

Introduction to Geographic Information Systems

Fall 2024

University of Washington

Monday 3:30-4:50 PM, Physics/Astronomy Auditorium A114 (Lecture)

Friday 10:00-11:20 AM or 12:00-01:20 PM, Gould Hall 007F (Lab)

3 credits, graded

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Communication

We will stay for a few minutes after the class, which meets twice a week, to answer any student questions or concerns. This is the best way to communicate with us. Additionally, you are welcome to use weekly office hours. The third-best option is via email, and we will do our best to respond within three business days. Please send ALL emails to both Karen and Anna. This will maximize our response time and avoid duplicative responses. Due to the limitations in the Canvas messaging service (e.g., that prevent us from seeing if another person has responded), we ask that you do not use the Canvas messaging services for course-related communications. Canvas message responses may be delayed.

Course Description

Geographic Information Systems (GIS) are tools for managing data that represent the location of features (geographic coordinate data) and what they are like (attribute data); they also provide the ability to query, manipulate, and analyze those data. Because GIS allows one to represent social and environmental data on maps, it has become an important analysis tool used across a variety of fields, including planning, public health, emergency management, infrastructure management, business, and climate change mitigation. GIS has become an important political instrument allowing communities and regions to graphically tell their story. This course is meant to introduce students to the basics and give you an understanding of its possibilities. You will learn to define and resolve real-world problems using geospatial tools.

Course Learning Outcomes

At the conclusion of the course, students should be able to:

- Describe GIS data types
- Collect geospatial datasets from governments and citizens
- Develop an understanding of basic skills necessary to work with GIS, such as spatial and attribute queries, geoprocessing tools, table summaries, using ArcGIS
- Produce maps and diagrams using effective visualization and cartography concepts
- Apply GIS to decision-making issues in dealing with climate change, social justice, resource allocation, or emergency management
- Develop and execute methods to answer a spatial problem of your interest.

Course Prerequisites

No prerequisites

Class content

Instruction will consist of two 80-minute sessions each week. Each week, we will examine a specific GIS concept and its associated skills and applications. The first session will include a lecture, quiz, and reading discussion; the second session will include a hands-on computer lab exercise and work on the final project. The same topic will be explored with a hands-on exercise using ArcGIS Pro, focusing on real-world problems confronted by communities and governments. The final project is a challenge of city planning of the student group's choice.

Evaluation

- | | |
|----------------------|---------------------------|
| • Quiz | 15% (graded) |
| • Reading reflection | 20% (complete/incomplete) |
| • Lab exercise | 30% (graded) |
| • Midterm proposal | 10% (complete/incomplete) |
| • Final project | 25% (graded) |

Final project (group of four people):

Your city council or government members ask you, a planner, to prepare a policy report to address an issue that concerns the local residents and then provide them with some suggestions. This issue could be of your choice and any topic, including health, transportation, food, environment, infrastructure, etc., and it should be an urban planning and/or public policy issue. Students will work in teams (4 students per team).

Midterm presentation (group of four people): Present the research proposal for the final project, including the problem statement, proposed methods, and anticipated results. Six minutes presentation + Q&A.

Lab exercise reports (individual or group of two people):

The lab exercise reports should include written answers and figures (screenshots) to address the questions and should be submitted by group. The deadline for each of the four reports is shown in the class schedule below. For each student, the report earning the lowest points over the quarter will be excluded from the final grade calculation. You have the option to perform lab exercises individually or with another peer.

Reading reflections (individual): student should submit their reflections on the weekly readings on the Canvas's discussion board before Monday noon. Graded as complete and incomplete. You will earn 3.5 points for each on-time completed submission, until you earn 20 points over the quarter. That is, only one missing submission among the seven reading submissions will not affect your grade. For each of the weekly readings, the reflection should include:

URBDP 404 (Undergraduate)

- a point that you find interesting from the article, which can be regarding the methodology or the scientific finding. ~2 sentences.
- a question or a critique, such as the weakness of the method, a bias in the research design, or an alternative approach you would prefer to adopt for your own research. ~2 sentences.

URBDP 504 (Graduate)

- Same as URBDP 404
- Plus, pick one article from the weekly readings that you find resonates the most with your study conceptually or methodologically, and write a paragraph (~200 words) to discuss its relevance to your work.

