

## Syllabus

# Geospatial Analysis in Economics with R

(Ökonomische Analyse von Geodaten mit R)

Winter semester 2023/2024

(as of October 19, 2023)

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## 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 2023, 10:00** and **11 January 2024, 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 12 to February 2, 2024. 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 the discussion of solutions.

### *2.2 Meetings*

Please bring your own 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, 12 January 2024, 10:00–17:00; room see [EXA](#))

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

**Session 2** (Friday, 19 January 2024, 10:00–17:00; room see [EXA](#))

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

**Session 3** (Friday, 26 January 2024, 10:00–17:00; room see [EXA](#))

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

**Session 4** (Friday, 2 February 2024, 10:00–17:00; room see [EXA](#))

- Map-making
- Geocoding
- Geospatial data in economic research
  - Identification mechanisms
  - 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.