Syllabus for Geog 279 Applied Statistics for Geography

(a.k.a. causal analysis in space),

Fall 2024

Instructor: Kathy Baylis
5808 Ellison Hall
Office Hours: 9-10 Tues or by appointment

Aspirational plan for the quarter (please check github for updates)

Week 0: Why causal analysis?

Week 1: Potential outcomes framework

Note: no class on Thurs, Oct 3

Read Ferraro et al 2018 https://doi.org/10.1073/pnas.18055631

Read (skim) Holland, P. W. (1986). Statistics and Causal Inference. *Journal of the American Statistical Association*, *81*(396), 945–960. https://doi.org/10.2307/2289064

Week 2: Causal Diagrams

(For Tues) Read Huntington, Nick "The Effect" Chapters 6 and 7
https://theeffectbook.net/index.html

(For Thurs) Read: Brodie, Jedediah F., Jayasilan Mohd-Azlan, Cheng Chen, Oliver R. Wearn, Mairin C. M. Deith, James G. C. Ball, Eleanor M. Slade, et al. (2023). "Landscape-Scale Benefits of Protected Areas for Tropical Biodiversity." *Nature* 620 (7975): 807–12. https://doi.org/10.1038/s41586-023-06410-z.

Assignment 1 due Thurs, Oct 10 (includes paper topic)

Week 3: Randomized Control Trials and Power Calculations

Read: Chapter 4 (Tues) and Chapter 15 (Thurs), Gertler, Paul J.; Martinez, Sebastian; Premand, Patrick; Rawlings, Laura B.; Vermeersch, Christel M. J.. (2016) Impact Evaluation in Practice Second Edition. © Washington, DC: Inter-American Development Bank and World Bank.

Week 4: Matching and Synthetic Controls

(Tues) Read: Honey-Rosés, Jordi, Kathy Baylis, and M. Isabel Ramírez. (2011). "A Spatially Explicit Estimate of Avoided Forest Loss: Spatial Estimate of Avoided Forest Loss." Conservation Biology 25 (5): 1032–43. https://doi.org/10.1111/j.1523-1739.2011.01729.x.

Original matching article: Donald B Rubin. Estimating causal effects of treatments in randomized and nonrandomized studies. (1974) Journal of Educational Psychology, 66(5):688–701.

(Thurs) Read: Alberto Abadie, Alexis Diamond, and Jens Hainmueller. (2010) Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. Journal of the American Statistical Association, 105(490):493–505.

Assignment 2 due Thurs, Oct 24

Week 5: Differences-in-Differences and Staggered roll-out

Read (for Tues): Wauchope, Hannah S., Julia P. G. Jones, Jonas Geldmann, Benno I. Simmons, Tatsuya Amano, Daniel E. Blanco, Richard A. Fuller, et al. 2022. "Protected Areas Have a Mixed Impact on Waterbirds, but Management Helps." *Nature* 605 (7908): 103–7. https://doi.org/10.1038/s41586-022-04617-0.

Read (for Thurs): Jonathan Roth, Pedro H.C. Sant'Anna, Alyssa Bilinski, John Poe, 2023. "What's trending in difference-in-differences? A synthesis of the recent econometrics literature," Journal of Econometrics, 235, (2): 2218-2244, https://doi.org/10.1016/j.jeconom.2023.03.008.

Week 6: Instrumental Variables and Regression Discontinuity Design

(For Tues) Read Mellon, Jonathan. 2024. " Rain, rain, go away: 194 potential exclusion-restriction violations for studies using weather as an instrumental variable." *American Journal of Political Science* 00: 1–18. https://doi.org/10.1111/ajps.12894

(For Thurs) Read: Noack, Frederik, Ashley Larsen, Johannes Kamp, and Christian Levers. 2022. "A Bird's Eye View of Farm Size and Biodiversity: The Ecological Legacy of the Iron Curtain." *American Journal of Agricultural Economics* 104 (4): 1460–84. https://doi.org/10.1111/ajae.12274.

Assignment 3 due Thurs, Nov 7

Week 7: Standard errors and spatial considerations

Week 8: Remote sensing and machine learning in causal analysis

Read Proctor, J., Carleton, T., Sum, S. (2023). "Parameter Recovery Using Remotely Sensed Variables." NBER Working Paper

Read (well, skim…) Baylis, K., T. Heckelei, H. Storm. 2021. "Machine Learning in Agricultural Economics" Handbook of Agricultural Economics, (eds. C. Barrett and D. Just) Elsevier. Volume 5: 4551-4612. https://doi.org/10.1016/bs.hesagr.2021.10.007

Assignment 4 due Thurs, Nov 21

Week 9: Machine learning in causal analysis

Note, no class Thurs, Nov 28: Thanksgiving

Week 10: Presentations

Final paper proposal due Dec 9

Some Resources

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press. https://doi.org/10.2307/j.ctvcm4j72

Huntington-Klein, Nick. "The Effect: An Introduction to Research Design and Causality"

This is a textbook geared towards upper level undergrads and masters students, so it's light on the math and heavy on the intuition, and starts with some pretty basic stuff. But it's well done and has good problem sets and other things. And it's free!

Videos associated with the book: https://www.youtube.com/playlist?list=PLcTBLulJV_AK1hKtnO0-kYrU0D09K-kj8

Gertler, Paul J.; Martinez, Sebastian; Premand, Patrick; Rawlings, Laura B.; Vermeersch, Christel M. J.. 2016 Impact Evaluation in Practice Second Edition. © Washington, DC: Inter-American Development Bank and World Bank. http://hdl.handle.net/10986/25030 License: CC BY 3.0 IGO.

Pearl, Judea and Dana Mackenzie. 2018. "The Book of Why"

Robins, James and Miguel A. Hernan. 2010. "Causal Inference: What If"

Grade:

40% assignments

10% presentation

50% paper proposal (Due Monday Dec 9)