ECON 192b
Spatial Analysis and Econometrics
Spring 2020

Course Meeting Times: M 5:00 p.m. – 8:00 p.m.

Office Hours: Sachar International Center TBD
M 12:00 – 1:00 and 4:00 – 5:00 or by appointment

Course Overview: This course will enable students to understand and visually represent spatially referenced data, develop econometric applications for the study of spatial data, and understand how these techniques can help them answer questions about topics in economics that have a spatial component. Through lectures, group work, and hands-on assignments, the class will enable students to explain the conditions under which the use of spatial econometric techniques are appropriate, their limitations, and demonstrate how to apply spatial econometric methods to data. These applications will enable students to use spatial analysis tools (QGIS and GeoDa) and spatial econometric tools in R effectively.

Prerequisites: Economics 184b or an equivalent course in statistics must be completed before enrolling in Economics 192b. In addition, it is strongly suggested that students have completed, or be taking concurrently, Economics 80a.

Course Learning Goals: After successfully completing this course, students will be able to:
• Undertake data investigation and analysis of spatial data, and visually represent that data.
• Understand the theoretical underpinnings of spatial econometrics.
• Apply spatial econometric models to data and draw conclusions from results.
• Appreciate how spatial econometric models have been taken to empirical data in the literature.


Software: QGIS: Free GIS Software
R: The Free/Open Source Data Analysis Language
RStudio: Fancy Environment for R (Choose the Free Version)
GeoDa
Course Requirements: Success in this four-credit course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.). Grading in the course will be distributed as follows:

1. **Mini-Projects (60% of grade)** – There will be six (6) linked mini-projects over the course of the semester. A selection of data will be provided for these assignments. It is suggested that you use the same dataset for all six mini-projects. You are required to turn in all exercises. It is expected that you will work on these exercises in a study group, all data choices must be your own and each student must turn in their own work. **Assignments will be due in .pdf format at 11:59 am on the dates given in the syllabus and will be discussed in class. NO late assignments will be accepted unless preapproved 24 hours in advance.**

2. **Final Project (20%)** – A cumulative final project drawing on earlier mini-projects will be due during the final exam period. This project will allow you to incorporate feedback from the mini-projects to present a systematic analysis of a spatially referenced dataset.

3. **In-Class Discussion (20%)** – A significant portion of each class will involve discussion of the assigned readings and applications to data; student attendance and participation is expected.

Accessibility: Brandeis seeks to welcome and include all students. If you are a student who needs accommodations as outlined in an accommodations letter, please talk with me and present your letter of accommodation as soon as you can. I will support you. In order to provide test accommodations, I need the letter more than 48 hours in advance. I will endeavor to provide your accommodations, but cannot do so retroactively. If you have questions about documenting a disability or requesting accommodations, please contact Student Accessibility Support at 781-736-3470 or access@brandeis.edu.

Academic Integrity: You are expected to be honest in all of your academic work. Please consult Brandeis University Rights and Responsibilities for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the director of academic integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found on the university library website.

Communication: You are expected to regularly check for updates to the syllabus on Latte. In the case of University-wide closures (i.e. Snow Days) class will be held via Zoom. These classes will be recorded and made available on Latte. You are responsible for all material covered in this manner.
Course Plan

Visualizing Spatial Data

January 13  Course Overview and Introduction to Visualizing Data in QGIS

January 20  No Class

January 27  Introduction to Visualizing Data in QGIS (Cont.)
    Chi and Zhu 1.1 – 1.4

Exploring Spatial Data

February 3  Intro to Spatial Weights and GeoDa
    Chi and Zhu 2.1 – 2.2

    DUE: Mini-Project 1 (Visualization)

February 10  Exploratory Data Analysis with Applications in GeoDa
    Chi and Zhu 2.3 – 2.4

February 17  No Class

February 24  Linear Regression and Diagnostics for Spatial Dependence
    Chi and Zhu 3.1

    DUE: Mini-Project 2 (Exploratory Analysis)

Spatial Econometrics

March 2  Uses and Abuses of Spatial Econometrics
March 9  Spatial Lag Models
        Chi and Zhu 3.2

    **DUE: Mini-Project 3 (Diagnostics)**

March 16  Spatial Error Models
        Chi and Zhu 3.3

March 23  Spatial Durbin Model
        Chi and Zhu 4.1

    **DUE: Mini-Project 4 (Lag and Error)**

March 30  Lagged X and Other Spatial Models
        Chi and Zhu 4.2 – 4.3

April 6   Geographically Weighted Regression
        Chi and Zhu 5.3

    **DUE: Mini-Project 5 (Spatial Durbin and Lagged X)**

April 13  No Class

April 20  Practical Considerations for Spatial Data Analysis
        Chi and Zhu 8.1 – 8.2

    **DUE: Mini-Project 4 (Geographically Weighted Regression)**

April 27  Final Project Discussion and Review