

GIS Applications in Planning and Public Policy

UAP 5114, Spring 2022

Thursday 4:00 to 6:45 PM (nominally), Old Fashioned In Person (not Zoom)

Course Google Drive at <https://tinyurl.com/GIS2022Drive> (we also use Canvas of course)

Contact Information

Instructor: Kris Wernstedt

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Office Hours: In-Person or Zoomily (by prior arrangement please)

Course Objectives

This course provides a hands-on intro for planners—as well as policy analysts, public administrators, engineers, resource managers, and other practitioners and researchers—to geographic information systems (GIS). It focuses on the development of hands-on skills in GIS software, data retrieval, analysis, and graphics, while also expanding understanding of GIS applications through lectures, readings, and presentations. More specifically, it covers:

- the basic concepts, structures, and functions of geographic information systems;
- the use of GIS to help articulate and define planning, social science, and policy-related problems and to evaluate alternative options for addressing these; and
- the communication of GIS analyses and results, in visual, textual, and oral forms.

The course uses ArcGIS Pro software, w/ a mini exposure to alternative GIS platforms.

Learning Outcomes

By the end of the course, each student will:

- Demonstrate understanding of basic concepts of GIS design and structure including fundamentals of cartography and spatial thinking, GIS data structures, base files, measurement, data collection, input, storage, editing, output, and display;
- Demonstrate understanding of the concepts and application of spatial measurement, classification, and analysis;
- Demonstrate the ability to plan, find data for, and implement a spatial data analysis project to answer a planning, policy, or other research question using GIS techniques; and
- Demonstrate the ability to communicate spatially-related information visually, orally, and in written text form.

Course Format

The course includes lectures, discussions, readings, presentations, and field plus in-class work. The first part of each week's meeting generally will include lecture, student presentations of readings, and discussion. The second part usually provides time for student work w/ me. I give lab and memo assignments to demonstrate GIS concepts and applications. **You will need to spend time outside class to complete the work (2-7 hours/assignment on average).**

Please respect your classmates and me by not trying to multi-task with other computer or real world activities during class time.

Required Course Materials

Law, Michael, and Amy Collins. 2021. *Getting to Know ArcGIS® Pro 2.8*. 4th ed. Redlands, California: Esri Press. Try to get the 4th edition of the text to correspond with page numbers in assignments. You can get it for under \$65 via Alibris.com, less as an e-book or rental.

Other required readings come from journals and appear weekly, as indicated on pages 4-6.

The book uses ArcGIS Pro 2.8, which may differ slightly from the version on the VTRC lab computers. You'll need to install ArcGIS Pro on your PC/ laptop/notebook to work outside the VTRC lab. You can download it for free from the Network Software [website](#) w/ a PID login, under ESRI Software (installation instructions come bundled). It doesn't have a Mac version, but on most Macs you can run it off a [partition](#) such as BootCamp. ([YouTube](#) has a nice video on installing Windows on a Mac via BootCamp).

Course Requirements and Grading

Course requirements include (1) preparation of 2 synopses (written and oral) of GIS readings; (2) reading and active participation in class discussions, w/ 1 question/week for each reading; (3) completion of 3 lab exercises; (4) completion of 3 memo assignments (likely 1 solo and 2 group efforts); and (5) completion of a research project employing GIS methods, which has several parts. Make sure to include your name at top of any written material you submit.

Synopses summarize readings on real-world GIS applications in planning, policy, and research. You will select **2** readings from the course reading list (1st come, 1st serve, [sign up](#)). For each synopsis, you will do a 5-7 minute oral presentation w/ PowerPoint (plus lead a ~10 minute discussion) and a 2-3 page written summary single spaced (Times New Roman 12 pt. or equivalent, 1 inch margins). I've posted an example on Canvas. The written synopsis must include each of the following sections labelled separately:

- Problem statement
- Research design and data analysis methodology (stressing GIS/spatial elements)
- Results and findings
- Interpretation and conclusions

You must submit the synopsis to the Canvas assignment folder by Tuesday night before you present it in class. This gives me a chance to read it before you present it. You can submit the format you use for your oral presentation (such as a PPT) by the day after class.

