Syllabus

Geospatial Analysis in Development Economics

M.WIWI-VWL.0025 & M.WIWI-VWL.0185

Master seminar

Winter semester 2025 / 2026

(as of April 29, 2025)

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1. General information

1.1 Course content

In development economics, the spatial dimension of economic activity plays a crucial role in understanding patterns of growth, inequality, and policy impact. For instance, from the distribution of infrastructure and access to services, to the spatial clustering of poverty or conflict, geographic data offers a powerful lens for analyzing economic development. Advances in geospatial data collection — from satellite imagery to high-resolution administrative maps — combined with growing computational capacity have made it possible to conduct spatial analyses at unprecedented levels of detail. This seminar introduces students to the core concepts, tools, and techniques of geospatial analysis, with a focus on applications in development economics. After introductory sessions on the fundamentals of **QGIS**, we cover the basics of geospatial data, including different data types (vector and raster), spatial projections, and coordinate systems. Students will learn how to read, manipulate, and visualize spatial data, perform spatial joins and aggregations, and work with both vector and raster datasets. We will also cover techniques for geocoding and integrating spatial and non-spatial data — key skills for linking economic and geographic information. Throughout the course, we will explore applied examples, showing how spatial analysis can be used to study topics in development research. The seminar combines hands-on technical training with discussions of research applications, equipping students to incorporate geospatial analysis into their own research projects.

1.2 Course goals

Students learn what geospatial data is, get to know some examples of its use in economic research, and how to process and analyze spatial data for their own research. They will gain an understanding of different types of geospatial data, including vector and raster data, as well as key concepts such as projections, coordinate systems, and spatial relationships. The students then learn how to implement basic geospatial data analysis using **R** and **QGIS**, including geocoding, spatial joins, and raster manipulation. Finally, they will apply these skills to a research question of their choice, integrating spatial data with economic analysis, and presenting their findings to an academic audience.

1.3 Prerequisites

Students should be familiar with mathematical statistics, basic econometrics, development economics and R. As a refresher, the Chair offers a self-study module for R.

1.4 Credit points

6 ECTS-LP.

1.5 Registration

The sign-up for this seminar is centralized. You can sign up until **October 15** via this form: https://survey.academiccloud.de/index.php/325583?lang=en.

Seminar slots will be allocated according to preferences and contested slots will be allocated in a lottery. In case of any questions about the process, please contact counseling-devecon@uni-goettingen.de. You will be informed about the result in the week prior to the semester start. In case you have not obtained a slot, you may attend the introductory meeting. In case a student drops out, you can take the slot.

If you have been allocated a slot and want to take the seminar, you need to register for the examination via FlexNow until **November 6**. The attendance at the introductory meeting is compulsory for registration. The number of participants is restricted to 12.

2. Course overview

2.1 Description of the teaching and learning methods

Students must demonstrate an understanding of geospatial data and its application for economic research. By manipulating and analyzing geospatial data during the seminar sessions and as part of their term paper, students demonstrate their ability to apply geospatial data analysis concepts and econometric methods using state-of-the-art statistical software packages. They further demonstrate their ability to identify which areas of research might benefit from the use of geospatial data, which they critically reflect on in a term paper. By presenting the term paper, they show their ability to concisely present complex empirical concepts. **The course language is English.**

2.2 Meetings

Introductory meeting: Thursday, October 30, 2025, 13:00–14:00 c.t. (seminar room: see eCampus/EXA)

- Course outline

Session 1: Introduction to geospatial analysis: Thursday, November 13, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- QGIS basics
- Survey of geospatial research in economics
- What is geospatial analysis? What is remote sensing?
- Survey of geospatial data types
- Datums, projections and distances

Session 2: Vector data – Thursday, November 20, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- Projections and spatial references
- Points, lines, polygons, and grids
- Reading and writing vector data
- Making maps of vector data
- Finding and accessing online vector data

Session 3: Manipulating vector data – Thursday, November 27, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- Making points, lines and polygons
- Topology and topological relations
- Geometric operations and buffers

- Spatial joins and aggregation

Session 4: Raster data – Thursday, December 4, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- Raster data types and resolutions
- Reading and writing raster data
- Cropping, masking and resampling
- Extracting, aggregating and dis-aggregating
- Finding and accessing online raster data

Session 5: Geocoding – Thursday, December 11, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- Geocoding data
- Combining spatial and non-spatial data

Session 6: Misc & Geospatial identification strategies – Thursday, December 18, 2025, 13:00–16:00 c.t. (computer room: see eCampus/EXA)

- Spatial RD
- Spatial DiD
- Distance-based designs
- Natural experiments from geography

Submission deadline for exposé (Thursday, December 25, 2025, 23:55)

Please upload on Stud.IP an electronic version of your exposé (in PDF format).

Q&A session 1: Thursday, January 8, 2026, 13:00–16:00 c.t. (seminar room: see eCampus/EXA)

Q&A session 2: Thursday, January 15, 2026, 13:00–16:00 c.t. (seminar room: see eCampus/EXA)

Final meeting - Thursday, January 29, 2026, 13:00–18:00 c.t. (seminar room: see EXA)

- Presentation of term paper

Submission deadline for term paper (Friday, February 6, 2026, 23:55)

Please upload on Stud.IP an electronic version of your term paper (in PDF format) as well as replication files.

