Econ. 895 Spatial Techniques in Empirical Economics
George Mason University, Fall 2021
Thurs. 10:30 am - 1:10 pm

Instructor: Noel D. Johnson

Email: njohnsoL@gmu.edu

Office Location: Carow 8

Office Hours: TBA. Will be held on Zoom initially.

Course Webpage: Blackboard

Course Description

This Course serves as an introduction to the use of spatial data in applied economic settings. Those taking the course will learn how to use R and QGIS to create and analyze spatial data. We will also read a selection of articles which use spatial data from the Urban, Growth, Trade, Economic History, and Development fields. The ultimate goal of the course is get students going on empirical research projects that will contribute to their dissertations and eventually be published.

Week 1	Introduction
Week 2	Vector Data, Distance, and IV's
Week 3	Buffers and Regression Discontinuity
Week 4	Rasters and D-in-D
Week 5	Geocoding and QGIS
Week 6	Cities
Week 7	Climate Data and Spatial Interpolation
Week 8	Lights at Night
Week 9	Network Access and Market Access
Week 10	Standard Errors in Space

Week 11 Catch-up and Review

Week 12 Student Research Paper Presentations

Week 13 Student Research Paper Presentations

Week 14 Student Research Paper Presentations

Course Requirements

Eighty percent of success is showing up – Woody Allen

- Research paper worth 50% of your final grade.
- Research paper presentation worth 30% of your final grade.
- Attending class and participating in discussions is worth 10% of your final grade.
- Coding Exercises are worth 10% of your final grade.

Papers

The paper should attempt to test a specific hypothesis using one or more of the empirical tools we discuss in class. The final work should be about 15-20 pages in length, double-spaced in Times Roman 12 pt. font.

I am requiring you to write the paper in LaTeX. This is the standard among most researchers in economics today and you might as well learn it now rather than later. You should be able to find many, many, tutorials online for getting started, but here are some I have used:

http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/

Here is another one...

https://www.tug.org/begin.html

And one more...

https://www.researchgate.net/publication/280050294_Template-based_introductory_guide_to_LaTeX_for_Economics_Instructional_Guide_Version_2

Presentations

Thirty percent of your course grade is determined by your paper presentation.

I encourage the use of slides for your presentation, but try not to over-do it. If you have questions on what is over-doing it, please refer to this book:

Tufte, E. (1983). *The visual display of quantitative information.* Graphics Press

I will grade your presentations on "content" (how well you have framed and answered your research question) and "style" (how well you present the material).

Since you're writing the paper in LaTeX, you should probably also make your presentation slides using the LaTeXpresentation environment known as Beamer. Here are some sample slides:

https://www.dropbox.com/sh/hnccpxpzmqjn55d/AACvkPZ25DxR5hhGrURXR91Ea?dl=0

Coding Exercises

This semester I will be distributing three coding exercises that you will complete for 10% of your grade. Each will consist of a series of tasks that you will need to accomplish in R by writing code, usually using a data set that I provide. You will be required to submit to me via email your executable code. That is, I should be able to cut and paste your code in to R Studio and it should run without throwing up any errors. This means you will have to load in the necessary packages etc. . . in the preamble to the code. We will discuss how to do this in class.

The Toolkit for Geospatial Research and Recommended Texts

We will almost exclusively focus on using R as a **GIS** for **reproducible** spatial computations. This allows us to use a **general purpose programming language** to directly work with spatial data in a powerful statistics environment. We will use QGIS only when we want to digitize our own maps. R has many geospatial packages. For **vector data**, we will be using the new simple features paradigm from the sf package. For **raster data**, we will be using the raster package. In addition to lecture notes and code examples, selected chapters from these books will guide you through both parts:

- (new sf-paradigm) Lovelace, R., Nowosad, J., and J. Muenchow. 2018. Geocomputation with R. CRC Press. **Available online**.
- (for R in general) Grolemund, G. and H. Wickham. 2018. R for Data Science. O'Reilly. **Available online**.
- (for R in general) Matloff, Norman. 2011. The Art of R Programming. No Starch Press. **Available online**
- (useful QGIS reference) Menke, K., R. Smith Jr., Pirelli, L., and J. V. Hoesen. 2016. Mastering QGIS. Packt Publishing Ltd.
- (useful intro to basic R and econometrics using R) Nick Huntington-Klein's videos at: http://nickchk.com/videos.html#rstats

Most of the readings we will discuss can be downloaded from either JSTOR, the NBER Working Papers archive, EconLit, or the course webpage. You are required to acquire these papers and read them before the week they are listed on the syllabus.