Students not doing a synopsis in a particular week still must do the *readings and participate* in discussion. Each such student must enter 1 or more questions for **each** reading in a Google form that I'll email each week, by **24 hours (Wednesday night)** before the reading's due date.

The three *lab exercises* comprise step-by-step, recipe-like GIS tasks, mostly out of Law & Collins. Each entails both content and presentation. These are individual assignments.

The three *memo* assignments ask you to apply your knowledge of GIS to answer a problem and develop a visual display of spatial information. Each encompasses content and presentation. Some of the memos rely on group work and others on individual efforts (more details later).

The *research project* will focus on a spatial analysis grounded in the scholarly or practitioner literature. I'll distribute more info later in the semester. The project includes an initial idea paragraph and discussion, revisions to your idea, an annotated bibliography, a written and oral proposal, project analysis and development, and oral and written presentation of the project at our final class meeting (attendance and participation in all project presentations required).

Task(s)	Weight
Synopses (2), both written & oral components	10%
Class Participation, including weekly questions	10%
Lab exercises (3)	24%
Memos (3)	24%
Research project proposal (written and oral)	5%
Research project annotated bibliography (written)	7%
Research project (written and oral)	20%

All assignments are due by 11:59 PM of the due date in the schedule, unless indicated otherwise. Uploaded them on Canvas (except readings' questions, which you enter in Google forms). ***If you turn in your work late, I will take off 10% of the grade for each 3 days it is late (e.g., up to 3 days late it loses 10%, more than 3 days and up to 6 days late it loses 20%, etc.).***

The above late penalty applies to work turned in up to 11:59 PM Friday May 7th, but not after May 7th. If you haven't submitted all work by that time, you can either take your grade as is or ask for an "incomplete." If the latter, you must request an incomplete in writing and I must give you a written response before May 7th. Except under extenuating circumstances (must be approved in writing), ***you will lose one full letter grade for your overall course grade every month (or portion of a month) after May 7th that you turn in your completed work.*** For example, if you turn in all work by June 7th and you earn an A- for the course on merit, you will receive a B- as a final grade for the course. And so forth, you get the idea.

Format of Assignments

For written assignments—synopses, research design/proposal, and memos—please use the [Chicago Manual of Style](#) format. Use the [author-date/references](#) style. Be sure to properly reference all material obtained from the internet, including the access date. I suggest EndNote, available to all VT students, to help organize references/notes. It provides templates for referencing automatically. You can get the program from VT's [Software Service Center](#).

Other

I will enforce the tenets of Virginia Tech's Graduate Honor Code, with all work subject to the code. For more information on the Graduate Honor Code, please refer to the [GHS Constitution](#).

I encourage students with special circumstances to contact me as soon as possible—such as those with disabilities, veterans or active duty military, and students with cultural/religious needs conflicting with class—so I can work to accommodate you. In general, please let me know if aspects of this course prevent you from learning or exclude you. Together we'll develop strategies to meet both your needs and the requirements of the course. In all cases, please feel free to contact me should you have any questions or concerns about any course requirements.

Schedule of Topics (*I will revise this some throughout the semester*)

