Spatial Data Analysis for Social Scientists
University of Lucerne, 2021

Jessica Di Salvatore
University of Warwick

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 two full-day workshops. The meetings will consist in a mix of lecture (with slides), examples in R and finally hands-on practice for participants. As the two days are one week apart, participants are encouraged to work with their own data (or data they consider interesting) since session 1. 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 will be provided for both days of the workshop.

PROGRAM

Day 1

Morning:

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

Afternoon:

- 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 2

Morning:

- 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

Afternoon:

- Modelling spatial dependence
- Specification and estimation
- Spatial Lag and Spatial Error models
- Presenting Spatial Effects

CORE READINGS

On spatial data (mostly for Day 1):

- 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 2):

- Ward, M.D. and Gleditsch, K.S., 2008. *Spatial regression models* (Vol. 155). Sage.

- 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
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- Braithwaite, A., Li, Q. 2007. “Transnational Terrorism Hot Spots: Identification and Impact Evaluation.” Conflict Management and Peace Science 24(4):281-96.
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- Franzese, Robert J., and Jude C. Hays. "Spatial econometric models of cross-sectional interdependence in political science panel and time-series-cross-section data." *Political Analysis* 15, no. 2 (2007): 140-164.
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- Jahn, D., 2006. Globalization as ‘Galton's problem’: The missing link in the analysis of diffusion patterns in welfare state development. *International Organization*, *60*(02), pp.401-431.
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- Plümper, T., Troeger, V.E. and Winner, H., 2009. Why is there no race to the bottom in capital taxation?. *International Studies Quarterly*, *53*(3), pp.761-786.
- Gimpel, J.G., Lee, F.E. and Kaminski, J., 2006. The political geography of campaign contributions in American politics. *Journal of Politics*, *68*(3), pp.626-639.
- Cao, X., 2010. Networks as channels of policy diffusion: Explaining worldwide changes in capital taxation, 1998–2006. *International Studies Quarterly*, *54*(3), pp.823-854.
- Cao, X. and Prakash, A., 2012. Trade competition and environmental regulations: Domestic political constraints and issue visibility. *The Journal of Politics*, *74*(01), pp.66-82.
- Cao, X., 2012. Global networks and domestic policy convergence: A network explanation of policy changes. *World Politics*, *64*(03), pp.375-425.
- Meseguer, C. and Gilardi, F., 2009. What is new in the study of policy diffusion?. *Review of International Political Economy*, *16*(3), pp.527-543.
- Gilardi, F., 2014. Methods for the analysis of policy interdependence. In *Comparative Policy Studies* (pp. 185-204). Palgrave Macmillan UK.
- Crabtree, C., Darmofal, D. and Kern, H.L., 2015. A spatial analysis of the impact of West
- German television on protest mobilization during the East German revolution. *Journal of Peace Research*, *52*(3), pp.269-284.
- Darmofal, D., 2006. The political geography of macro-level turnout in American political development. *Political Geography*, *25*(2), pp.123-150.
- Darmofal, D., 2009. Bayesian spatial survival models for political event processes. *American Journal of Political Science*, *53*(1), pp.241-257.
- Schutte, S. and Donnay, K., 2014. Matched wake analysis: finding causal relationships in spatiotemporal event data. *Political Geography*, *41*, pp.1-10.
- Weidmann, Nils B., and Michael D. Ward. "Predicting conflict in space and time." *Journal of Conflict Resolution* 54, no. 6 (2010): 883-901.
- Schutte, S. and Weidmann, N.B., 2011. Diffusion patterns of violence in civil wars. *Political Geography*, *30*(3), pp.143-152.