
Geographic Information Systems

Columbia University GSAPP PLANA4577 & A4578
Wood Auditorium, 113 Avery | Tuesdays, 9 – 11AM

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Syllabus: Fall 2021

But, of course, that view of infinite vision is an illusion, a god trick.¹

Course Description

Overview

Geographic Information Systems (GIS) are tools for managing, describing, analyzing, and presenting information about relationships between what happens and where it happens. Through GIS, geographic features are tied to attribute data describing aspects of those features – some qualitative such as land use and some quantitative such as demographic information. For its analytical possibilities and because its techniques allow one to represent social and environmental data as a map, GIS has become an important tool across a variety of fields for studying urban and rural areas alike, including planning, architecture, engineering, public health, environmental science, epidemiology, and business. Further, GIS has become an important political instrument allowing communities and regions to (geo)graphically tell their stories.

The course will cover technical skills associated with and required in spatial analysis, conceptual issues in geographic thinking and research design, as well as practical examples and case studies of GIS as applied in urban contexts.

Roughly speaking, the course is organized in two parts. The first two-thirds of the course will focus on the basics by leading students through concept-first, skills-based GIS exercises alongside lectures and readings that discuss pertinent geographical concepts. The last third of the course will focus on the development of self-directed projects requiring that students find data and design methods of analysis based on the techniques and approached learned in the course.

Method of Instruction

Unless otherwise specified in the Course Schedule, the course will meet twice per week: once in lecture and once again in smaller lab sections during which students will have the opportunity to seek faculty guidance on assignments, review previous deliverables, and discuss the various applications of concepts covered in readings and lecture.

The class is designed around project-based learning with practical examples. Course exercises describe practical, although usually hypothetical, scenarios with clear constraints, purposes, and audiences. Through these exercises, students are expected to apply and adapt skills and techniques to a variety of urban questions and problems. As such, lab sections are divided by applied discipline (and degree program).

The separate components of the course—lecture, labs, readings, and assignments—are designed to be complementary and non-overlapping, each supplying a specific portion of the course's overall "method of instruction." By this, the lectures will reference but not recount the readings, and lab sessions will include discussion and troubleshooting of assignments but are not intended to complete the exercises. Rather, students are expected to complete required

¹ Haraway, D. (1988). Situated knowledges: the science question in feminism and the privilege of partial perspective. *Feminism Studies*, 14 (3), 582.

readings and exercises prior to each week's class, arriving to lecture and lab with relevant questions.

Student Learning Objectives

The course seeks to provide students with a basic level of familiarity with several aspects of Geographic Information Systems and Geographic Information Science, such that the range of possibilities for GIS-based work is understood and an adequate foundation for critically and effectively engaging those possibilities is laid. Thus the general objectives for the course are

- Providing an understanding of the skills and concepts necessary to work with GIS software;
- Teaching spatial data visualization techniques along with introductory knowledge of effective cartography and additional software for the production of maps and other information graphics;
- Teaching skills needed to develop and execute a research and/or geodesign project requiring GIS as a data management, analysis, and visualization tool;
- Identifying, accessing, *and* evaluating publicly available data sets;
- Providing an introductory understanding of the ethical questions surrounding data creation, analysis, and representation in urban contexts; and
- Contextualizing the above within the competing, complex, and generally inequitable sociopolitical histories in which GIS has formed and to which it has contributed.

Please note that beyond these, more specific learning objectives pertaining to the tailored scope and purpose of this course for students from different degree programs are listed in individual assignments.

Standard Information

Lecture (A4577) meets on Tuesdays from 9 to 11AM. Barring any technical difficulties, class will begin promptly.

Students must be enrolled in one of the course's lab sections (A4578), according to their degree program. Refer to the University's course listing for meeting times and locations.

- Section 001 (urban planning students) with Alanna Browdy (aeb2217@columbia.edu).
- Section 002 (urban planning students) with Daniel Froehlich (dcf2134@columbia.edu).
- Section 003 (architecture and urban design students, for visual studies credit) with Carsten Rodin (ccr2139@columbia.edu).

Asynchronous & Remote Learning Guidelines

We continue to live through a strange and uncertain moment, indeed. If asynchronous and remote learning become necessary during the semester, guidelines and course policies will be posted to Canvas. Rest assured: disruptions in time and space will not lessen the learning objectives nor lower learning outcomes.

In-Class Device Policy

For the respect of others, our classroom policy on devices and computers is as follows.

- In addition to the exercises during lab sessions, students may use the lab computers, laptops, tablets, etc. to access readings and notes.
- Students may use those devices for other reasons very minimally, so long as they do not become a distraction or an in-class habit.
- Non-class-related, on-screen content is not allowed. This means that, by way of example, the absolute only way to make Twitter usage okay by this policy is to be tweeting about class (with appropriate hashtags and mentions, of course).

Whether in-person or remote, we ask that students follow this policy. Each of us—your instructors and your peers—are showing up, separately and together, and full attentiveness is both a show of respect and a prerequisite step toward a successful semester. Sustained engagement through a screen is difficult, and so we will do our part to mitigate that too.

