

Geo200cn sp17

Quantitative Geography

discussion + lecture: Monday 5:10-7:00p Hunt Hall 166
lab: Monday + Wednesday 10:00-11:50a Hunt Hal 253

instructor: Sheryl-Ann Simpson (ssimpson@ucdavis.edu)
office hours: Tuesdays 1-3p, Hunt Hall 183, please sign up for times tinyurl.com/mvbjxfo

ta: Elise Hellwig (echellwig@ucdavis.edu)
office hours: Tuesdays 2:30-4:30p, or by appointment Wickson Hall 3104

Course summary

This course provides an introduction to quantitative spatial analysis with a focus on spatial data manipulation, modeling, and analysis. Students leaving the course should have gained both methodological skills, and have a stronger sense of the concepts underlying this type of research and analysis.

Course Requirements:

(more detailed assignments will be handed out throughout the quarter)

Discussion and lectures: You are required to attend, and expected to participate in discussion and lecture sessions each week. (5%)

Labs: While attendance is not required lab sessions are an opportunity for you to get assistance with labs assignments. (NA)

Lab assignments: You will be required to complete a series of lab assignments throughout the quarter. (50%)

Reading responses: You will be required to complete three reading responses thought the quarter that analyze the research design and methods of published works, and demonstrate your own comprehensions of basic concepts and ideas in quantitative spatial analysis. (15%)

Methods and Essays: You will have the opportunity to either write a longer form essay reviewing concepts and methods in quantitative spatial analysis, or begin to work on the methods for a study you will design. (30%)

Required Texts

O'Sullivan, D., and D. Unwin. 2010. Geographic Information Analysis, 2nd Edition. Wiley. (OSU)

James, G., D. Witten, T. Hastie and R. Tibshirani, 2013. An Introduction to Statistical Learning with Applications in R. Springer (ISLR)

Each week there will be empirical examples to complementing the text, posted on Canvas, or accessible online.

Reading Schedule

wk1 April 3 - Introduction to Spatial Data Analysis

Tobler, Waldo. 1976. Analytical cartography. *The American Cartography*. 3(1):21-31
OSU 1

wk2 April 10 - Spatial Data Analysis + Statistical Learning

Sheppard, Eric. 2010. Quantitative geography: representations, practices, and possibilities. *Environment and Planning D*. 19:535-554.
OSU 2
ISLR 1+2

wk3 April 17 - Maps + Patterns and Process

OSU 3+4

choose at least one:

Abdrienko, Gennady, Natalia Andrienko, Richard Fischer, Volker Mues and Andreas Schuck. 2006. Reactions to geovisualization: An experience from a European project. *International Journal of Geographical Information Science*, 20(10):1149-1171.

Kim, Annette M. 2015. Critical cartography 2.0: From "participatory mapping" to authored visualizations of power and people. *Landscape and Urban Planning*, 142:215-225.

wk4 April 24 - Point Patterns Analysis

OSU 5+6

choose at least one:

Hijmans, Robert and David M. Spooner. 2001. Geographic distribution of wild potato species. *American Journal of Botany*, 88(11):2101-2112.

Krider, Robert E. and Daniel S. Putler. 2013. Which birds of a feather flock together? Clustering and avoidance patterns of similar retail outlets. *Geographical Analysis*, 45:123-149.

O'Loughlin, John, Frank D. W. Witmer and Andrew M. Linke. 2010. The Afghanistan-Pakistan wars, 2008-2009: Micro-geographies, conflict diffusion, and clusters of violence. *Eurasian Geography Economics*, 51(4):437-471.

wk5 May 1 - Spatial Autocorrelation + Local Statistics

OSU 7+8

choose at least one:

Baker, William L. and Kurt F. Kipfmüller. 2001. Spatial ecology of pre-Euro-American fires in a southern Rocky Mountain subalpine forest landscape. *The Professional Geographer*, 53(2):248-262.

Scott, Christopher A., Sandy Dall'Erba and Rolando Díaz Caravantes. 2010. Groundwater rights in Mexican agriculture: Spatial distribution and demographic determinants. *The Professional Geographer*, 62(1):1-15.

Sim, Sunhui and Andy Miller. 2016. Exploratory spatial data analysis of the distribution of multiple crimes: A case study of three coastal cities. *Papers in Applied Geography*. 2(1):79-84.

wk6 May 8 - Fields, Geostatistics and Spatial Interpolation
OSU 9+10

choose at least one:

Hessl, Amy et. al. 2007. Mapping paleo-fire boundaries from binary point data: Comparing interpolation methods. *The Professional Geographer*, 59(1):87-104.