Date	Lecture Topic(s)	Readings (Tentative)	Assignment Due
Week 1, 20 January	general introductions	FREEBIE	Just Show Up
Week 2, 27 January	GIS basics and geographic referencing systems	(Gocmen & Ventura 2010, Reynard 2018, Ye <i>et al.</i> 2014)	Select Readings to Present
Week 3, 3 February	geographic referencing (continued); file types	(Pallathadka <i>et al.</i> 2021, Mouratidis 2022)	Lab #1
Week 4, 10 February	map design	(Griffin & Jiao 2019, MacQuillan <i>et al.</i> 2017)	Lab #2
Week 5, 17 February	joining & relating data; project idea discussion	(Garnett & Grogan 2021, Wang <i>et al.</i> 2019)	Project Idea Paragraph
Week 6, 24 February	queries; scripting	(Gilblom <i>et al.</i> 2020, Golan <i>et al.</i> 2019)	Lab #3
Week 7, 3 March	overlay, extraction & data mgmt. tools; project idea discussion	(Kang <i>et al.</i> 2020, Kim & Bostwick 2020)	Memo #1, Project Idea Revisions (Oral)
Week 8, 10 March	Spring Break (no class)		
Week 9, 17 March	GIS data input and editing; digitizing	(Boeing & Waddell 2017, Brennan-Horley & Gibson 2009, D'Ignazio & Klein 2021)	Project Paragraph Rewrite
Week 10, 24 March	image registration	(Haffner 2019, Townley <i>et al.</i> 2016)	Project Annotated Bibliography
Week 11, 31 March	raster analysis; geocoding	(Lichtenstein & Weber 2015, Kramar <i>et al.</i> 2018)	Memo #2
Week 12, 7 April	project proposal presentations	no readings due	Project Proposal
Week 13, 14 April	suitability analysis	(Aly <i>et al.</i> 2017, Wang & Di 2020)	Memo #3
Week 14, 21 April	spatial analysis	(Griffin & Sener 2016, Roig-Tierno <i>et al.</i> 2013)	freebie
Week 15, 28 April	project presentations	no readings due	project presentation

You also need to schedule oral and written synopsis presentations of two (2) readings **not** in red. All written lab and memo work is due by 11:59 PM of the due date in the schedule, unless indicated otherwise.

Readings (all are required reading, and all except **readings in red** also require weekly questions from everybody and serve as sources for synopses)

- Aly, Ahmed, *et al.* 2017. "Solar Power Potential of Tanzania: Identifying Csp and Pv Hot Spots through a GIS Multicriteria Decision Making Analysis." *Renewable Energy* 113:159-175. doi: <https://doi.org/10.1016/j.renene.2017.05.077>.
- Boeing, Geoff, and Paul Waddell. 2017. "New Insights into Rental Housing Markets across the United States: Web Scraping and Analyzing Craigslist Rental Listings." *Journal of Planning Education & Research* 37 (4):457-476. doi: 10.1177/0739456X16664789.
- Brennan-Horley, Chris, and Chris Gibson. 2009. "Where Is Creativity in the City? Integrating Qualitative and GIS Methods." *Environment and Planning A* 41 (11):2595-2614.
- D'Ignazio, Catherine, and Lauren Klein. 2021. "Who Collects the Data? A Tale of Three Maps." *MIT Case Studies in Social and Ethical Responsibilities of Computing* Winter. doi: 10.21428/2c646de5.fc6a97cc (use DOI to access article online, also access <https://dsl.richmond.edu/panorama/redlining/>).
- Garnett, Holly Ann, and Sean Grogan. 2021. "I Came, I Saw, I Voted: Distance to Polling Locations and Voter Turnout in Ontario, Canada." *Canadian Journal of Political Science* 54 (2):316-334. doi: 10.1017/S0008423921000196.
- Gilblom, Elizabeth A., *et al.* 2020. "A Tightly Wound Braid: Forces of Opportunity and Exclusion within an Era of School Choice Legislation." *Journal of Urban Affairs* 42 (4):634-662. doi: 10.1080/07352166.2019.1629818.
- Gocmen, Z. Asligul, and Stephen J. Ventura. 2010. "Barriers to GIS Use in Planning." *Journal of the American Planning Association* 76 (2):172-183. doi: 10.1080/01944360903585060.**
- Golan, Yael, *et al.* 2019. "Gendered Walkability: Building a Daytime Walkability Index for Women." *Journal of Transport and Land Use* 12 (1):501-526. doi: 10.2307/26911279.
- Griffin, Greg P., and Junfeng Jiao. 2019. "Crowdsourcing Bike Share Station Locations." *Journal of the American Planning Association* 85 (1):35-48. doi: 10.1080/01944363.2018.1476174.
- Griffin, Greg Phillip, and Ipek Nese Sener. 2016. "Public Transit Equity Analysis at Metropolitan and Local Scales: A Focus on Nine Large Cities in the Us." *Journal of public transportation* 19 (4):126-143. doi: 10.5038/2375-0901.19.4.8.
- Haffner, Matthew. 2019. "A Place-Based Analysis of #Blacklivesmatter and Counter-Protest Content on Twitter." *GeoJournal : Spatially Integrated Social Sciences and Humanities* 84 (5):1257-1280. doi: 10.1007/s10708-018-9919-7.
- Kang, Yuhao, *et al.* 2020. "Multiscale Dynamic Human Mobility Flow Dataset in the U.S. During the Covid-19 Epidemic." *Scientific Data* 7 (1):390. doi: 10.1038/s41597-020-00734-5.
- Kim, Sage J., and Wendy Bostwick. 2020. "Social Vulnerability and Racial Inequality in Covid-19 Deaths in Chicago." *Health Education & Behavior* 47 (4):509-513. doi: 10.1177/1090198120929677.
- Kramar, David E., *et al.* 2018. "A Spatially Informed Analysis of Environmental Justice: Analyzing the Effects of Gerrymandering and the Proximity of Minority Populations to U.S. Superfund Sites." *Environmental Justice* 11 (1):29-39. doi: 10.1089/env.2017.0031.
- Lichtenstein, Bronwen, and Joe Weber. 2015. "Women Foreclosed: A Gender Analysis of Housing Loss in the Us Deep South." *Social & Cultural Geography* 16 (1):1-21. doi: 10.1080/14649365.2014.932002.

