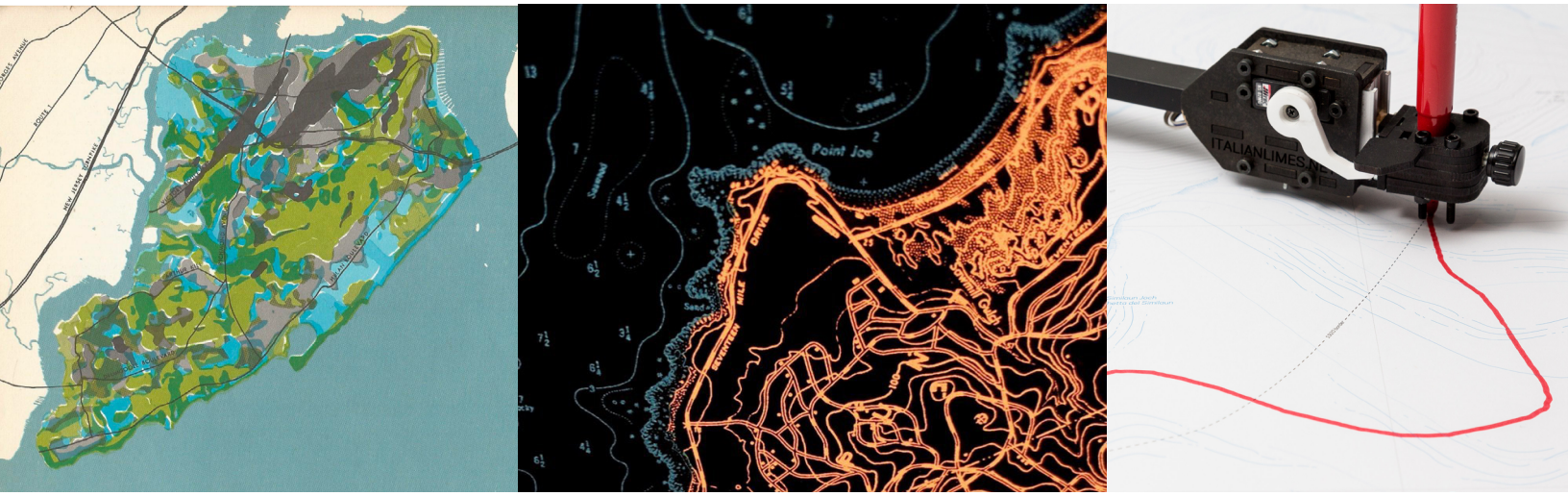
GIS for Design Practices



From left: Ian McHarg, *Design with Nature*, 1970; Evan Applegate, *Radiant Maps*, 2025; Studio Folder, *Italian Limes*, 2014.

Fridays 11-1 @ 408 Avery Hall

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Introduction

GIS for Design Practices will introduce GSAPP students to mapping concepts and techniques, including finding, creating, manipulating, and representing spatial information.

This course is focused on the use of spatial methods and cartography as part of the toolset of designers. The thoughtful use of spatial data can reveal previously unseen patterns, change the way we see our world, and transform understandings of initial site conditions. However maps are never just representations, they are nearly always active agents in shaping the worlds they describe. Geographic analysis can define the baseline of what is considered or excluded – and when used by designers of the built environment, what is possible and what is not possible.

This course engages with this agency of maps directly in hands-on workshops covering the technical skills required to use maps as both tools for research and design-based interventions. Likewise the course will focus throughout on fostering a deep understanding of the promises, as well as the limitations of GIS-based methods.

This course is organized in three sections:

- **Data in/& Design**, which provides an introduction to geographic information systems (GIS), data types, and spatial qualities of data
- **Spatial Concepts** and spatial relationships between datasets
- Modes of **Representation**, including both static and interactive data visualizations

Learning Objectives

After completing the course participants will:

- Develop robust familiarity with GIS-based workflows through QGIS
- Gain fluency with foundational GIS concepts (including how the GIS data model abstracts geographic phenomena)
- Understand GIS spatial data types, the kinds of analysis that are possible with each, and where to find spatial data
- Develop familiarity with concepts of spatial analysis including proximity and overlay operations
- Acquire fluency with visual design concepts central to cartographic representations, as well as fluency with practical workflows between GIS environments and design softwares
- Develop basic fluency with the design and creation of online interactive maps

Assignments and Expectations

This is a project-based seminar course for which students are expected to produce original work and contribute to class discussions.