Late Policy

Reflections are graded on a complete or incomplete basis, with late submissions not permitted. However, missing a single reflection will not impact your grade. The final project builds on the skills practiced in lab assignments, and includes a midterm presentation to ensure progress. We strongly recommend starting on your lab exercise and final project early to avoid last-minute challenges preventing timely submission. In the event that you are unable to submit your lab report or final paper on time, a late policy, 10% of the score deduction each day, will be enforced to ensure fairness to other students. The lowest grade among all lab reports will be excluded from the calculation

of your final grade. We also recognize that some challenges are simply insurmountable, for example, physical or mental illness or a family emergency. If you foresee further accommodations needed, we encourage you to use the Disability Resources for Students (DRS) at disability.uw.edu.

Grade conversion

This table describes how numeric grades (out of 100) will convert to the 4.0 grade scale for the class.

Grade point	Minimum score
4	98
3.9	96.5
3.8	95
3.7	93.5
3.6	92
3.5	90.5
3.4	89
3.3	87.5
3.2	86
3.1	84.5
3	83
2.9	81.5
2.8	80
2.7	78.5
2.6	77
2.5	75.5
2.4	74
2.3	72.5
2.2	71
2.1	69.5
2	68
1.9	66.5
1.8	65
1.7	63.5
1.6	62
1.5	60
0	<60

Class schedule

Week	Topic	Lab
1	September 30 Introduction to GIS	October 4 Lab 0: Create your first map in GIS! <i>No submission</i>
2	October 7 Cartography and Map Design	October 11 Lab 1: Pollution Concerns in the Duwamish Watershed (Land Use Data: Tables, Joining, and Querying)
3	October 14 Spatial Data - Types, Structures, and Representation	October 18 Lab 2: Education Center in Coastal Areas (Projection and Quantitative Mapping: U.S. Census and other Data Source)
4	October 21 Spatial Analysis	October 25 Lab 3: 15-minute City and Equity (Geoprocessing and Vector Data Analysis)
5	October 28 Quantitative Mapping: Census Data	November 1 Midterm Preparation
6	November 4 Guest talk: "Indian Health Service and GIS" from Dylan Stevenson	November 8 Midterm Presentation <i>Midterm proposal due on November 7</i>
7	November 11 Veterans Day (No Class)	November 15 Lab 4: Black Church Site Recommendations (Model Builder)
8	November 18 Remote Sensing	November 22 Lab 5: Extreme Heat Exposure and Vulnerability (Raster Data and Decision Support Analysis)
9	November 25 Geocoding and Address Finding	November 29 Native American Heritage Day (No class)

	Lab 6: Food Dessert and Public Health (Geocoding and Create Spatial Data)	
10	December 2 Final Project Preparation	December 6 Final presentation <i>Final project due on December 5</i>

Weekly Readings

All course readings except news articles are provided on [Canvas](#) under “Files”. Click the link below to access news articles. The textbook material is optional, not required reading, and is not included in the reflection assignment.

Week	Topic	Readings
1	September 30 Introduction to GIS	Plumer & Popovich, 2020, How Decades of Racist Housing Policy Left Neighborhoods Sweltering . The New York Times. (No submission of reflection is required for this week. We'll discuss it in class) Textbook optional: Longley et al., Chapter 1 Geographic Information: Science, Systems, and Society, <i>Geographic Information Science & Systems</i> .
2	October 7 Cartography and Map Design	Bui, Miller and Sanger-Katz, 2022, How Abortion Bans Will Ripple Across America , The New York Times. Kiln.it, 2014, " Carbon Map – Which Countries are Responsible for Climate Change? ", the Guardian. Textbook optional: Maantay and Ziegler, Chapter 1 Basics of Mapping and GIS. <i>GIS for the Urban Environment</i> .
3	October 14	Zandbergen & Hart. 2006. Reducing Housing Options for Convicted Sex Offenders: Investigating the Impact of