Students with Disabilities

Students with disabilities taking this course who may need disability-related accommodations are encouraged (but not required) to make an appointment with LM at the start of the semester. Disabled students who need accommodations should be registered in advance with the Office of Disability Services.

Evaluation & Grading

Readings & Participation (10% of final grade)

There is a considerable amount of reading available on GIS- and digital mapping-related topics. Especially at the introductory level, an understanding of the science, theory, and application of GIS is extremely important. Care has been taken to include necessary readings within this course with an understanding that the assignments themselves can overwhelm a student's schedule before the time necessary for readings is taken into account. Therefore, while the suggested reading list is sometimes lengthy, the required readings are minimal. Further, the reading lists include a brief descriptive summary of the readings to help guide students in their preparation.

Students are expected to keep up with the syllabus schedule, completing readings prior to class and arriving prepared for discussion in lecture and with questions in lab. (Regarding "participation points," notes are kept regarding student involvement for each class session.) Be advised that, given the interdisciplinary nature of the course, required readings are expected of all students while lab instructors may require additional readings from the syllabus specific to their lab section.

Given the material covered in the course, the lab-based method of instruction, the skills-development value of collaborative troubleshooting, and the remote components of the class, it is only appropriate to include digital platforms when evaluating "active participation." The class's Canvas discussion board and the Perusall platform (see below) will be used for augmenting in-class discussion. For the social-media inclined, use the hashtag #gsappGIS and tag or mention as appropriate for participation credit.

Lab Assignments (40% of final grade, total)

Because GIS is rooted in computer-based analysis, its adequate teaching and learning requires regularly completed exercises. Successful completion of the course requires that students stay with the schedule, completing exercises in a timely manner (even between deliverable deadlines), such that skills learned early can be built upon later. Lab sessions will often review the concepts included in exercises and answer questions about lab work conducted individually, but students are expected to complete the assignments outside of class.

There are four lab assignments, each of which contains multiple exercises. Each of the four assignments accounts for 10% of a student's final grade in the course.

Reading Response: A Map (10% of final grade)

Students will write a brief reading response to a map of their choice (which must meet certain cartographic criteria). The response will be posted to the course's Canvas discussion board for broader response. Each student will also informally present their response during lab sessions. This assignment is intended to develop and hone close-reading and map critique skills, while engaging questions of the roles of GIS, map practices, and cartographic choices in the contexts through which their products circulate. A full assignment description will be distributed early in the semester.

Final Project (40% of final grade, total)

Students are expected to design, research, and complete a small final project on a topic of their choosing by the end of the semester. The project is required to answer and/or explore a specifically spatial research question using GIS. Students are required to complete this project within groups of two or three students. (Students wishing to complete their project individually must acquire prior permission, with a compelling reason, from their lab instructor *and* LM.)

A full assignment description—detailing expectations, guidelines, considerations, and deadlines—will be distributed before the midterm. Briefly, students will be required to submit a project paragraph that describes a proposed topic and scope of study (worth 5%) and a project proposal with data sources and a workable methodology prior to executing the project (worth 15% of the final grade). Class time toward the end of the semester is reserved for individual work with faculty guidance and desk crits. Final deliverables include a written and graphical report (worth 15% of the final grade) along with a presentation (5% of the final grade).

<i>Opportunities for Extra Credit</i>	Several exercises will include questions that can be answered for extra credit. Additional extra credit assignments may be offered at instructors' discretion.
<i>Attendance</i>	<p>Given the method of instruction in the course, students are expected to attend every class meeting. Attendance records will be maintained throughout the semester. Note that arriving late to class is not necessarily equivalent to having attended class. Students with excessive absences (greater than 1) without appropriate reason will see a reduction in their final grades.</p> <p>Students who will miss class due to religious holidays or other appropriate reason should email LM, their lab instructor, <i>and</i> the TAs in the first week of classes with the dates (and reasons) of their foreseen absences and are encouraged to make arrangements with their peers for notes. Please note that these absences do not automatically imply deadline extensions.</p>
<i>Submission</i>	<p>Each assignment will outline the specific requirements for its submission format, deadline, and deliverable expectations.</p> <p>Save for extenuating circumstances for which extensions will be given only with prior approval and compelling reasons, absolutely no late assignments will be accepted without a late penalty. The late penalty is a reduction of 50% of the total points possible within the first 24 hours after the deadline and an additional 25% of the total possible points up to 48 hours after the deadline.</p>
<i>Back-up Policy</i>	Students are responsible for consistently backing up their work throughout the semester. Extensions will not be granted for technical losses of work. (Given the availability of cloud storage and the need to regularly store one's work off GSAPP machines, this should never be a problem.)
<i>Grades</i>	<p>Students are sometimes concerned with where lines are drawn in determining final grades. To avoid confusion or panic, here's how it works:</p> <ul style="list-style-type: none"> ○ Students who successfully complete the course—demonstrating progress in their technical skills and conceptual development, reaching proficiency with theoretical and applied content—will pass the course (<i>i.e.</i>, they will have earned a Pass grade). ○ Students who do not achieve this level of proficiency but have completed the course in full (including attendance) and demonstrated progress sufficient for passing the course will receive a Low Pass grade. ○ Any level of work below this will be considered grounds for a failing grade. ○ Following the percentages listed above, only students who demonstrate mastery above and beyond proficiency, whose work exemplifies thoughtful care and high quality (in both content and delivery) on a consistent basis, <i>and</i> who contribute to the class regularly through participation (both in class and online, as appropriate) are eligible for a High Pass.
<i>Expectation of Academic Honesty</i>	<p>As always and as with every other course, this class is conducted in accordance with University and GSAPP policy on matters of academic honesty and integrity and with attention to GSAPP's Honor Code. Note that instances of plagiarism will not be tolerated—whether in written text, in research design, or in data acquisition and creation. We build on the work of others; give credit where credit is due.</p> <p>Additionally, this course contains a few considerations which should be stated. At several points in the semester, students will be encouraged to look to their peers for collaborative problem solving and troubleshooting especially within the lab setting. Except where otherwise stated in specific assignments, collaboration is welcomed but individual assignments must be conceived and completed individually.</p> <p>For your reference, consult GSAPP's Honor System (https://www.arch.columbia.edu/honor-system) and Plagiarism Policy (https://www.arch.columbia.edu/plagiarism-policy).</p>

