

Mapping Our Worlds: Spatial Analysis and Communication with Geographic Information Systems

Global Development 3140/5140

Instructor

Lecture: Mondays and Wednesdays, 10:10am-11:00am, B02 Warren Hall

Lab: Fridays, 10:10am-12:05pm, B30A Mann Library

Office Hours: Wednesdays, 11:10-1:00pm or by appointment

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How things are related in space matters for many things – where different groups live and work, who faces health hazards, how people experience the places they live in, and more. Maps are powerful tools because they help us recognize things we might not otherwise see – and because they present pictures of the world that people act upon to pursue goals. In this class we learn how to conduct spatial analyses and make maps, shouldering the responsibility entailed by the power maps can confer. In-class lectures and activities will provide conceptual and technical foundations for spatial analysis and cartography. Lab sessions and assignments will give a practical introduction to using GIS software to map and analyze spatial patterns.

By the end of the semester, you will be able to

- Explain conceptual issues and choices involved in making maps and understanding phenomena that take place across space.
- Use GIS software to implement data management and spatial analysis operations.
- Use GIS software to create informative maps and justify your choices in displaying information on those maps.
- Gather data, conduct an analysis, and present findings regarding a spatial phenomenon.

Additionally, graduate students will be able to

- Discuss and apply key concepts in social scientific work on mapping and spatial analysis.
- Frame research questions on phenomena with spatial dimensions, conduct analyses, and report findings in ways that reflect advanced reasoning and build on conversations within their discipline.

Note: We are constantly on the lookout for materials that are current and helpful to you. As a result, this syllabus may change at the instructor's discretion.

Required Texts

You are strongly encouraged to obtain hard copies. These are references that you will want to have on hand to access in the future. Electronic texts do not come with a guarantee of indefinite availability. If using an electronic version, it is your responsibility to find the pages indicated in the syllabus.

GIS Fundamentals, 7th ed. Paul Bolstad and Steven Manson

Making Maps: A Visual Guide to Map Design for GIS, 3rd ed. John Krygier and Denis Wood.

Course Components

- Lectures** Course lectures emphasize thinking about space and how human activities are spatially situated, introduce key concepts for GIS, work through GIS tools, and include time for discussion. Students who attend, take notes, and ask questions in class and in office hours tend to excel!
- Readings** Most readings come from *GIS Fundamentals*, by Paul Bolstad and Steven Manson. We will post additional readings on Canvas. *Graduate students are assigned an additional one to two readings each week, relating to that week's themes. You are strongly encouraged to read texts before we meet in lecture. If you use an e-book or a different edition, it is your responsibility to find the assigned sections.*
- Discussion Board** *Graduate students only.* Each week, you will post at least one contribution to a Canvas discussion board, discussing the additional reading for that week. Details will be provided in class.
- Map/Tool Share** Once in the semester each student will share a mapping application they have found outside course materials: either a map or a GIS tool. For maps, you will explain what the map shows and discussing the choices it represents. For tools, you'll share how the tool works and what it helps you do. Details will come in a handout.
- Quizzes** We will have occasional quizzes in class or on Canvas. Quizzes may focus on lecture and reading material covered that week, as well as key concepts or techniques covered earlier. There may or may not be advance notice. Your lowest quiz grade (including 0 credit for quizzes you miss) will be dropped.
- Labs** During lab sessions, you will apply GIS concepts and techniques using QGIS (available at <https://www.qgis.org/download/>; version 3.34 suggested). Lab assignments are due at 11:59pm the following Monday. Late labs will lose 5% grade credit each day afterward.
- GIS notebook** The GIS notebook may be a physical notebook with hand-written notes or a word processor document. Over time, you will record commands, tools, tips, tricks, or procedures that you find useful either for conceptualizing or carrying out the lab assignment. By the end of the course, it will serve as a personal QGIS user manual.
- Final Project** For your final project, you will identify a question or issue that the tools we learn in this course can address. You will apply several of these tools to conduct an analysis that addresses that question, writing a report and creating map representations that illustrate what you did. You will present your findings to the class. Graduate students will be required to write in a research paper format and engage at a higher level with published scholarship.

