

Applied Econometrics Using GIS Techniques

Summer Term 2024

Prof. Dr. Erkan Gören
Carl von Ossietzky University Oldenburg
Institute of Economics
26111 Oldenburg

E-mail: erkan.goeren@uni-oldenburg.de
Phone: +49-441-798-4292
Room: A5-0-006
Office Hours: Wednesday, 16:00-17:00
During the semester break: appointment by e-mail

Course Information:

Lecture: Wednesday, 14:00 - 16:00, A05 1-161, CIP Room

Exercise: Thursday, 14:00 - 16:00, A05 1-161, CIP Room

Start: 3rd of April 2024; End: 4th of July 2024

Course Description:

The use of geographic information systems (GIS) has become increasingly popular among economists. The broad term GIS encompasses a set of tools (both software and hardware) to collect, store, visualize and analyze spatial data from the real world. GIS techniques allow economists to use data on geography and weather as sources of exogenous variation for estimating the causal impact of a wide range of treatments (e.g., infrastructure, mass media, slave trade, land suitability for agriculture, and terrain ruggedness). Satellite images from the earth's surface, which can be analyzed with geo-processing tools in GIS, allow economists to construct geo-spatial indicators (e.g., temporal changes in the intensity of night-time light and patterns of deforestation) that more closely reflect the local actors and underlying mechanisms of interest. Scanned old maps can be used in GIS to identify the location of ethnic groups for estimating the causal impact of geographic partitioning of ethnic homelands during colonization on local conflict patterns in Africa. The increasing availability of disaggregated, high-resolution spatial data for the earth's surface permits the construction of geospatial indicators of any kind and at arbitrary smaller units of analysis. This capability of GIS has opened new pieces of economics research that had previously escaped the researcher's attention but can now be conducted.

For this course, we will be using ArcGIS Desktop 10 produced by ESRI, the most common software tool used to analyze geospatial data. This course provides an introduction to some fundamental geo-processing operations using ArcGIS that are most relevant for economics research. It discusses the GIS programming tools available in ArcGIS and provides state-of-the-art applications based on various pieces of empirical economics research. A non-exhaustive list of geo-processing tools using ArcGIS

includes performing mathematical functions on spatial data, the calculation of geographic distances between various forms of spatial units, aggregating geospatial data within polygons, and drawing maps. A core concept when working with geospatial data is map projection and geographic coordinate systems. The reason is that all spatial maps introduce some kind of geographic distortions when projecting the earth's 3-dimensional sphere to a plain 2-dimensional map. Thus, a basic understanding of map projections and coordinate systems is essential for assessing the kind of distortions acting on the specific properties of the sphere (e.g., area, distance, and shape). In addition, this course provides an introduction to programming in Python for the purpose of automation and replication of geo-processed spatial datasets.

Course Structure:

The lecture will be accompanied by a computer lab that enables students to gain practical experience with the implementation of geo-processing tools using ArcGIS. During the lab, we will replicate spatial datasets for some of the actual pieces of economics research. In this way, students will be able to apply GIS tools to new spatial datasets. More importantly, students will be able to acquire the necessary data management skills to export spatial data in a suitable file format that can be directly imported into standard econometric software packages such as R.

Course Evaluation:

The final grade consists of two parts. First, students have to write a research report based on a scientific peer-reviewed research article in the field of economics that employs GIS techniques. In the research report, students have to demonstrate their ability to apply their GIS knowledge and explain key issues regarding the replication of the main findings of the research article of their choice. The report should be written in the form of a draft paper of maximum 20 pages (including, references, tables, etc.). Final drafts are due at the end of the Summer Semester – the exact date will be communicated during the course.

Second, students are required to critically assess the motivation, findings, and contribution of the selected research paper, with special emphasis on how the data is constructed and the relative strength and limitations of the research approach. The oral presentations should last about 25 minutes and should be accompanied by slides. Each presentation is followed by a discussion of up to 15 minutes. All students have to upload their slides prior to the start of the oral presentations.

References

- [1] **Harder, Christian, and Brown, Clint (2016)**. The ArcGIS Imagery Book: New View. New Vision. First Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [2] **Harder, Christian, and Brown, Clint (2017)**. The ArcGIS Book: 10 Big Ideas about Applying The Science of Where. Second Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [3] **Heywood, Ian, Cornelius, Sarah, and Carver, Steve (2011)**. An Introduction to Geographical Information Systems. Fourth Edition, Pearson Education Limited, Harlow, England.
- [4] **Keranan, Kathryn, and Malone, Lyn (2017)**. Instructional Guide for The ArcGIS Imagery Book. First Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [5] **Keranan, Kathryn, and Malone, Lyn (2018)**. Instructional Guide for The ArcGIS Book. Second Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [6] **Law, Michael, and Collins, Amy (2018)**. Getting to Know ArcGIS Desktop. Fifth Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [7] **Zandbergen, Paul A. (2013)**. Python Scripting for ArcGIS. First Edition, Esri Press, 380 New York Street, Redlands, California, United States of America.
- [8] **Wickham, Hadley, and Grolemund, Garrett (2017)**. R for Data Science. First Edition, O'Reilly, 1005 Gravenstein Highway North, Sebastopol, California, United States of America.
- [9] **Wooldridge, Jeffrey M. (2019)**. Introductory Econometrics: A Modern Approach. Seventh Edition, South-Western Educational Publishing.
- [10] *Additional documents, including lecture slides, literature, data, etc. will be made available on Stud.IP.*