The final product of this course will be an atlas that students will develop over the course of the semester. More information about the final project can be found here. Aside from the final project deliverable, four assignments that build toward the final project deliverable will be completed and presented during pinups.

Students will also be expected to participate in and prepare for class discussions through completion of assigned readings and tutorials, and delivering a short presentation on a map precedent once during the semester. More information about expectations for specific class sessions can be found below and full course requirements are outlined after the course schedule.

Course Overview

Date	Week	Topic	Tutorial Deadline	Assignment Deadline
	Data in/& Design			
9/5	1	Introduction		
9/12	2	Data Types & Finding Data	Tutorial 1: Intro	
9/19	3	Projections	Tutorial 2: Data & Symbols	Assignment 1 pin-up
9/26	4	Making Data	Tutorial 3: Projections	**Initial project proposal**
	Spatial concepts			
10/3	5	Spatial concepts 1: Geoprocessing	Tutorial 4: Making Data	Assignment 2 pin-up
10/10	6	Spatial concepts 2: Distance	Tutorial 5: Geoprocessing	
10/17	7	Spatial concepts 3: Raster Analysis	Tutorial 6: Distance	Assignment 3 pin-up
	Representation			
10/24	8	Web Mapping 01	Tutorial 7: Raster Analysis	**Final project proposal**
10/31	9	Final Project Workshop & Desk Crits	Tutorial 8.1: Interactive Maps	
11/7	10	Web Mapping 02		
11/14	11	Representation + Workshop	Tutorial 8.2: Interactive Maps	Assignment 4 pin-up
11/21	12	**Final Review**		

Website

Please see the class website at designpractices.org for all assignments and final reading list.

Schedule & Readings

Data in/& Design

Week 01 / September 05: Introductions

Students will learn about course expectations and be introduced to mapping as a creative and generative process. The final project will be discussed. Students will sign up for their precedent map presentation.

Readings:
None

Week 02 / September 12: Data Types & Finding Data

We will introduce vector and raster data types, and the advantages and disadvantages of each as conceptual models of the world and for analysis.

Readings:
Corner, James. "The Agency of Mapping." 2014.

Couclelis, Helen. "People Manipulate Objects (but Cultivate Fields): Beyond the Raster-Vector Debate in GIS." 1992.

Week 03 / September 19: Projections

Assignment 1 pin-up

Students will discuss projections and the ways that coordinate reference systems influence how we conceive of and map the world.

Readings:
Bolstad, P., 2019. Geodesy, Datums, Map Projections, and Coordinate Systems, in: GIS Fundamentals: A First Text on Geographic Information Systems. XanEdu, Ann Arbor, MI.

Optional: Steward, H.J. , 2015. Projections Used for Military Grids, in: History of Cartography, Volume 6: Cartography in the 20th Century. University of Chicago Press.

Week 04 / September 26: Making Data

This class will focus on traditional and novel ways of producing the data that we use to make maps.

Readings:
Ferrari, Marco, Elisa Pasqual, Alessandro Busi, Aaron Gillett. ***A Moving Border: Alpine Cartographies of Climate Change*** [Selections]. 2019 - also review project website: Folder. *Italian Limes*. 2014

Williams, Sarah, Jacqueline Klopp, Daniel Orwa, Peter Waiganjo, and Adam White. "Digital Matatus: Using Mobile Technology to Visualize Informality." 2015.

Spatial Concepts

Week 05 / October 03: Spatial Concepts 01: Geoprocessing

Assignment 2 pin-up

This class will cover fundamental spatial analysis concepts and techniques, illustrating how to explore spatial relationships between data.

