ICPSR Summer Program: Spatial Econometrics (July 9-13 July 2018)

Instructor: Robert (Rob) J. Franzese, Jr. (franzese@umich.edu; www.umich.edu/~franzese)

Description & Objectives: Spatial interdependence is ubiquitous across the social sciences, & beyond. For examples: The likelihood and outcomes of demonstrations, riots, coups, & revolutions in one country almost certainly depend in substantively crucial ways on such occurrences in other countries (e.g., through demonstration effects or snowballing). In public health, public policy, and public administration, the policies and strategies adopted, and their efficacy, in one jurisdiction depend critically on those in neighboring, competing, or otherwise related jurisdictions. In democratic competition, election outcomes and candidate qualities or strategies in some contests surely depend on those in others, and representatives’ votes in legislatures certainly depend on others’ votes or expected votes. In international relations, states’ entry decisions in wars, alliances, and organizations, e.g., heavily depend on how many and who else enters & how. In comparative & international political economy, globalization, i.e., international economic integration, implies strategic (& non-strategic) interdependence in economic policymaking. In individual micro-behavioral research across the social and health sciences, long-standing and recently surging interest in contextual or network effects often refers to effects on each individual’s behavior or opinion from sets of other individuals’ opinions or behaviors; e.g., a respondent’s opinion or behavior likely depends on those of her state, district, community, or social group. Such interdependence is obviously a central focus of epidemiology and of some parts of geography, and in analogous ways in many other disciplines such as in criminology as well as urban, regional, real-estate, & natural-resource economics.

This course introduces spatial and spatiotemporal econometric models for continuous and limited dependent variables that directly incorporate such interdependence, with an emphasis on applications in the social sciences and related disciplines. Space, in many of these analyses, is more than geography; it refers to any substantive dimension on which observational units may be “proximate” and so potentially influential (friendship relations, for instance). The main objective is to demonstrate how to incorporate the interdependence implied by most social-scientific theories into empirical analyses. Students will learn inter alia 1) to diagnose spatial patterns in their data, 2) to estimate the structural parameters of spatial and spatiotemporal regression models, 3) to calculate and present spatial and spatiotemporal effects, 4) to use spatial modeling and testing to discriminate between the multiple sources of spatial correlation—common exposure, interdependence, and selection—and to distinguish and estimate the relative strengths of the behavioral sources of the interdependence (strategic responses, free-riding, learning, coercion, etc.) among units.

Daily Schedule: Our typical day will begin with a morning session starting around 9:30am. We will break for lunch around 11:30am, resuming with our afternoon session around 1pm. We will take a 15-to-30-minute break around 2:45-3:00pm, and resume for lab from around 3:00 or 3:15 to around 4:30 or 4:45.

Prerequisites & Background: Students should have understandings of basic matrix algebra, calculus, probability, statistics, and regression analysis at levels commensurate with successful completion of a second semester in graduate empirical methods in the social sciences, as well as some familiarity with a software package that can be used for spatial analysis (e.g., Stata, R, or MatLab for instance). Course materials will generally be provided in R and Stata.

Course Materials: We do not use a textbook, but Anselin (2006), Anselin et.al. (2013), and Franzese & Hays (2008) provide overview most topics covered. Ward & Gleditsch (2008) provides good introductory textbook overview; fuller, intermediate-to-advanced textbooks include LeSage & Pace (2009), with a Bayesian focus, Bivand et al. (2013), with a geospatial-statistics focus, or Elhorst (2013), with a spatiotemporal focus. The foundational classic is Anselin (1988). The course may work with draft edition of Franzese, Hays, and Cook, Empirical Analysis of Spatial Interdependence.

Course Outline with Readings and Lab Plans

Session 1 (Monday, July 9th, Morning):
Introductory Stuff, Theoretical and Empirical Models of “Spatial” Interdependence


Session 2 (Monday, July 9th, Afternoon):
First: Math, Stats, Regression+ML, HypothTest & 3 intuitions;
Break;
Diagnosing Spatial Association in Raw Data and/or in OLS Residuals


********** Lab 1 Exercises: Intro Spatial Analysis & Software; Measures & Diagnostics**********

Session 3 (Tuesday, July 10th, Morning):
Spatial & Spatiotemporal Regression Models I: Setting up Spatial Autoregressive Models


Session 4 (Tuesday, July 10th, Afternoon):
Spatial & Spatiotemporal Regression Models II: Estimating Spatial Autoregressive-Lag Models


**********Lab 2 Exercises: SAR & STAR Models**********
Session 5 (Wednesday, July 11th, Morning):
Spatial & Spatiotemporal Regression Models III: Estimation & Interpretation


Session 6 (Wednesday, July 11th, Afternoon):
Spatial & Spatiotemporal Regression Models IV: Calculating & Presenting Spatial/Spatiotemporal Effects


**********Lab 3 Exercises: More SAR & STAR Models**********

[We will vote on the order in which the class prefers to cover the remaining topics – Spatial QualDep Models: Spatial Probit; Spatial QualDep Models: Duration & Count; Spatial Systems-of-Equations Models; and Multiparametric, Conditional, & Endogenous Interdependence Models. The syllabus shows the 2017 schedule.]

Session 7 (Thursday, July 12th, Morning): Limited & Qualitative DepVars I: Spatial-Probit Model


Session 8a (Thursday, July 12th, Afternoon): Continue: Spatial QualDep I: Spatial-Probit Model.


**********Lab 4 Exercises: Spatial Probit**********
Session 8b (Thu., 13th, Afternoon: Cont.): S-QualDep II: S-Duration & S-Simultaneous-Equations Models


Session 9a (Friday, July 13th, Morning): Spatial QualDep III: Spatial-Count Models.


**********Lab 5 Exercises: Spatial-Duration & Count **********

Session 9b-10 (Friday, July 14th, Morning-Afternoon):
Multiparametric and Context-Conditional Spatial-Lag Models, plus Network-Behavior Coevolution


**********Lab 6 Exercises: m-STAR Model**********