- MacQuillan, E. L., *et al.* 2017. "Using GIS Mapping to Target Public Health Interventions: Examining Birth Outcomes across GIS Techniques." *Journal of Community Health* 42 (4):633-638. doi: 10.1007/s10900-016-0298-z.
- Mouratidis, Kostas. 2022. "Covid-19 and the Compact City: Implications for Well-Being and Sustainable Urban Planning." *Science of The Total Environment* 811:152332. doi: <https://doi.org/10.1016/j.scitotenv.2021.152332>.
- Pallathadka, A., *et al.* 2021. "Using GIS-Based Spatial Analysis to Determine Urban Greenspace Accessibility for Different Racial Groups in the Backdrop of Covid-19: A Case Study of Four Us Cities." *GeoJournal*:1-21. doi: 10.1007/s10708-021-10538-8.
- Reynard, Darcy. 2018. "Five Classes of Geospatial Data and the Barriers to Using Them." *Geography Compass* 12 (4):e12364. doi: doi:10.1111/gec3.12364.
- Roig-Tierno, Norat, *et al.* 2013. "Business Opportunities Analysis Using GIS: The Retail Distribution Sector." *Global Business Perspectives* 1 (3):226-238. doi: 10.1007/s40196-013-0015-6.
- Townley, Greg, *et al.* 2016. "Utilizing Participatory Mapping and GIS to Examine the Activity Spaces of Homeless Youth." *American Journal of Community Psychology* 57 (3-4):404-414. doi: 10.1002/ajcp.12060.
- Wang, Yaqi, and Qian Di. 2020. "Modifiable Areal Unit Problem and Environmental Factors of Covid-19 Outbreak." *Science of The Total Environment* 740:139984. doi: <https://doi.org/10.1016/j.scitotenv.2020.139984>.
- Wang, Zheyue, *et al.* 2019. "Are Vulnerable Communities Digitally Left Behind in Social Responses to Natural Disasters? An Evidence from Hurricane Sandy with Twitter Data." *Applied Geography* 108:1-8. doi: 10.1016/j.apgeog.2019.05.001.
- Ye, Hao, *et al.* 2014. "GIS for All: Exploring the Barriers and Opportunities for Underexploited GIS Applications." *OSGEO Journal* 13:19-28.