Readings:
McHarg, I., 1970. Processes as Values, in: Design with Nature. Wiley, New York, pp. 102–115.

Shelton, T., 2018. Rethinking the RECAP: mapping the relational geographies of concentrated poverty and affluence in Lexington, Kentucky. Urban Geography 39, 1070–1091. https://doi.org/10.1080/02723638.2018.1433927

Week 06 / October 10: Spatial Concepts 02: Distance

Discussion will focus on the ways in which we measure distance and the varying ways in which distance is experienced.

Readings:
Etherington, T.R., 2016. Least-Cost Modelling and Landscape Ecology: Concepts, Applications, and Opportunities. Curr Landscape Ecol Rep 1, 40–53. https://doi.org/10.1007/s40823-016-0006-9

Optional: Crawley, H., Jones, K., 2021. Beyond here and there: (re)conceptualising migrant journeys and the 'in-between.' Journal of Ethnic and Migration Studies 47, 3226–3242. https://doi.org/10.1080/1369183X.2020.1804190

Precedents:
Read and review representations and narratives from the following research efforts:

The Journeys Project at Tufts: Mapping Migrant Journeys

Crossing the Darien Gap, Council on Foreign Relations

The Complex Motivations and Costs of Central American Migration

Week 07 / October 17: Spatial Concepts 03: Raster Analysis

Assignment 3 Pin-up

In this class we will return to raster analysis techniques and consider how satellite sensing informs our understanding of terrestrial issues.

Readings:
Kurgan, Laura. "Mapping Considered as a Problem of Theory and Practice." 2013.

Emily Badger and Quoctrung Bui, "A Decade of Urban Transformation, Seen From Above," The New York Times, December 27, 2019, sec. The Upshot.

Plumer, Brad, Nadja Popovich, and Brian Palmer. 2020. "How Decades of Racist Housing Policy Left Neighborhoods Sweltering." The New York Times, August 31, 2020, sec. Climate.

Columbia University Libraries provides access to NYTimes.com for all students. Please see instructions on the course website to set up an account

Please also review from week 2: Couclelis, Helen. "People Manipulate Objects (but Cultivate Fields): Beyond the Raster-Vector Debate in GIS." 1992

Representation

Week 08 / October 24: Web Mapping 01

This class will provide a brief history of the World Wide Web and interactive mapping before turning to modern usage of interaction for storytelling.

Readings:
Berners-Lee, T., Cailliau, R., Groff, J., Pollermann, B., 1992. World-Wide Web: The Information Universe. Internet Research 2, 52–58. https://doi.org/10.1108/eb047254

Precedents
Please read these map-based articles from the New York Times:

Raymond Zhong and Mira Rojanasakul, "How Close Are the Planet's Climate Tipping Points?" New York Times, August 11, 2024.

Serkez, Yaryna. "Opinion: Every Place Under Threat." The New York Times, October 2, 2020, sec. Opinion.

Columbia University Libraries provides access to NYTimes.com for all students. Please see instructions here to set up an account

Week 09 / October 31: Desk Crits & Final Project Workshop

Students will workshop their final project with peers and meet with the instructors in desk crits. Attendance is mandatory for the full class period.

Week 10 / November 07: Web Mapping 02

This class will close the feedback loop by focusing on how web maps can be used to organize or solicit engagement.

Readings:
Crampton, J.W., 2003. The History of Internet Mapping, in: The Political Mapping of Cyberspace. Edinburgh University Press, pp. 27–47.

Week 11 / November 14: Additional Topics in Representation

Assignment 4 Pin-up

This session will be used to conduct a feedback workshop on assignment 4 and discuss representational approaches. Topics on how mapping techniques can be used across (and between) design disciplines and workflows will be discussed.

Readings:
Desimini, Jill, and Charles Waldheim. "Introduction: Projecting the Landscape Imaginary." 2016.

Week 12 / November 21: Final Presentations

Requirements

Attendance & engaged participation (20%) Attendance at all class sessions is required. You are expected to bring your engaged and generous participation to class discussions and in critique workshops with your peers.