To be clear: instances of plagiarism, inappropriate collusion, and other breaches or abuses of our community's expectations of academic honesty are grounds for failure in the course and automatic administrative reporting.

Resources & Materials

This Syllabus The first, go-to resource available to all students is this syllabus. Indeed, by many definitions, it is a map. Almost every administrative and logistical question raised by students in years past is answered here. The syllabus also includes guidance beyond what is required for completing the course, particularly within the reading list. Note that students are responsible for knowing the information and policies contained within the syllabus; please read it carefully.

Software & Hardware The course will focus heavily on techniques that use ESRI's ArcGIS suite of software. ArcGIS is installed on GSAPP computers and several computers accessible (including remotely) across the Columbia campus. Additionally, single-use educational licenses will be given to students in the class for use on their personal machines (Windows OS only). To request a license, notify your TA during the first week of class.

A note on GIS software: The course's objective is not to create experts in using ESRI software, and there are certainly a variety of other GIS software packages available. (Indeed, software proficiency is a necessary but insufficient element of GIS proficiency.) As an industry standard, we will use the ArcGIS desktop suite. That said, the skills are transferable to other software, and several tutorials are available to students (see below).

Recommended Purchases There are no required reading purchases associated with the course. All reading materials not accessible online or via the University Libraries will be made available as PDFs and distributed through Canvas.

Students using GSAPP machines are encouraged to have an external hard drive or accessible cloud storage for their files related to this class.

Canvas This class will rely heavily on the Canvas platform for distributing readings and assignments, collecting and sharing additional resources, submitting digital copies of assignment deliverables, and discussion. Canvas will also be used to distribute class-wide emails. Please be sure to actively monitor the email address associated with your Canvas login.

All sorts of other resources on Canvas: Throughout the semester, additional resources (links to tutorials, training materials, and so on) will be posted to Canvas for your reference and support. While each lab assignment includes step-by-step exercises and instructions, it is likely that students may need or want to consult resources for other skills and platforms while working through their final projects or after the semester. As such, a collection of the most commonly useful resources will be made available.

The Canvas discussion boards (your peers are resources, too): Discussion boards and forums are a long-standing community institution for collaborative troubleshooting throughout groups of computer users. If you have a question, it is likely that your peers may be presently working out the same issue or may have already found a solution. If your peers have a question, it is likely that you could help. Students are encouraged to post questions and relevant points for conversation to the discussion board on Canvas and collectively work toward finding answers prior to emailing LM, your lab instructor, or TA. Learning GIS is a techniques-heavy endeavor with several moments that require developing critical problem-solving skills. These skills are substantially and demonstrably better acquired when the solutions are derived through work and discussion.

The class TAs will participate, monitor, and moderate the online discussion (where necessary) on a (minimum) weekly basis.

Perusall Readings are distributed through Perusall, integrated into the course's Canvas page. Perusall is a collective reading and notetaking platform, and students are encouraged to use it as such.

(You can also keep notes that are not shared with others.) The readings are posted class-wide, which allows questions and notes from across the disciplinary perspectives represented by the collection of lab sections. Also: shared reading notes, comments, and responses to classmates' threads will count toward students' participation grade.

Columbia Libraries' Research Data Services

Columbia's Research Data Services (RDS) is located on the lower level of Lehman Library (at SIPA) and is a great resource for GIS data and technical questions. RDS collects spatial data and may have what you need for your final project. Further, if they don't have the data you're looking for, the data librarians can usually help you find it. RDS also has technical consultants available for questions regarding data as well as those related to performing certain GIS operations. As in-person services resume, their facility is equipped with (extremely nice) computer stations, and they offer walk-in services as well as scheduled consultations. Check their hours of operation, available workshops, and the spatial data catalog on the Columbia Libraries website. <https://library.columbia.edu/services/research-data-services.html>.

Other Online Resources

In addition to the tutorials provided through the course, students are encouraged to use the University's subscriptions to various training resources, including the Lynda platform containing several video tutorials on various software packages (from Excel to GIS to Illustrator). Students can find these online through CLIO and many are linked from the RDS website.