Lofan, John R. Zengwang Xu and Brian J. Stults. 2014. Interpolating U.S. decennial census tract data from as early as 1970-2010: A longitudinal tract database. *The Professional Geographer*, 66(3):412-420.

wk7 May 15 - Linear Regression + Classification
ISLR 3+4+6

choose at least one:

Lobben, Amy K. 2007. Navigating map reading: Predicting performance and identifying relative influence of map-related abilities. *Annals of Associated American Geographers*, 97(1):64-85.

Wentz, Elizabeth A. et al. 2014. Factors influencing water consumption in multifamily housing in Tempe, Arizona. *The Professional Geographer*, 66(3):501-510.

wk8 May 22 - Spatial Regression, GWR, Multilevel Models

Chapters 1+2+3 in Ward, Michael D. and Kristian Skrede Gleditsch. 2008. *Spatial Regression Models* (access through UCD library)

Artelaris, Panagiotis. 2015. Local versus regime convergence regression models: A comparison of two approaches. *GeoJournal*. 80:263-277.

[there's a lot in these readings, so don't worry about getting every details, or get bogged down in the formulas. Instead focus on understanding the general concepts]

choose at least one:

Harris, Paul, A. Stewart Fortheringham and Steve Juggins. 2010. Robust geographically weighted regression: A technique for quantifying spatial relationships between freshwater acidification critical loads and catchment attributes. *Annals of the Association of American Geographers*, 100(2):286-306.

Taus, Alina, Yelena Ogenva-Himmelberger and John Rogan. 2013. Conversion to organic farming in the continental United States: A geographically weighted regression analysis. *The Professional Geographer*, 65(1):87-102.

wk9 May 29 - [no class Memorial Day]

wk10 June 5 - Non-Linear Models + Space Time
ISLR 7

An, Li, et. al. 2015. Space-time analysis: Concepts, quantitative methods, and future directions. *Annals of the Association of American Geographers*, 105(5):891-914.

choose at least one:

non-linear models

Chun, Bumseok and Subhrajit Guhathakurta. 2017. The impacts of three-dimensional surface characteristics on urban heat islands over the diurnal cycle. *The Professional Geographer*, 69(2):191-202.

Simpson, Sheryl-Ann. forthcoming. Spatial patterns of international migrant resident settlement and incorporation in Winnipeg Manitoba. *Population, Space and Place*.

space-time

Eastman, Ronald J. et. al. 2013. Global trends in seasonality of normalized difference vegetation index (NDVI), 1982-2011. *Remote Sensing*, 5:4799-4818.

Park, Yoo Min, Mei-Po Kwan. 2017. Individual exposure estimates may be erroneous when spatiotemporal variability of air pollution and human mobility are ignored. *Health and Place*. 43:85-94.

Yin, Li. 2009. The dynamics of segregation in Buffalo: An agent-based simulation. *Urban Studies*. 46(13):2749-2770.

WKfn (finals wk) June 12 - Bayesian Inference+ Unsupervised Learning

Ellison, Aaron. 2004. Bayesian inference in ecology. *Ecology Letters*, 7:509-520.

ISLR 10

choose at least one:

bayesian inference

Malanson, George P. et. al., 2017. Relations of Alpine plant communities across environmental gradients: Multilevel versus multi-scale analysis. *Annals of the American Geographers*. 107(1):41-53.

Sores Magalhães, Ricardo J. and Archie C.A. Clements. 2011. Mapping the risk of anaemia in preschool-age children: The contribution of malnutrition, malaria, and helminth infections in West Africa. *PLoS Medicine*, 8(6): e1000438.

<https://doi.org/10.1371/journal.pmed.1000438>

unsupervised learning

Mberogo, Seth, Kazadi Sanga-Ngoie and Shoko Kobayashi. 2013. Vegetation dynamics of Zimbabwe investigated using NOAA-AVHRR NDVI from 1982-2006: A principal component analysis. *International Journal of Remote Sensing*, 34(19):6764-6779.

Grimmer, Justin and Brandon M. Stewart. 2013. Text as data: The promise and pitfalls of automatic content analysis methods for political texts. *Political Analysis*. 21(3):267-297.

Pérez-Loredo, Maria Guadalupe, Felipe García-Ochoa, Blanca E. Barragán-Huerta. 2016. Comparative analysis of betalain content in *Stenocercus stellatus* fruits and other cactus using principal component analysis. *International Journal of Food Properties*, 19(2):326-338.