Most of the articles require knowledge of econometric techniques. I will attempt to explain the methods used when they come up, however, you may wish to have a more detailed treatment of the methods at your disposal. An excellent source for the basics (plus some more advanced material) is:

- Joshua Angrist and Jorn-Steffen Pischke, Mastering Metrics: The Path from Cause to Effect. (Princeton University Press, 2014).

Two more recent books are:

- Cunningham, S. (2020). *Causal Inference: The Mixtape.*
- Huntington-Kline, N. (2021). *The Effect: An Introduction to Research Design and Causality.*

I have also been enjoying this book recently as a guide to integrating theory with empirical design:

- Ashworth, S., Berry, C.R. and de Mesquita, E.B., (2021). *Theory and Credibility: Integrating Theoretical and Empirical Social Science.* Princeton University Press.

If you plan on using stata to do some econometrics and you want a thorough conceptual guide to that, check out Shapiro's and Gentzkow's guide to 'Code and Data' which I have placed in the readings on the course webpage.

Some good resources on on how to write an academic paper are:

- McCloskey, D. (2000). *Economical Writing.* Waveland Press, Incorporated
- Cochrane Writing Tips PhD Students (in the course readings folder)
- Harvard Sophomore Writing Economics (in the course readings folder)

I also highly recommend this book:

- William Thomson, A Guide for the Young Economist. (MIT Press: 2011).

Copyright Notice

Please do not share the material from this course widely. Much of the content of the lecture slides in the this course were created by Richard Bluhm (Leibniz University) and used with his permission. He, in turn, has the following copyright notice attached to his course materials:

> Many sources are not yet properly attributed on the lecture slides, so please to not share these materials widely. I owe a great debt to those who have developed GIS classes for economics audiences before: Masayuki Kudamatsu's IIES course for ArcGIS has been an inspiration to many classes including this one, but I have also used materials from a class Stelios Michalopoulos gave in UWarwick many years ago and a class previously taught Paul Raschky at U. St. Gallen.

Some Important Dates

First Day of Classes: **8/26**

Thanksgiving Recess: **11/24–11/28**

Last Day of Classes: **12/2**

PLEASE NOTE: COURSE POLICIES

1. George Mason University Honor System and Code

Honor Code

George Mason University has an Honor Code, which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited.

All violations of the Honor Code will be reported to the Honor Committee.

Plagiarism (statements from Mason Web Site)

Plagiarism means using the exact words, opinions, or factual information from another person without giving that person credit.

http://mason.gmu.edu/ montecin/plagiarism.htm#plagiarism

Please familiarize yourself with the Honor System and Code, as stated in the George Mason University Undergraduate Catalog. When you are given an assignment as an individual, the work must be your own. Some of your work may be collaborative; source material for group projects and work of individual group members must be carefully documented for individual contributions.

http://mason.gmu.edu/ montecin/plagiarism.htm

2. Class Registration

Students are responsible for verifying the accuracy of their own schedules. Students need to check PatriotWeb regularly to verify that they are registered for the classes that they think they are. This is particularly important since students are no longer dropped for nonpayment.

Faculty may not allow a student who is not registered to continue to attend class and may not grade the work of students who do not appear on the official class roster.

Deadlines each semester are published in the Schedule of Classes available from the Registrar's Web Site registrar.gmu.edu

After the last day to drop a class, withdrawing from this class requires the approval of the dean and is only allowed for nonacademic reasons.

Undergraduate students may choose to exercise a selective withdrawal. See the Schedule of Classes for selective withdrawal procedures.

3. Accommodations for students with disabilities:

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703-993-2474. All academic accommodations must be arranged through that office.

The need for accommodations should be identified at the beginning of the semester and the specific accommodation has to be arranged through the Office of Disability Resources. Faculty cannot provide accommodations to students on their own (e.g. allowing a student extra time to complete an exam because the student reports having a disability).

4. Safe Return to Campus Statement (for students in courses with on-campus meetings)

All students taking courses with a face-to-face component are required to take Safe Return to Campus Training prior to visiting campus. Training is available in Blackboard (https://mymason.gmu.edu). Students are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (www2.gmu.edu/safe-return-plan). Similarly, all students in face to face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system and students will receive either a Green, Yellow, or Red email response. Only students who receive a "green" notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

4. Campus Closure

If the campus closes or class is canceled due to weather or other concern, students should check the class webpage and monitor their email for updates on how to continue learning and information about any changes to events or assignments.