Communication:

Communication via Email and StudIP.

2.3 Examination and grading of the module

The grading consists of three components:

- Term paper [70%]
- Presentation of term paper [30%]
- Participation in class [at the margin]

Furthermore, in order to pass the course, participants must

- be present and actively participate during all seminar sessions
- submit all written course requirements on time
- achieve a weighted average grade exceeding or equal to 4.0

2.4 Course materials

- The preliminary list of required readings is announced below.
- Supplementary course materials will be announced at the beginning of each meeting and/or published on Stud.IP.

3. Term paper requirements

Exposé

The exposé should be no longer than 1.5 pages with font size 12 and line spacing 1.5 times, alignment: justification, margin (right, left, top and bottom margin): 2.5 cm each. It should briefly develop the research question the student wishes to study and the geospatial data and methods they intend to use for the empirical analysis. Potential challenges and ways to address them may be briefly formulated.

Term paper

In your term paper you describe your geospatial data analysis project in detail. This includes mentions of the data sources and collection, processing of geospatial data and (potentially) combination with non-geospatial data, descriptive statistics and the analysis of the data, as well as interpretation of the findings, implications and limitations of the work.

The length of the term paper must not exceed 15 pages. The cover sheet, reference list, figures, and tables (if any) are excluded from the page count. Please use the following formatting: Font size: 12 pt, line spacing: 1.5 times, alignment: justification, margin (right, left, top and bottom margin): 2.5 cm each. Please make sure that you are consistent in your referencing and bibliography.

Use a referencing style that is in line with basic conventions in the economics literature. Always quote within a work using the same method. The Chair recommends the in-text author-year citation style (see, for example, information sheet “Citation according to the Harvard system”). All sources that you have cited in the text must appear in the reference list. Everything that you have only read but not cited in the text must NOT appear in the reference list. Term papers need to be written in English. The work must be done independently by the student.

Every idea, statement or fact taken from other sources must be appropriately cited. Quotes need to be indicated as such. Plagiarism is sanctioned with the grade 5 (failed). The general rules of the Faculty of Business and Economics apply. A signed declaration must be attached to each scientific work: “I hereby declare that I wrote this term paper independently, without assistance from external parties, and without use of other resources than those indicated. All information taken from other publications or sources in text or in meaning are duly acknowledged in the text. I give my consent to have this thesis checked by plagiarism software.”

Additionally, please attach a **declaration** if you have used AI-based chatbots such as ChatGPT. Sample annex:

> Declaration on the use of ChatGPT and comparable tools: In this paper, I have used ChatGPT or another AI tool as follows.:
>
> [ ] not at all
>
> [ ] during brainstorming
>
> [ ] when creating the outline
>
> [ ] to write individual passages, altogether to the extent of ...% of the entire text
>
> [ ] for the development of source code
>
> [ ] for optimizing or restructuring source code
>
> [ ] for proofreading or optimizing
>
> [ ] further, namely: …
>
> I hereby declare that I have stated all uses completely. Missing or incorrect information will be considered as an attempt to cheat.

Replication files

Please upload all files necessary for replicating your empirical analysis to Stud.IP together with your submission. Your empirical analysis is considered replicable if all results used in your paper (regression tables, figures, etc.) can be generated from the raw data using your code scripts.

Your submission should include the following files:

- all raw data

- the merged dataset
- code to clean and merge the raw data
- code to analyze the data
- a short instruction for the replication, e.g., a README file or Makefile

The raw data should be marked as such and stored in a separate folder. If the datasets are very large, feel free to use file transfer services such as WeTransfer or Dropbox links. The merged dataset should be saved in a common format (e.g., csv, dta, rds). Please make sure that your code can be executed outside your own computer without further adjustments to the code. For that reason, please use relative file paths only. Add comments to specify which part of the code corresponds to which part of your paper.

Preliminary reading list:

- *Lovelace, R., Nowosad, J., & Muenchow, J. (2019). Geocomputation with R. Chapman and Hall/CRC. Link*
- *Henderson, J. V., Storeygard, A., & Weil, D. N. (2012). Measuring economic growth from outer space. American economic review, 102(2), 994-1028.*
- *Donaldson, D., & Storeygard, A. (2016). The view from above: Applications of satellite data in economics. Journal of Economic Perspectives, 30(4), 171-198.*
- *Michalopoulos, S., & Papaioannou, E. (2018). Spatial patterns of development: A meso approach. Annual Review of Economics, 10(1), 383-410.*
- *Lehnert, P., Niederberger, M., Backes-Gellner, U., & Bettinger, E. (2023). Proxying economic activity with daytime satellite imagery: Filling data gaps across time and space. PNAS nexus, 2(4).*
- *Bomprezzi, P., Dreher, A., Fuchs, A., Hailer, T., Kammerlander, A., Kaplan, L. C., ... & Unfried, K. (2024). Wedded to Prosperity? Informal Influence and Regional Favoritism.*
- *Asatryan, Z., Baskaran, T., Birkholz, C., & Hufschmidt, P. (2023). Favoritism by the governing elite (No. 1029). Ruhr Economic Papers.*
- *https://www.plad.me/*

Note: Dates and contents subject to change!