter–A Guide to Econometrics

Fumio Hayashi–Econometrics

Grading: Grading (assuming good attendance) will be based on a midterm (33%), a final (33%), and homework assignments (33%).

Software: In class, we will make use of stata and r for data analysis

Course Outline: I plan on covering the following topics throughout the semester. The list may be contracted or expanded based on how long things are taking.

A. Overview and Logit

B. Numerical Optimization
1. Nonlinear Equations and Optimization in One Dimension
2. Newton's Method
3. Quasi-Newton Method
4. Nelder Mead Simplex Method

C. Theory of MLE
1. Consistency
2. Asymptotic Normality
3. Asymptotic Efficiency

D. Monte Carlo Simulation , the Delta Method, and the Bootstrap
1. Monte Carlo Simulation
2. The Delta Method
3. The Bootstrap

E. More on Logit and Probit
1. Interaction Terms in the Logit Model
2. Probit

F. Simulation Based Estimation
1. Simulated Maximum Likelihood
2. Simulated Method of Moments

G. Discrete Choice Models
1. Multinomial Logit
2. Conditional Logit
3. Multinomial Probit

H. Count Models
1. Poisson Regression
2. Negative Binomial Regression

I. Duration Models
1. Discrete vs. Continuous Durations
2. Parametric Models
3. Cox Proportional Hazard Models

J. Censoring, Truncation, and Selection
1. Tobit

2. Heckman Selection Models

K. Non-nested Model Testing

L. Missing Data and Multiple Imputation

M. Nonlinear Panel Data
1. The Bias in Nonlinear Fixed Effects Estimation
2. Conditional Fixed Effects Logit

N. Endogeneity and IV in Nonlinear Models

O. Nonlinear Time Series

P. Bayesian Estimation

Q. Principal Components and Factor Analysis

R. Nonparametrics and Casual Inference
1. Kernel Density Estimation
2. Kernel Smoothing
3. Regression Discontinuity
4. Matching