Spatial Econometrics

10:00–13:30 British Summer Time, Jul 21–Aug 1, 2025

North Teaching Centre (NTC) 2.06, Wivenhoe Park

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Introduction

Spatial dependencies are universal in social sciences. Phenomena as diverse as the occurrence and outcomes of violent mass protests, policy learning and position taking in party competition, or the competitive setting of tax rates to attract foreign direct investment across neighboring jurisdictions all share a similar feature: any move taken by one actor is shaped by moves made by other actors. Spatial econometrics allows us to detect, model, and estimate such interdependence, and to work toward a theoretically meaningful interpretation of interdependent relationships.

The theoretical substance lies in the nature of interconnectedness between units, be it geographic, economic, cultural, strategic, etc., thus covering a wide ground of social science applications. This course begins with a data-oriented view of spatial patterns and dependencies in the real world, and then introduces a theory-guided approach to building, estimating, and evaluating spatial and spatiotemporal regression models.

Objectives

The course starts from the premise that interconnectedness is an important and theoretically meaningful feature of a broad range of phenomena in social sciences. The main aim is therefore to enable participants to identify and incorporate interconnectedness in their own areas of interest. This will involve learning how to detect spatial patterns, bringing data into a suitable format for spatial analysis, the estimation of structural parameters of spatial and spatiotemporal models, and the presentation and interpretation of spatial and spatiotemporal effects. The materials provided in the labs will enable participants to undertake their own research projects using spatial econometrics.

Prerequisites

The beginning of the course will cover all necessary background materials in brief. That said, participants will benefit most from the course if they have some understanding of regression analysis, basic

knowledge of matrix algebra and maximum likelihood, as well as prior experience with R.

Outline

Textbooks

- Ward, Michael D., and Kristian Skrede Gleditsch. 2018. *Spatial Regression Models (Second Edition).* Quantitative Applications in the Social Sciences No. 155. Sage Publications
- LeSage, James P., and R. Kelley Pace. 2009. *Introduction to Spatial Econometrics.* Chapman & Hall/CRC

Day 1 Theoretical and Empirical Models of Spatial Interdependence Jul 21

- LeSage & Pace: Chap. 1
- Ward & Gleditsch: Chap. 1.1–1.4

Applied

- Steinwand, Martin C. 2015. "Compete or Coordinate? Aid Fragmentation and Lead Donorship." *International Organization* 69 (2): 443–472

Day2 Connectivity Weights Jul 22

- Beck, Nathaniel, Kristian Skrede Gleditsch, and Kyle Beardsley. 2006. "Space Is More Than Geography: Using Spatial Econometrics in the Study of Political Economy." *International Studies Quarterly* 50 (1): 27–44
- Plümper, Thomas, and Eric Neumayer. 2010. "Model Specification in the Analysis of Spatial Dependence." *European Journal of Political Research* 49 (3): 418–442
- Zhukov, Yuri M., and Brandon M. Stewart. 2013. "Choosing Your Neighbors: Networks of Diffusion in International Relations." *International Studies Quarterly* 57 (2): 271–287

Applied

- Murdoch, James C., Todd Sandler, and Keith Sargent. 1997. "A Tale of Two Collectives: Sulphur Versus Nitrogen Oxides Emission Reduction in Europe." *Economica* 64 (254): 281–301
- Steinwand, Martin C. 2011. "Estimating Free-Riding Behavior: The StratAM Model." *Political Analysis* 19 (4): 488–502

Day 3 Detecting Spatial Association & Specification Checks Jul 23

- Ward & Gleditsch: Chap. 1.6
- Anselin, Luc. 1995. "Local Indicators of Spatial Association–LISA." *Geographical Analysis* 27 (2): 93–115

Applied

- Gleditsch, Kristian Skrede, and Michael D. Ward. 2000. "War and Peace in Space and Time: The Role of Democratization." *International Studies Quarterly* 44 (1): 1–29

Further

- Anselin, Luc, et al. 1996. "Simple Diagnostic Tests for Spatial Dependence." *Regional Science and Urban Economics* 26 (1): 77–104
- LeSage & Pace: Chap. 6.3

Day 4 Model Choice **Jul 24**

- Cook, Scott J., Jude C. Hays, and Robert J. Franzese. 2020. "Model Specification and Spatial Interdependence." Chap. 39 in *The SAGE Handbook of Research Methods in Political Science and International Relations,* edited by Luigi Curini and Robert J. Franzese, 730–747. SAGE Publications
- Halleck Vega, Solmaria, and J. Paul Elhorst. 2015. "The SLX Model." *Journal of Regional Science* 55 (3): 339–363

Applied

- Laroze, Denise, Eric Neumayer, and Thomas Plümper. 2021. "Covid-19 Does Not Stop at Open Borders: Spatial Contagion Among Local Authority Districts During England's First Wave." *Social Science & Medicine* 270:113655
- Sharma, Hari, and John Gibson. 2019. "Civil War and International Migration from Nepal: Evidence from a Spatial Durbin Model." University of Waikato Working Paper in Economics 6/19. Hamilton, New Zealand
- Villamil, Francisco, Stuart J. Turnbull-Dugarte, and José Rama. 2024. "Rally 'round the Barrack: Far-Right Support and the Military." *The Journal of Politics* 86 (4): 1524–1540