	Spatial Data - Types, Structures, and Representation	<p>Residency Restriction Laws Using GIS. <i>Justice Research and Policy</i>.</p> <p>Bui et al., 2016, "40 Percent of the Buildings in Manhattan Could Not Be Built Today", the New York Times.</p> <p>Textbook optional:</p> <p>Maantay and Ziegler, Chapter 2 Modeling Spatial Data and Basic Mapping Concepts.</p>
4	<p>October 21</p> <p>Spatial Analysis</p>	<p>Bruno et al. 2024. A Universal Framework for Inclusive 15-minute Cities. <i>Nature Cities</i>, 1-9.</p> <p>Mokrech et al. 2012. Scenarios of Future Built Environment for Coastal Risk Assessment of Climate Change using a GIS-based Multicriteria Analysis. <i>Environment and Planning B: Planning and Design</i>.</p> <p>Textbook optional:</p> <p>Maantay and Ziegler, Chapter 9 Methods of Spatial Data Analysis.</p>
5	<p>October 28</p> <p>Quantitative Mapping and Census Data</p>	<p>Badger 2018, A Census Question That Could Change How Power Is Divided in America, the New York Times.</p> <p>Zhang et al. 2022. Associations between Nighttime Light and COVID-19 Incidence and Mortality in the United States. <i>International Journal of Applied Earth Observation and Geoinformation</i>.</p> <p>Textbook optional:</p> <p>Maantay and Ziegler, Chapter 6 Source of Urban Data.</p> <p>MacDonald & Peters. (2011). Urban policy and the census. <i>Esri Press</i>.</p>
6	<p>November 4</p> <p>Guest talk: "Indian Health Service and GIS" from Dylan Stevenson</p>	<p>Dennis et al., 2016, An Urban American Indian Health Clinic's Response to a Community Needs Assessment. <i>American Indian and Alaska native mental health research</i>.</p>

		<p>Kim et al., 2018, Enhancing Healthcare Accessibility Measurements using GIS: A case study in Seoul, Korea. <i>PloS one</i>.</p> <p>Optional:</p> <p>Lujan, 1990. As Simple as One, Two, Three: Census Underenumeration among the American Indians and Alaska Natives. Center for Survey Methods Research, Bureau of the Census.</p>
7	<p>November 11</p> <p>Veterans Day (No Class)</p>	No readings
8	<p>November 18</p> <p>Remote Sensing</p>	<p>Chen et al. 2023. Higher Depression Risks in Medium- than in High-Density Urban Form across Denmark. <i>Science Advances</i>.</p> <p>Rusk, 2022, "Across Currents", in Urban Omnibus.</p> <p>Textbook optional:</p> <p>Burke et al. 2021. Using Satellite Imagery to Understand and Promote Sustainable Development. <i>Science</i>.</p>
9	<p>November 25</p> <p>Geocoding and Address Finding</p>	<p>Richardson et al. 2017. Can the Introduction of a Full-service Supermarket in a Food Desert Improve Residents' Economic Status and Health? <i>Annals of epidemiology</i>.</p> <p>Ortega-Avila, A. G. 2023. Spatial Patterns and Health-Based Characterization of the Retail Food Environment in Mexico City. <i>Applied Spatial Analysis and Policy</i>.</p> <p>Textbook optional:</p> <p>Maantay and Ziegler, Chapter 7 Mapping Databases.</p>
10	<p>December 2</p> <p>Final Project Preparation</p>	No reading

Access and Accommodations

Your experience in this class is important to us. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course. If you have not yet established services through DRS but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at disability.uw.edu.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](#). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form](#).

Use of Generative Artificial Intelligence in Coursework

The school has provided instructors with the flexibility to develop their own policies for appropriate use of AI for student's coursework. I view AI as part of the evolution of tools that we can choose to be well-intentioned to improve science and communication. There are potential benefits of using AI tools (e.g., ChatGPT) for various purposes, including but not limited to troubleshooting coding issues, searching for functions or tools, exploring literature content, checking grammar errors, and improving writing. Students who choose to use generative AI tools for their assignments are fully responsible for the output of their work. This means they should verify the accuracy of the information and reflect potential errors, fake content, or biases generated by the AI tools. Users should also be aware that inputs to AI tools may be used for the company's future purposes. It is important to avoid misconduct, including the submission of copyrighted, confidential, or personally identifiable information to these AI tools, as it grants permission to the AI company for using these contents. Also note that the use of Chat-GPT and similar tools does not alleviate the need to cite sources and references in your writing. Provide a statement on components that AI was used if you choose to use AI tools for the final paper. Whether using AI or not will not affect the standard of grading.