There are, of course, several other tutorials available online. (Think youtube.) Please use these sparingly and discriminatingly. They are usually fine for refreshing one's memory on "what to click," but can often foster bad habits.

Additional Skills Workshops

At different points in the semester, the TAs may offer additional software skills workshops or informal draft feedback sessions, as needed. These will be scheduled for times outside of class (usually a weekend afternoon).

Office & Lab Hours

LM and lab instructors hold regular office hours (day/time will be posted to Canvas) and by appointment. In the latter portions of the semester, LM will schedule additional office and lab hours to discuss course progress and final project development.

TA lab hours will be held weekly as described and scheduled on the course Canvas page. It is suggested that students use these lab hours as working session to take advantage of the available guidance.

Notes on Email

Email is absolutely a resource for students, but it is not chat. Do not expect *immediate* responses from LM, the lab instructors, or TAs to emailed questions. It is very important (especially during "crunch times") that you use the other resources available to you. There are several ways to find help if you need it, so please do not let an as-yet-unanswered email hold you back. One of the greatest assets you will have in this course is your own time management. (Again, use TAs' lab hours wisely.)

If you email a technical question, be sure to include enough information to receive an adequate and helpful response. Necessary information includes, but is not limited to,

- (1) a complete description of what you are trying to accomplish and the problem you are encountering,
- (2) any relevant information regarding the datasets you are using,
- (3) the steps you have already taken to address your problem (so we don't tell you to do what you've already done), and
- (4) any necessary screenshots to help us understand what you are doing when we cannot sit with you in front of a computer.

Do not be surprised if an email without this information is returned to you asking for elaboration.

Semester Map (aka Schedule, Assignments, & Readings)

A map says to you, "Read me carefully, follow me closely, doubt me not."
It says, "I am the earth in the palm of your hand. Without me, you are alone and lost."²

Notes on the Reading

How to approach the reading lists: Required readings are marked with an asterisk (*). Please note that "not required" is not the same as "optional." Students come to this class with different and specific backgrounds, from different degree programs, and different levels of familiarity with GIS and its related disciplines and practices. Brief descriptions of each week's readings (*in italics*) are provided to help students navigate the lists. At a minimum, students are required to read through the list summaries, prioritize both the required readings and the readings that fill gaps in your background, and skim the others. Several are included because of their value as references whether for cartographic examples, case studies that apply specific techniques in urban research, examples of GIS in design practices, or technical definitions (especially those that are excerpted from textbooks). Some are more relevant to certain disciplines or practices, and thus more relevant to certain lab sections. In these cases, the summaries aim to make this clear, and lab instructors may require specific additional readings occasionally. Still, all are provided for the entire class, and students are expected to know these references exist if or when they are needed.

If you're pressed for time one week, here's a little help: First, always read through the summaries, so you know what's covered. Then, keep in mind that the textbook-type references generally introduce and define the key vocabulary I will use in lecture. Skimming these is the easiest way to prepare if you find following new technical vocabulary challenging. If that's not the case, choose at least one reading that contextualizes the technical concepts in practice, history, or theory. Lastly, plan ahead for the mid-semester week without a reading list. This is a moment to "take a breath," review, revisit any gaps, and shore up any weaknesses—including catching up on readings that may have been missed—as we head into the final projects.

About serious (*i.e.*, formidable) math in the readings: I understand that many people in our class will not be fully comfortable reading equations, let alone reading papers that heavily rely on the language of mathematics to describe their process and content. While these are neither the norm nor the majority in the reading list, where readings are "math-heavy" remember that they were chosen for the logic of their content, not for the mathematical description of that logic. Don't be discouraged. My suggestion is to skim the equations and to take more care in reading their explanations.

A Few Bibliographic Abbreviations

A few edited volumes and textbooks reappear throughout the semester's schedule. For convenience, their citations are abbreviated within the reading list. Their full citations are below.

FBC: Fotheringham, A S, Brunsdon, C, and Charlton, M. 2000. *Quantitative Geography: Perspectives on Spatial Data Analysis*. London: Sage Publications. [This is available as an ebook through CLIO at <https://clio.columbia.edu/catalog/10917537>.]

LGMR: Longley, P A, Goodchild, M F, Maguire D J, and Rhind D W (eds). 2005. *Geographical Information Systems: Principles, Techniques, Management, and Applications (2nd Edition, Abridged Edition)*. Hoboken, NJ: John Wiley & Sons.

MZ: Maantay, Julie and John Ziegler. 2006. *GIS for the Urban Environment*. Redlands, CA: ESRI Press.

Part 1 | Mapping Data

Week 0

Because classes start on Thursday this year, no lab sessions will meet during the official "first week of classes." Our class begins with the first lecture, including the lab sections. That said, the class TAs will hold their regular lab hours (posted on Canvas) for students with questions regarding getting set up or started with the course.

² From Beryl Markham. *West with the Night*. New York: North Point Press, 1983.

Week 1
T 14 Sep

INTRODUCTIONS & HOUSEKEEPING;
PREMISES: GIS, SPATIAL ANALYSIS AND VISUALIZATION, TOBLER'S FIRST LAW

Assignments

Lab Assignment 1 is distributed at the end of lecture. (Assignments and exercise materials are distributed online. They will be linked from the course's homepage on Canvas.)