The Numbers

NOTE: DO NOT rely on the automatic calculation in Canvas, which will not accurately reflect your grade. To calculate your grade, use the figures below. We will periodically provide estimates of your current total grade on Canvas.

Item	Proportion (Undergraduate)	Proportion (Graduate)
Map or Tool Share	5	5
Quizzes	15	15
Labs	40	30
GIS Notebook	15	10
Discussion		15
Final Project (several assignments)	25	25
Total	100%	100%

Making a Good Learning and Teaching Environment

We want to foster a classroom environment that facilitates your learning. That requires that all students have a fair chance to pay attention and take part in dialogue. We have put together these class policies based on our experiences of what does and does not help.

Course Citizenship. We want this to be a place where everybody can share their reasoning and experiences so that together we can come to fuller understanding. To do this, we need to facilitate discussion well, and you need to participate mindfully. We expect you to make a good faith effort to listen and express yourself in ways that build other people up. That includes making it known when something said in class strikes you as hurtful or harmful. It also includes being willing to let your own assumptions be questioned. At any time, please let us know if you think we could do better.

Communication. We want to help you succeed, and for that to happen, we need open lines of communication. Do not hesitate to reach out to us in person or through email. We will provide notifications through email and Canvas; please check both regularly. We promise to communicate clearly and with courtesy, and we expect the same of you. We will do our best to respond to emails within 48 hours. It will be easiest to reach us during work hours (8am-5pm weekdays). On nights and weekends we may be harder to reach due to commitments outside of work. *To ensure that we promptly identify and address your email, please include the text "GDEV 3140" in the header.*

Office Hours. We will hold in-person office hours during the times listed. If you need to meet outside scheduled office hours, email us to make an appointment. *If you have questions about content or assignments, please ask them during class so everyone can benefit from clarification.*

Lecture Slides. We will post lecture slides on Canvas about once a week. These slides provide a broad outline; being attentive and taking notes in class will help you retain what we cover.

Missing Class. We understand that there are health and personal situations that can cause you to have to miss class, sometimes on very short notice. Generally, it will be up to you to work with a classmate to catch up on material you have missed. If you are in a situation that causes you to miss more than a week of class, please communicate with us about that, and we will work with you.

Labs & Computing

Lab & Computer Access. Scheduled labs will take place in B30A Mann Library. We will primarily use open-source software that you can add to your own device for free, including QGIS and GeoDA. QGIS is also available on computers in labs within Mann Library and at other locations on campus.

Data Backup. *You should have a backup system (memory stick, external hard drive, or cloud storage) on which to back up all your class work.* If you use Box, it will help to set up Box Sync or have all your data in a single folder. You are responsible for the loss of any work that is not backed up.

Extra Credit Policy

Out of concern for fairness, we do not offer extra credit. An activity that merits grade credit necessarily requires time and effort. Not all students have time available. As a result, extra credit opportunities bring a bias in favor of students who can take extra time. Since this luxury isn't available to all, we aim to give everyone a reasonable chance to do well by meeting the evaluation criteria within this syllabus.

On Artificial Intelligence

One of the most rewarding things about a class like this is that you learn how to do things yourself. It can be really empowering to know how something challenging works! AI can be useful in making maps and performing spatial analyses. But if you don't know what it's doing, you can't be accountable for what you produce, and you could produce serious mistakes. You are allowed to use AI to learn new tools. But in making maps and doing analyses, you may be asked to explain every step you take. Build your own capability so that you will be less likely to be fooled by AI.

AI is not permitted for use in any writing. We consider this use of AI plagiarism and in violation of academic honesty. If you need support in building your writing skills, we can provide resources.

Meeting Your Needs

Students with Disabilities: Your access in this course is important to me. If you have, or think you may have a disability, please contact Student Disability Services for a confidential discussion: sds_cu@cornell.edu, 607-254-4545, <https://sds.cornell.edu>. Please request your accommodation letter early in the semester, or as soon as you become registered with SDS, so that we have adequate time to arrange your approved academic accommodations.