Course Outline

Week 1: Introduction

- Introduction
- (1) David Weil's Peptalk (in Readings Folder)
- (2) Donaldson, D. and Storeygard, A. (2016). The view from above: Applications of satellite data in economics. *Journal of Economic Perspectives*, 30(4):171–98
- (3) Michalopoulos, S. and Papaioannou, E. (2018). Spatial patterns of development: A meso approach. *Annual Review of Economics*, 10:383–410
- Work through the videos on "Introduction to R for Economists" and "Basic R Videos" at http://nickchk.com/videos.html#rstats

Week 2: Vector Data, Distance, and IV's

- (4) Dittmar, J. E. (2011). Information technology and economic change: the impact of the printing press. *The Quarterly Journal of Economics*, 126(3):1133–1172
- Lovelace et al. 2018, Chapters 2.1, 2.2, 2.4, 2.5
- Coding Exercise 1 Distributed

Week 3: Buffers and Regression Discontinuity

- (5) Dell, M. (2010). The persistent effects of peru's mining mita. *Econometrica*, 78(6):1863–1903
- Lovelace et al. 2018, Chapters 3.2, 4.2, 5.2
- Coding Exercise 2 Distributed

Week 4: Rasters and D-in-D

- (6) Nunn, N. and Qian, N. (2011). The potato's contribution to population and urbanization: Evidence from a historical experiment. *The Quarterly Journal of Economics*, 126(2):593–650
- Lovelace et al. 2018, Chapters 3.3, 4.3, 5.3, 5.4
- Coding Exercise 1 Collected
- Coding Exercise 3 Distributed

Week 5: Geocoding and QGIS

- Menke 2016, chapter 6
- Coding Exercise 2 Collected

Week 6: Cities

- (7) Davis, D. R. and Weinstein, D. E. (2002). Bones, Bombs, and Break Points: The Geography of Economic Activity. *American Economic Review*, 92(5):1269–1289.
- (8) Bleakley, H. and Lin, J. (2012). Portage and path dependence. *The quarterly journal of economics*, 127(2):587–644
- (9) Hornbeck, R. and Keniston, D. (2017). Creative destruction: Barriers to urban growth and the great boston fire of 1872. *American Economic Review*, 107(6):1365–98
- Coding Exercise 3 Collected

Week 7: Climate Data and Spatial Interpolation

- (10) Anderson, R. W., Johnson, N. D., and Koyama, M. (2017). Jewish persecutions and weather shocks: 1100–1800. *The Economic Journal*, 127(602):924–958
- These two tutorials on spatial interpolation are useful:
  - https://mgimond.github.io/Spatial/interpolation-in-r.html
  - https://rspatial.org/analysis/4-interpolation.html

Week 8: Lights at Night

- (11) Michalopoulos, S. and Papaioannou, E. (2013). Pre-colonial ethnic institutions and contemporary african development. *Econometrica*, 81(1):113–152
- (12) Alesina, A., Michalopoulos, S., and Papaioannou, E. (2016). Ethnic inequality. *Journal of Political Economy*, 124(2):428–488

Week 9: Network Access and Market Access

- (13) Donaldson, D. and Hornbeck, R. (2016). Railroads and american economic growth: A "market access" approach. *The Quarterly Journal of Economics*, 131(2):799–858
- (14) Johnson, N. D. and Koyama, M. (2017). Jewish communities and city growth in preindustrial europe. *Journal of Development Economics*, 127:339–354

Week 10: Standard Errors in Space

- (15) Kelly, M. (2019). The standard errors of persistence

- (16) Colella, F., Lalive, R., Sakalli, S. O., and Thoenig, M. (2019). Inference with arbitrary clustering

Week 11: Catch-up and Review

Week 12: Student Research Paper Presentations

Week 13: Student Research Paper Presentations

Week 14: Student Research Paper Presentations

References

Alesina, A., Michalopoulos, S., and Papaioannou, E. (2016). Ethnic inequality. *Journal of Political Economy*, 124(2):428–488.

Anderson, R. W., Johnson, N. D., and Koyama, M. (2017). Jewish persecutions and weather shocks: 1100–1800. *The Economic Journal*, 127(602):924–958.

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Donaldson, D. and Hornbeck, R. (2016). Railroads and american economic growth: A "market access" approach. *The Quarterly Journal of Economics*, 131(2):799–858.

Donaldson, D. and Storeygard, A. (2016). The view from above: Applications of satellite data in economics. *Journal of Economic Perspectives*, 30(4):171–98.

Hornbeck, R. and Keniston, D. (2017). Creative destruction: Barriers to urban growth and the great boston fire of 1872. *American Economic Review*, 107(6):1365–98.

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Nunn, N. and Qian, N. (2011). The potato's contribution to population and urbanization: Evidence from a historical experiment. *The Quarterly Journal of Economics*, 126(2):593–650.

Tufte, E. (1983). *The visual display of quantitative information*. Graphics Press.