Readings

Don't freak out; the purpose of Day 1 is to establish some of our working premises and lay out the stakes for our class. The MZ chapter provides some "basics" for you. The other textbook references (Johnston, Longley et al, Steinberg and Steinberg, and Yeh) each take these "basics" a step further, providing definitions, background, and situating GIS within different fields and practices. Refer to these as needed, now or later in the semester. Centering the "urban" and quoting from its abstract, "Cosgrove [briefly] traces the history of urban cartography and its techniques, from the grid to the aerial perspective to contemporary digital mapping technologies." For students starting off with more comfort around research methods, the Goodchild article makes the case for GIS practices within social science methodologies. The Aitkin and Michel article helps start our semester-long conversation about critical GIS. (Indeed, we will revisit this article later in the semester, when it will be marked with an asterisk.) Lastly, I'm including my essay critiquing a planning and architecture project. The essay is not "about GIS" (so don't worry that you haven't learned GIS yet). Rather, it provides my answer to the question "Why GIS?" while also raising several of the premises, themes, possibilities, and stakes we will explore this semester. It's only fair that y'all know where I'm coming from.

- Aitken, Stuart C., and Suzanne M. Michel. "Who Contrives the 'Real' in GIS? Geographic Information, Planning and Critical Theory." *Cartography and Geographic Information Systems* 22, no. 1 (January 1995): 17–29.
- Cosgrove, Denis. "Carto-City." In Abrams, Janet, and Peter Hall, eds. *Else/Where: Mapping: New Cartographies of Networks and Territories*. Minneapolis: Univ. of Minnesota Design Institute, 2008. Pp. 148-157.
- Goodchild, Michael F *et al.* 2000. "Toward Spatially Integrated Social Science." In *International Regional Science Review*. 23(2): 139-159.
- Johnston, R J. 2005. "Geography and GIS." In *LGMR*, 39-47.
- Longley, Paul A, *et al.* 2005. "Chapter 1. Systems, Science, and Study." In *Geographical Information Systems and Science, 2nd Ed.*. Hoboken, NJ: John Wiley & Sons, 3-33.
- *MZ. "Chapter 1. Basics of Mapping and GIS." 5-23.
- *Meisterlin, L. "Not Yet #AfterRikers: Looking for #JusticeInDesign." *The Avery Review*, no. 32 (May 2018). <https://averyreview.com/issues/32/not-yet-after-rikers>.
- Steinberg, S. L., and S. J. Steinberg. "Chapter 1. Why Think Spatially?" In *GIS Research Methods: Incorporating Spatial Perspectives*. Redlands, Calif: ESRI Press, 2010.
- Yeh, Anthony G.O. 2005. "Urban Planning and GIS." In *LGMR*, 877-888.

Week 2
T 21 Sep

SPATIAL DATA STRUCTURE & TYPES;
CARTOGRAPHY & SYMBOLOGY; QUANTITATIVE CLASSIFICATION

Assignments

Reading Response: A Map is distributed at the end of lecture.

Readings

This week covers two big, deeply intertwined, topics: Mapping and Spatial Data. Chapter 2 in the MZ textbook introduces both. The Weibel and Dutton chapter takes a deep dive into one particular process (generalization) that involves both spatial data structure and cartography. The Matt Wilson and Pickles chapters each discuss GIS-based mapping practices and spatial data and technologies within the ongoing GIS-centric discourse involving (among other related topics) criticality, positionality, epistemology, and power. Of course, none of these relationships are new, and Mabel Wilson's essay (as well as selections from the book in which its found) traces W.E.B. DuBois's cartographic interventions, as example. Lastly, the Offenhuber article discusses relationships between data and its physicalization (versus visualization) as a means of considering, both, how data is structured and understood.

- *MZ. "Chapter 2: Spatial Data and Basic Mapping Concepts." 25-38.
- Offenhuber, Dietmar. 2019. "What We Talk about When We Talk about Data Physicality." *IEEE Computer Society, Computer Graphics & Applications*, May/June 2019: 1-14.
- *Pickles, John. 2005. "Arguments, Debates, and Dialogues: the GIS-Social Theory Debate and the Concern for Alternatives." In *LGMR*, 49-60.
- Weibel, R and G Dutton. 2005. "Generalising Spatial Data and Dealing with Multiple Representations." In *LGMR*, 125-155.
- *Wilson, Mabel O. "The Cartography of W.E.B Du Bois's Color Line" in Du Bois, W.E.B. *W.E.B Du Bois's Data Portraits: Visualizing Black America*. Edited by Whitney Battle-Baptiste and Britt Rusert. Hudson, NY: The W.E.B. Du Bois Center At the University of Massachusetts Amherst ; Princeton Architectural Press, 2018, 37-43. [and additional excerpts]
- *Wilson, Matthew W. "Chapter 1. Criticality: The Urgency of Drawing and Tracing." In *New Lines: Critical GIS and the Trouble of the Map*. Minneapolis: University of Minnesota Press, 2017. Pp.25-45.
- . "Introduction: But Do You Actually *Do* GIS?" In *New Lines: Critical GIS and the Trouble of the Map*. Minneapolis: University of Minnesota Press, 2017. Pp.1-24.

