Syllabus

Geospatial Analysis in Economics with R

(Ökonomische Analyse von Geodaten mit R)

Winter semester 2024/2025

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Laura Wedemeyer, M.Sc.

Tel.: +49 (0)551 39-28317

Email: laura.wedemeyer@uni-goettingen.de

Office: Oeconomicum room 2.207

Office hours: by appointment

Felix Turbanisch, M.A.

Tel.: 0551-39-28315

Email: felix.turbanisch@uni-goettingen.de

Office: Oeconomicum room 2.209

Office hours: by appointment

1. General Information

1.1 Course content

This course introduces tools for the analysis of geospatial data in economics using the programming language R. It builds on the foundations laid by the course *Introduction to Economic Analysis with R* offered in the summer semester and online. It is directed at students at Bachelor, Master, and PhD level.

1.2 Course goals

The goals of this course are threefold. First, students will acquire the tools to read in and manipulate geospatial data in R as well as to generate output in the form of maps or features for use in empirical analysis. Second, the course will enable students to "think spatially," i.e., to come up with their own research questions and ways to answer them using geospatial data. Third, students will learn about the

theory of representing geospatial data, for example with respect to coordinate reference systems, vector, and raster formats.

To achieve these goals, the course is designed to be highly interactive and with a focus on learning by doing. Equipped with both the tools and sound background knowledge, students will be ready to use geospatial data in their own empirical research and critically review existing research.

1.3 Prerequisites

Students should be familiar with basic econometrics and have a working knowledge of R that corresponds to the course contents of *Introduction to Economic Analysis with R* (offered in the summer semester and [online](#)) or *R for Data Science* (available [online](#)).

1.4 Credit points

This course is an additional offer; no credit points can be earned.

1.5 Registration

Please register via [Stud.IP](#) between **23 October 2024, 10:00** and **9 January 2025, 23:59**. The number of participants is restricted to 30. Students will be admitted on a first-come-first-serve basis. In addition, there will be a waiting list.

2. Course overview

2.1 Description of the teaching and learning methods

The course takes place each Friday from January 10 to January 31, 2025. The course language is English. Each topic consists of small chunks of instruction (in the form of live demos, written explanations, and code fragments) and is followed by hands-on exercises and a discussion of solutions.

2.2 Meetings

Please bring your computers since we will not have access to a computer lab. Please also make sure to have R and R Studio installed on your machine. Instructions and downloads can be found [here](#).

Session 1 (Friday, 10 January 2025, 10:00–17:00; room see EXA)

- Introduction: applications of geospatial data in economic analysis
    - Data sources
    - Coordinate reference systems
- Vector data

Session 2 (Friday, 17 January 2025, 10:00–17:00; room see EXA)

- Vector manipulation
  - o Topological relations and operations
  - o Spatial subsetting and joins
  - o Buffers, centroids, and grids

Session 3 (Friday, 24 January 2025, 10:00–17:00; room see EXA)

- Remote-sensing basics
- Raster data and manipulation
  - o File formats and raster object properties
  - o Subsetting, aggregating
  - o Map algebra
- Raster and vector interaction
  - o Extracting and feature generation
  - o Vectorization and rasterization

Session 4 (Friday, 31 February 2025, 10:00–17:00; room see EXA)

- Map-making
- Geocoding
- Geospatial data in economic research
  - o Identification mechanisms
  - o Replication exercises

2.3 Examination and grading of the module

None.

2.4 Course materials

We are not really following any textbook, but this comes closest to explaining much of what is covered in the course:

- Lovelace, Robin, Jakub Nowosad, and Jannes Muenchow. 2019. *Geocomputation with R*. CRC Press. Available at https://r.geocompx.org/.

To brush up on R basics:

- Schmidt, Sebastian S., and Felix Turbanisch. 2022. *Economic Analysis with R*. Available at http://economic-analysis-with-r.uni-goettingen.de/.

- Wickham, Hadley, Mine Çetinkaya-Rundel, and Garrett Grolemund. 2023. *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. 2nd edition. Sebastopol, CA: O'Reilly Media. Available at https://r4ds.hadley.nz/.

All lecture materials will be published on Stud.IP.