Once SDS approves your accommodation letter, it will be emailed to both you and Professor Zinda. Please follow up to discuss the necessary logistics of your accommodations. If you experience any access barriers in this course, such as with printed content, graphics, online materials, or any communication barriers, reach out to me or your SDS counselor right away. If you need an immediate accommodation, please speak with me after class or email me and SDS at sds_cu@cornell.edu.

Maps are an intensely – though not exclusively – visual medium. This presents special difficulties for ensuring accessibilities for students with visual disabilities. With the guidance of Student Disability Services and the Center for Teaching Innovation, we have worked to implement accessibility measures wherever we are able, given the limitations of available resources for tactile and haptic images in online instruction. This is a work in progress. If we are not adequately meeting your needs, please notify us, and we will work with you to ensure full accessibility.

If you are experiencing undue personal or academic stress at any time or need to talk with someone about a personal problem or situation, we encourage you to seek support as soon as possible. We are

available to talk with you about stresses related to your work in our class. Additionally, we can assist you in reaching out to any one of a wide range of campus resources, including

- Your college's Academic Advising or Student Services Office
- Cornell Learning Strategies Center at 255-6310, <http://lsc.cornell.edu>
- Cornell Health at 255-5155, <https://health.cornell.edu/>
- Peer Support - Empathy Assistance & Referral Service at 255-EARS, <https://www.earscornell.org/>

At Cornell, we use an academic support practice called “Academic Concern,” which is designed for all students across every college in the university. It serves as a communication bridge among you, your instructors, and your [college academic advising office](#) that prompts outreach to support you when, for example, an exam didn't go as planned or if you've missed several classes (especially when those absences can affect your grade).

Here's how it works: If one of your instructors notices you might need academic support, they let your college advising office know. The office will then invite you to [schedule a meeting](#) with an advisor so you can be proactive in planning to keep your academics on track. They'll also point you to valuable campus resources to help you improve your learning.

Keep in mind that if we submit an Academic Concern, it's not because you're in trouble or have done something wrong. It's simply a way for us to make sure you're getting the support you need when you need it to be successful in this course.

Academic Integrity

Students are expected to follow Cornell University's [Code of Academic Integrity](#). Violations of the Code such as plagiarism (from any source, including fellow classmates) can result in failure or even expulsion from Cornell. Group work should summarize each student's contribution.

Schedule

Date	Class	Topic
Week 1	1	Getting Started. Intro: What's a map?
	2	Maps as Models, Maps as Propositions
	3	Lab 1: Intro to Lab & QGIS
Week 2		NO CLASS
	4	Introduction to Map Making
	5	Lab 2: Creating Map Displays
Week 3	6	Data Structures: Vector
	7	Data Structures: Raster
	8	Lab 3: Exploring Data Structures
Week 4	9	Geodesy and Datums
	10	Projections and Coordinate Systems
	11	Lab 4: Projections and Coordinate Systems
Week 5	12	Data Creation
	13	Data Collection: GNSS
	14	Lab 5: Data Creation
Week 6	15	Attribute Data Structures
	16	Data Quality
	17	Lab 6: Data Attribution
Week 7	18	Data Query and Description
	19	Distance and Buffer
	20	Lab 7: Basic Analytical Tools
Week 8		NO CLASS
	21	Map Overlay
	22	Lab 8: Overlay and Buffer
Week 9	23	Space, Place, and Social Life
	24	Working with Rasters
	25	Lab 9: Working with Rasters
Week 10	26	Overlay for Problem Analysis
	27	Dealing with Incompatible Data Layers
	28	Lab 10: Mapping Pollution Risks
Week 11	29	Network Analysis
	30	Guest Speaker
	31	Lab 11: Network Analysis
Week 12	32	Counter-Mapping 1
	33	More Cartography
	34	Lab 12: Consolidating Cartographic Skills
Week 13	35	Counter-Mapping 2
	36	Counter-Mapping 3
	37	Lab 13: Project Work
Week 14	38	Project Work
		NO CLASS
Week 15	39	Project Work / Presentations
	40	Presentations
	41	Presentations during lab time
Week 16	42	New Horizons