Regarding Mapping basics and concepts: the Kent and Klosterman article provides helpful tips, useful to more than planners (despite its title). The other MZ chapters as well as the Kraak chapter each cover specific considerations with more detail (their titles are appropriately descriptive). Regarding Spatial Data basics and concepts: Chapter 2 in FBC includes a clear description of spatial data types with additional information for students interested in programming with spatial data.

- FBC. "Chapter 2. Spatial Data." 15-29.
- Kent, Robert B and Richard E Klosterman. 2000. "GIS and Mapping: Pitfalls for Planners." In *Journal of the American Planning Association*. 66(2): 189-198.
- Kraak, M J. 2005. "Visualising Spatial Distributions." In *LGMR*, 157-173.
- MZ. "Chapter 3: Thematic Mapping." 57-89.
- . "Chapter 4: Data Classification Methods and Data Exploration" [excerpts]. 94-115.

Lastly, we're starting to work with demographic information more seriously. So, in addition to the DuBois precedents, I've included documentation and explanation of American Community Survey data from the US Census Bureau. And there are two relevant subsections in the Additional References section at the end this syllabus worth calling out: sources providing examples (and guidance) regarding mapping, cartography, and data visualization and additional reference material from the US Census Bureau for using the ACS.

US Census Bureau. 2008. "A Compass for Understanding and Using American Community Survey Data: What General Data Users Need to Know." US Department of Commerce. Economics and Statistics Administration.

Week 3
T 28 Sep

PROJECTIONS & COORDINATE SYSTEMS

Assignments

Lab Assignment 1 is due online at 9AM, Tuesday 28 Sep.
Lab Assignment 2 is distributed.

Readings

Suggested order for the first few readings: The Redford and Sorkin clip is a classic West Wing scene, outlining the argument against the Mercator and a once-popularly suggested replacement. After watching that clip and recovering from Allison Janney's brilliance, read the Monmonier chapter which details the "controversy" dramatized in the television clip. Then note that the Chang chapter clearly and straightforwardly covers the technical concepts (with definitions, etc) that we'll discuss in this week's lecture, before moving on to the next group of readings.

Chang, Kang-Tsung. 2010. "Chapter 2. Coordinate Systems." In *Introduction to Geographic Information Systems. 5th Edition*. Dubuque, IA: McGraw-Hill, 18-40.

- *Monmonier, Mark. 1991. "Chapter 1: The Peters Projection Controversy." In *Drawing the Line*. Chicago: University of Chicago Press, 9-44.
- *Redford, Paul and Aaron Sorkin. 2001. "Somebody's Going to Emergency, Somebody's Going to Jail." Season 2, Episode 16 of *The West Wing*. [Directed by Jessica Yu.] Excerpt at <https://youtu.be/vVX-PrBRtTY>.

Last week, we began our work on spatial visualization as interpretative, steeped in assumptions and perspectives operationalized and convincingly manifest through mapping. This week, understanding "projection," in all of its meanings, requires questioning perception as well as one's position within a view and one's imposition of a view. Proppen's chapter traces the cartographic and cultural interpretations of a single (NASA) image of the earth toward the scalar possibilities of Google Earth's interactive renderings. The Krygier and Wood chapter (from the same edited volume) is a graphic essay—map(?)—that is as much about perspective as it about proposition, as much about projection as it is about references and frames. Lastly, the Pickles chapter discusses the history of the cartographic gaze as imbricated with histories of measured-vision-as-epistemology and the primacy of this gaze within Western reason. It is very strongly recommended for design students and PhD students, and encouraged for others.

- Krygier, John, and Denis Wood. "Ce N'est Pas Le Monde (This is not the World)." In Dodge, Martin, *et al*, Eds. *Rethinking Maps: New Frontiers in Cartographic Theory*. London: Routledge, 2011. Pp. 189-219.
- Pickles, John. "Ch 4. The Cartographic Gaze, global visions and modalities of visual culture." In *A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World*. London ; New York: Routledge, 2004. Pp. 75-91.
- *Propen, Amy D. "Cartographic Representation and the Construction of Lived Worlds: Understanding Cartographic Practice as Embodied Knowledge." In Dodge, Martin, *et al*, Eds. *Rethinking Maps: New Frontiers in Cartographic Theory*. London: Routledge, 2011. Pp. 113-130.

Part 2 | Analyzing Data

Week 4
T 5 Oct

THE MODIFIABLE AREAL UNIT PROBLEM;
GEOPROCESSING & VECTOR-BASED ANALYSIS

Assignments

Research Project assignment description is distributed.

Readings

The FBC chapters and the MZ chapters provide background information and descriptive definitions of key technical concepts and methods for this week. Miller's short article does the work of connecting our operating premise (Tobler's Law) to conclusions we will reach through our early analyses.

- FBC. "Chapter 1. Establishing the Boundaries." 1-14.
- , "Chapter 3. The Role of Geographic Information Systems." 30-64.
- *MZ. "Chapter 9. Methods of Spatial Data Analysis." 209-235.
- *Miller, Harvey J. 2004. "Tobler's First Law and Spatial Analysis." In *Annals of the Association of American Geographers*. 94(2): 284-289.