Day 5 Estimation **Jul 25**

- Bivand, Roger, and Gianfranco Piras. 2015. "Comparing Implementations of Estimation Methods for Spatial Econometrics." *Journal of Statistical Software* 63 (18): 1–36
- Kelejian, Harry H., and Ingmar R. Prucha. 1998. "A Generalized Spatial Two-Stage Least Squares Procedure for Estimating a Spatial Autoregressive Model with Autoregressive Disturbances." *The Journal of Real Estate Finance and Economics* 17 (1): 99–121
- Casella, George, and Edward I. George. 1992. "Explaining the Gibbs Sampler." *The American Statistician* 46 (3): 167–174

Weekend (Jul 26–27)

Day 6 Effects **Jul 28**

- LeSage & Pace: Chap. 2.7

- Whitten, Guy D., Laron K. Williams, and Cameron Wimpy. 2021. "Interpretation: The Final Spatial Frontier." *Political Science Research and Methods* 9 (1): 140–156
- Golgher, André Braz, and Paul R. Voss. 2016. "How to Interpret the Coefficients of Spatial Models: Spillovers, Direct and Indirect Effects." *Spatial Demography* 4 (3): 175–205

Further

- King, Gary, Michael Tomz, and Jason Wittenberg. 2000. "Making the Most of Statistical Analyses: Improving Interpretation and Presentation." *American Journal of Political Science* 44 (2): 341–355

Day 7 & 8 Time & Space Jul 29–30

- Cook, Scott J., Jude C. Hays, and Robert J. Franzese. 2023. "STADL Up! The Spatiotemporal Autoregressive Distributed Lag Model for TSCS Data Analysis." *American Political Science Review* 117 (1): 59–79
- Millo, Giovanni, and Gianfranco Piras. 2012. "splm: Spatial Panel Data Models in R." *Journal of Statistical Software* 47 (1): 1–38
- Darmofal, David. 2015. "Time-Series Cross-Sectional and Panel Data Models." Chap. 8 in *Spatial Analysis for the Social Sciences,* 141–157. Cambridge University Press

Applied

- Nwaogu, Uwaoma G., and Michael J. Ryan. 2015. "FDI, Foreign Aid, Remittance and Economic Growth in Developing Countries." *Review of Development Economics* 19 (1): 100–115
- Skogstad, Karl. 2016. "Defence Budgets in the Post-Cold War Era: a Spatial Econometrics Approach." *Defence and Peace Economics* 27 (3): 323–352
- Xu, Zhicheng, Yu Zhang, and Yang Sun. 2020. "Will Foreign Aid Foster Economic Development? Grid Panel Data Evidence from China's Aid to Africa." *Emerging Markets Finance and Trade* 56 (14): 3383–3404
- González-Rostani, Valentina, and Jeffrey Nonnemacher. 2025. "Are Protests Contagious? The Dynamics of Temporal and Spatial Diffusion of Political Protests." *Journal of Elections, Public Opinion and Parties,* Online First. https://doi.org/10.1080/17457289.2025.2504860

Further

- Elhorst, J. Paul. 2014. "Spatial Panel Data Models." Chap. 3 in *Spatial Econometrics: From Cross-sectional Data to Spatial Panels,* 37–93. Springer
- Hays, Jude C., Aya Kachi, and Robert J. Franzese. 2010. "A Spatial Model Incorporating Dynamic, Endogenous Network Interdependence: A Political Science Application." *Statistical Methodology* 7 (3): 406–428
- Wang, Wei, and Jihai Yu. 2015. "Estimation of Spatial Panel Data Models with Time Varying Spatial Weights Matrices." *Economics Letters* 128:95–99

Day 9 Limited Dependent Variable and Duration Models Jul 31

- LeSage & Pace: Chap. 10.1

- Franzese, Robert J., Jude C. Hays, and Scott J. Cook. 2016. "Spatial- and Spatiotemporal-Autoregressive Probit Models of Interdependent Binary Outcomes." *Political Science Research and Methods* 4 (1): 151–173
- Hays, Jude C., and Aya Kachi. 2009. "Interdependent Duration Models in Political Science." APSA 2009 Annual Meeting Papers. Toronto, Canada. https://ssrn.com/abstract=1450062
- Hays, Jude C., Emily U. Schilling, and Frederick J. Boehmke. 2015. "Accounting for Right Censoring in Interdependent Duration Analysis." *Political Analysis* 23 (3): 400–414

Applied

- Hennessy, Alexandra, and Martin C. Steinwand. 2014. "The Sources of Pension Reforms in Europe: Domestic Factors, Policy Diffusion, or Common Shock?" *International Interactions* 40 (4): 477–505
- Metternich, Nils W., and Julian Wucherpfennig. 2020. "Strategic Rebels: A Spatial Econometric Approach to Rebel Fighting Durations in Civil Wars." *International Interactions* 46 (3): 334–371

Further

- Martinetti, Davide, and Ghislain Geniaux. 2017. "Approximate Likelihood Estimation of Spatial Probit Models." *Regional Science and Urban Economics* 64:30–45

Day 10 Presentation of Research Ideas from Participants Aug 1

Bibliographic information as of July 18, 2025.
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