Additionally you will prepare a brief (2-3 minute) presentation on a precedent map/project once during the semester.

Tutorials (30%)

Skills-focused weekly tutorials are required and will expose you to multiple methods for engaging with spatial data. Tutorials include step by step instructions and are graded on completion (not accuracy).

Assignments (20%)

Four assignments that build toward the final project deliverable will be completed and presented during pinups. These assignments will allow you to apply the skills acquired via tutorials and begin to experiment with creative applications of spatial methods. For each assignment a description will be distributed 1 week before it is due.

Final Project (30%)

The final product of this course will be an atlas that students will develop over the course of the semester. There will be two interim deliverables for the final project and a final presentation. More information about the final project can be found here.

Software

Geographic Information Systems is not a software. As such this course will not seek to provide students with proficiency in a particular software platform.

Tutorial resources will be primarily provided for QGIS. This is an open source software program for geographic analysis that runs on Windows, Mac, and Linux operating systems. All students will be expected to download and install QGIS (LTR). Documentation for QGIS is available here, and a training manual with good basic tutorials is available here and an introduction to GIS methods using QGIS is available here.

Information regarding other GIS softwares will be provided in course resources.

Academic Integrity

Columbia University Academic Integrity Statement: The intellectual venture in which we are all engaged requires of faculty and students alike the highest level of personal and academic integrity. As members of an academic community, each one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity.

Scholarship, by its very nature, is an iterative process, with ideas and insights building one upon the other. Collaborative scholarship requires the study of other scholars' work, the free discussion of such work, and the explicit acknowledgement of those ideas in any work that inform our own. This exchange of ideas relies upon a mutual trust that sources, opinions, facts, and insights will be properly noted and carefully credited.

In practical terms, this means that, as students, you must be responsible for the full citations of others' ideas in all of your research papers and projects; you must be scrupulously honest when taking your examinations; you must always submit your own work and not that of another student, scholar, or internet agent. Any breach of this intellectual responsibility is a breach of faith with the rest of our academic community. It undermines our shared intellectual culture, and it cannot be tolerated. Students failing to meet these responsibilities should anticipate being asked to leave Columbia.

For more information on academic integrity at Columbia, students may refer to the Columbia University Undergraduate Guide to Academic Integrity as well as the GSAPP Honor System and Plagiarism Policy.

Use of AI in this course

Large language models are a new and rapidly developing resource that can be very handy when learning new technical skills. Any use of LLMs or other AI software for your work in this course must be disclosed and cited as you would with any other source. See citation guidelines for LLMs from the University of Minnesota Libraries here. Failure to cite the use of LLMs will be considered equivalent to plagarism. For more on Columbia's AI policy see here

Community & Accessibility

This is a discussion and collaborative-critique based course. All students and the instructor must be respectful of others in the classroom. If you ever feel that the classroom environment is discouraging your participation or is problematic in anyway please contact me.

GSAPP is committed to full inclusion of all students. Students needing any form of accommodation due to a disability should check in with Disability Services (DS) and speak with me at the beginning of the semester to provide the accommodations letter from DS. Alternatively you may ask your advisor to consult with me regarding your accommodations.

Communication / Office Hours

Office Hours

Appointments for office hours will be available via Calendly for ease of scheduling. If you have a conflict with the available meeting times on calendly please email the instructors.

Email Policy

Please always send emails with both instructors cc'd.

Students should not rely on or expect an immediate response to questions sent via email to the instructors. Please begin assignments with enough time to attend office hours or ask a question several days before the assignment is due.

Learning how to troubleshoot technical issues and locate relevant resources is crucial in your long-term success with GIS methods. With this in mind emails with technical questions must at a minimum contain the following:

- a clear description of what you are trying to do, and what the problem is
- a summary of the steps you have already taken to address the issue
- screenshots (where applicable) that help to explain the problem
- a link to at least one resource you consulted for assistance with the issue before writing the email. The QGIS docs is a good starting place as is GIS Stack Exchange.