We've seen in the last few weeks that every part of mapping data presupposes an assumed perspective. We shouldn't be surprised, then, that the analysis of spatial data does as well. The Mark, Martin, and Raper chapters (all in the LGMR textbook), collectively describe different perspectives with impacts on the assumptions established before spatial analysis (as a representational act), which carry further impacts on methods, interpretations, and conclusions. For further relevance: Martin and Raper both discuss the MAUP, while Mark builds upon more elemental geometric concepts. My essay draws on concepts from each of our topics thus far (and, indeed, included in each of those three chapters) in an argument toward cartographic analysis and representation capable of alternative perspectives.

- Mark, D M. 2005. "Spatial Representation: A Cognitive View." In *LGMR*, 81-89.
- Martin, D G. 2005. "Spatial Representation: The Social Scientist's Perspective." In *LGMR*, 71-80.
- *Meisterlin, Leah. "Cartographies of Distance." In *Ways of Knowing Cities*, edited by Laura Kurgan and Dare Brawley, 250-72. New York: Columbia Books on Architecture and the City, 2019.
- Raper, J F. 2005. "Spatial Representation: The Scientist's Perspective." In *LGMR*, 61-70.

Further, as we continue to explore and refine geodemographic methods, let's consider the information and datasets we use to represent communities, populations—similarities, differences, and patterns. Warning: I will absolutely ask the class questions about the Schlossberg reading during lecture this week. As for the others: The Monmonier chapter reviews and reprises some of our earlier topics (classification, aggregation, units, scales, and so on) to accessibly and practically discuss some of the dangers (cautions) of mapping demographic information. The Crampton chapter considers the borders, or bounding, involved in demographic mapping, with a specific focus on the construction of geographies of race and racialized geographies. (This reading is denser than many others and does presuppose comfort and familiarity with prominent Western philosophy.) Lastly, especially because next week you will receive the final project assignment description, the Zuberi chapter³ unpacks some of the problems associated with demographic statistics and categorization (in particular, racial attribution) in social research. If you don't read it this week, do read it before submitting the final project proposal.

- Crampton, Jeremy. "Rethinking Maps and Identity: Choropleths, Clines, and Biopolitics." In Dodge, Martin, *et al*, Eds. *Rethinking Maps: New Frontiers in Cartographic Theory*. London: Routledge, 2011. Pp. 26-49.
- Monmonier, Mark. 1991. "Chapter 10. Data Maps: Making Nonsense of the Census." In *How to Lie with Maps*. Chicago: University of Chicago Press, 139-162.
- *Schlossberg, Marc. 2003. "GIS, the US Census, and Neighborhood Scale Analysis." In *Planning, Practice, and Research*. 18(2-3): 213-217.
- *Zuberi, Tukufu. "Deracializing Social Statistics: Problems in the Quantification of Race." In Zuberi, Tukufu, and Eduardo Bonilla-Silva, eds. *White Logic, White Methods: Racism and Methodology*. Lanham: Rowman & Littlefield Publishers, 2008. Pp. 127-134.

Week 5
T 12 Oct

RASTER-BASED ANALYSIS: RASTER MATH, DENSITY MAPPING;
AN INTRODUCTION TO INTERPOLATION & REMOTE SENSING

Assignments:

Lab Assignment 2 assignment is due online at 9AM on Tuesday, 12 Oct.
Lab Assignment 3 assignment is distributed.

Readings

The three sections of Albrecht's textbook provide (very) brief, easy-to-follow definitions and descriptions of specific techniques of analysis. Chapter 6 in FBC includes an (admittedly math-heavy) description of density mapping and other point-based analyses in the face of the MAUP. Note that Chapter 7 of the same book (included in Week 8's reading list) also includes elaboration on methods of interpolation. The MZ chapter provides an overview of several raster-based operations, data types, and sources (as well as an introduction to a few topics we'll cover later in the semester). The Couclelis paper importantly continues our conversation of the relationship between spatial data models (vector or raster), spatial scale, and the spatial perceptions, experiences, and interpretations that they presuppose, allow, and enforce.

- *Albrecht, Jochen. *Key Concepts and Techniques in GIS*. London: SAGE Publications Ltd, 2007. [Relevant Sections: 8 "Map Algebra", 9 "Terrain Modeling," and 10 "Spatial Statistics."]

³ A footnote for everyone, but really focused toward UP students: I recommend reading through this book, not only this chapter. While most of the methods it discusses are aspatial, and so inappropriate for our purposes here, each chapter carries implications for the methods used in planning and that many of you will use in your theses. (There is one particularly "spatial" chapter, which is not surprisingly covered in the Advanced Spatial Analysis course.)

- *Couclelis, Helen. 1992. "People Manipulate Objects (but Cultivate Fields): Beyond the Raster-Vector Debate in GIS." In Frank, *et. al.* (Eds.) *Theories and Methods of Spatio-Temporal Reasoning in Geographic Space*. Springer Berlin Heidelberg, 65-77.
- FBC. "Chapter 6. Point Pattern Analysis." 130-161.
- MZ. "Chapter 12. Other Geotechnologies and Recent Developments in GIS." 293-314.