Academic Integrity

Students at the UW are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. UW is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, misuse of AI tools, and other misconduct are serious violations of [the University of Washington Student Conduct Code](#) (WAC 478-121). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the [University of Washington Community Standards and Student Conduct](#).

Land Acknowledgement

The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip, and Muckleshoot nations.

Illness Protocol

If you feel ill or exhibit respiratory or other symptoms, you should not come to class. Seek medical attention if necessary and notify your instructor(s) as soon as possible by email. UW Environmental Health & Safety recommends that you wear a well-fitting mask while you are symptomatic

Additional recommendations include getting your [annual flu shot](#) and getting boosted with the updated COVID vaccines (available at [clinics and pharmacies, as well as through UW Medicine](#) and local health agencies).

Please check your email and CANVAS announcements daily BEFORE coming to class. If we need to conduct class remotely because the instructor or a guest speaker is unable to attend in person, we will send all registered students an email and/or post a CANVAS announcement with a Zoom link for remote instruction or a plan for making up the class.

Inclusion & Diversity

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, we are expected:

To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.

To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.

To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.

Classroom Climate

We are co-creators of our learning environment. It is our collective responsibility to develop a supportive learning environment for everyone. Listening with respect and an open mind, striving to understand others' views, and articulating your own point of view will help foster the creation of this environment. We engage our differences with the intent to build community, not to put down the other and distance our self from the other. Being mindful to not monopolize discussion and/or interrupt others will also help foster a dialogic environment.

The following guidelines can add to the richness of our discussion:

We assume that persons are always doing the best that they can, including the persons in this learning environment.

We acknowledge that systematic oppression exists based on privileged positions and specific to race, gender, class, religion, sexual orientation, and other social variables and identities.

We posit that assigning blame to persons in socially marginal positions is counter-productive to our practice. We can learn much about the dominant culture by looking at how it constructs the lives of those on its social margins.

While we may question or take issue with another class member's ideology, we will not demean, devalue, or attempt to humiliate another person based on her/his experiences, value system, or construction of meaning.

We have a professional obligation to actively challenge myths and stereotypes about our own groups and other groups so we can break down the walls that prohibit group cooperation and growth.

[Adapted from Lynn Weber Cannon (1990). Fostering positive race, class and gender dynamics in the classroom. *Women Studies Quarterly*, 1 & 2, 126-134.]

We are a learning community. As such, we are expected to engage with difference. Part of functioning as a learning community is to engage in dialogue in respectful ways that supports learning for all of us and that holds us accountable to each other. Our learning community asks us to trust and take risks in being vulnerable.

Pronouns

We share our pronouns because we strive to cultivate an inclusive environment where people of all genders feel safe and respected. We cannot assume we know someone's gender just by looking at them. So we invite everyone to share their pronouns if you are comfortable with it.

Bias Concerns

Our 2018 climate survey states that most people in SPH do not report bias incidents because they do not know where to go. Students are encouraged to report any incidents of bias to someone they feel comfortable with, including instructors, advisers or department staff. They can email dcinfo@uw.edu for immediate follow up. Bias concerns can be anonymously and confidentially reported via the online form found here: <https://sph.washington.edu/about/diversity/bias-concerns>.

Sexual Harassment

Sexual harassment is a form of harassment based on the recipient's sex that is characterized by: Unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature by a person who has authority over the recipient when:

Submission to such conduct is an implicit or explicit condition of the individual's employment, academic status, or ability to use University facilities and services, or submission to or rejection of the conduct affects tangible aspects of the individual's employment, academic status, or use of University facilities.

Unwelcome and unsolicited language or conduct that creates an intimidating, hostile, or offensive working or learning environment, or has the purpose or effect of unreasonably interfering with an individual's academic or work performance. These are not acceptable.

If you have experienced sexual harassment, gender discrimination, including sexual assault, relationship or intimate partner violence, stalking, or other sexual misconduct during or outside the class, you have the right to make a formal complaint and request an investigation under Title IX. Information about Title IX reporting options is available at <https://www.washington.edu/titleix/report/>. The University also has other designated offices to help you avoid and/or report sexual harassment: SafeCampus (<https://www.washington.edu/safecampus/>); Office of the Ombud (<https://www.washington.edu/ombud/>); and University Complaint Investigation and Resolution Office (<https://www.washington.edu/uciro/>).