**Spatial Data Analysis for Social Scientists**
**University of Lucerne, 2021**
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## COURSE DESCRIPTION

What does space add to our understanding of political and social phenomena? What can we learn from investigating how units (states, individuals, nodes of a network) interact with each other in space? The course is intended for Social Scientists who want to take advantage of spatial data to enrich their analyses by combining newly available georeferenced data or creating their own. Participants will also learn how to detect and model spatial dependencies that most social phenomena exhibit. The three main objectives of this course are *i)* building datasets based on geographical/spatial features of phenomenon of interests, *ii)* visualizing spatial patterns and map clustering using Moran's Index and Local Indicators (LISA), and *iii)* modelling spatial interdependence to make more accurate statistical inferences. The first part of the course focuses on how to use GIS tools to build spatial dataset containing geographical variables (e.g. distances) and to combine (and potentially geocode) different types of data based on locations. The second part of the course moves to the statistical analysis of such data, with particular focus on the detection of spatial dependencies and their modelling using spatial lag and spatial error models.

## COURSE STRUCTURE

The course is developed in four half-day workshops. The meetings will consist in a mix of lecture (with slides), examples in R and finally hands-on practice for participants. Data and codes will be provided, but participants are welcome to bring their own data and consider how to apply methods to their own research goals. We will make sure to allocate time to discuss project-specific goals and challenges on the last day of the workshop. Participants are expected to read required material before the meetings.

**SOFTWARE/LAPTOP**

You should bring your laptop with Rstudio already installed. This requires you to install R in the first place. See this tutorial on how to install R and Rstudio: https://www.datacamp.com/community/tutorials/installing-R-windows-mac-ubuntu

R Codes and data will be provided.

**PROGRAM**

**Day 1**

- Introduction to key concepts for spatial analysis
- Introduction to GIS in R (data management, part I)
- Upload shapefiles and produce basic maps
- Basic operations

**Day 2**

- Combine spatial data from different sources
- Edit tables/features
- Distance, Buffers, Intersections
- Exploratory Spatial Data Analysis
- Brief overview on how to geo-reference digital maps

**Day 3**

- Spatial clustering: interdependence vs common exposure
  - Measures of spatial autocorrelation (Moran, Geary, LISAs)
  - Testing spatial autocorrelation
  - Structure of interdependence (contiguity; distance; networks)
  - Create spatial lags

**Day 4**

- Modelling spatial dependence
- Specification and estimation
- Spatial Lag and Spatial Error models
- Presenting Spatial Effects
- Brainstorming ideas on implementing spatial analysis!

**CORE READINGS**

***Get in touch if you have troubles accessing any of the resources below.***

1.  A primer to spatial data and spatial analysis in Social Sciences:

Di Salvatore, J., & Ruggeri, A. (2021). Spatial analysis for political scientists. Italian Political Science Review, 1-17. doi:10.1017/ipo.2021.7

2.  Short introduction to Spatial Models:

Ward, M. & Gleditsch, K. (2019). *Spatial regression models.* SAGE Publications, Inc., https://www.doi.org/10.4135/9781071802588

On spatial data (mostly for Day 1-2):
- Gilberto Camara, Antonio Miguel Monteiro, Suzana Druck Fucks, Marilia Sá Carvalho, Spatial Analysis and GIS: A Primer. http://www.dpi.inpe.br/gilberto/tutorials/spatial_analysis/spatial_analysis_primer.pdf
- Gleditsch, Kristian Skrede, and Nils B. Weidmann. "From hand-counting to GIS: Richardson in the information age." *Lewis Fry Richardson: His Intellectual Legacy and Influence in the Social Sciences* (2020): 73.

On spatial interdependence (mostly for Day 3-4):
- Franzese, R.J. and Hays, J.C., 2008. Interdependence in Comparative Politics Substance, Theory, Empirics, Substance. *Comparative Political Studies*, *41*(4-5), pp.742-780.
- Halvard Buhaug, Kristian Skrede Gleditsch, Contagion or Confusion? Why Conflicts Cluster in Space, *International Studies Quarterly*, Volume 52, Issue 2, June 2008, Pages 215–233, https://doi.org/10.1111/j.1468-2478.2008.00499.x
- Neumayer, E. and Plümper, T., 2015. W. *Political Science Research and Methods*.