As Couclelis summarizes, the analysis of rasters (specifically aerial imagery), has a different geographic ontology and a slightly different history than its vector counterpart. The Haffner chapters situate these technologies and their roles in military and colonizing projects, using the French example, relating them to Modernism in architecture and urban planning and design and to the development of postwar French social theory. Kurgan critically revisits this history, expanding and examining cases of/ through satellite imagery. (Not listed, but useful: Kurgan's "Lexicon" chapter, "from Military Surveillance to the Public Sphere" (pp. 39-54) provides brief and clear descriptions of relevant satellite projects.) The McHarg excerpts are a seminal example of the logic of raster analysis (albeit pre-computer) in urban planning and design, stemming from the history Haffner recounts, applied to growing environmental questions. Decades later, Ratti and Richens provide a straightforward overview of GIS-based techniques for eliciting (sometimes vector) descriptions of urban form from raster data.

- *Haffner, Jeanne. "Chapter 2. The Politics of Spatial Form: Aerial Photography in Social-scientific Research, Architecture, and Urban Planning in the 1920s and 1930s." in *The View from above: The Science of Social Space*. Cambridge, Mass: MIT Press, 2013. Pp. 19-53.
- . "Chapter 4. Modeling the Social and the Spatial: 'Social Space' in Postwar French Social-scientific Research." Pp. 81-107.
- *Kurgan, Laura. "Chapter 3. Cape Town, South Africa, 1968: Search or Surveillance?" In *Close Up at a Distance: Mapping, Technology, and Politics*. New York: Zone Books, 2013. Pp. 97-112.
- . "Chapter 4. Kosovo 1999: SPOT 083-264." Pp. 113-128.
- *McHarg, Ian. *Design with Nature*. New York: American Museum of Natural History, 1969. [selected excerpts]
- Ratti, Carlo and Paul Richens. 2004. "Raster Analysis of Urban Form." In *Environment and Planning B*. 31(2): 297-309.

Week 6
T 19 Oct

MULTI-CRITERIA EVALUATION & SPATIAL DECISION SUPPORT SYSTEMS

Assignments

Research Project: Project Paragraph is due at 9AM on Tuesday, 19 Oct.

Readings

Malczewski's 2004 monograph is an excellent reference for students interested in using MCDA techniques toward suitability analysis (their most common usage). Note that the entire paper is provided with the readings, but only sections 3.3, 3.4, 4.1, 4.2, and 4.4 are required for technical background. (That said, Chapter 5 has several case study examples and Chapter 6 importantly summarizes conflicts and conclusions.) Malczewski's 2006 article traces the fast growth in GIS-based MCDA and summarizes the recent history for anyone interested in using these approaches. The Eastman chapter discusses the logics of vector and raster approaches to multicriteria evaluation, within a framework of fuzzy measures to reconcile the two. The Carr and Zwick text includes a very detailed description of one application of multicriteria evaluation and decision modeling in urban planning: the land use conflict identification strategy. The early chapters (4 through 7) are a helpful reference of technical considerations, concepts, definitions, and (ArcGIS-focused) tools. Chapters 8 through 12 discuss inclusion and participation, identifying and working with conflict, and projecting into the future. This text should be considered required for MSUP students and a very helpful textbook and case study example for others.

- Carr, Margaret H and Paul D Zwick. 2007. *Smart Land-Use Analysis: The LUCIS Model*. Redlands, CA: ESRI Press. [selections]
- Eastman, J R. 2005. "Multi-Criteria Evaluation and GIS." In *LGMR*, 493-502.
- *Malczewski, Jacek. 2004. "GIS-based Land-use Suitability Analysis: A Critical Overview." In *Progress in Planning* 62(1): 3-65.

-----, 2006. "GIS-based Multicriteria Decision Analysis: A Survey of the Literature." In *International Journal of Geographic Information Science*. 20(7): 703-726.

The underlying premise of this week's technical topic (MCE/MCDA/SDSS) is that data-driven, structured, and mathematically operationalized models can be deployed to facilitate planning, design, and to envision outcomes. Thus, I'm pairing the following two readings. First, the FBC chapter is a math-heavy description of major moments in quantitative geography and spatial modeling. (Don't be daunted by the equations. Remember my note above.) Pavlovskaya's chapter reminds us that 'numeric' and 'quantitative' are not synonymous, and that GIS-based modelling need not be limited to technopositivism.

FBC. "Chapter 9. Spatial Modelling and the Evolution of *Spatial Theory*." 213-235.

*Pavlovskaya, Marianna. "Non-Quantitative GIS." In Cope, Meghan, and Sarah Elwood, eds. *Qualitative GIS: A Mixed Methods Approach*. 1st ed. Thousand Oaks, CA: Sage, 2009. Pp. 13-37.

Decision support systems are but one in a long history of map-based techniques developed for governance and spatially constructed governmentality. So, for a bit of that history: Pickles's Chapter 5 traces the role of mapping in the history of Europe's "new forms of property regime necessitated by the extension of capitalism" and "as a tool of government and state formation" in the 15th to 17th centuries (99). Whereas Ch 5 focuses largely on places and the local; Chapter 6 examines cartographies in service of territory, empire, and the nation. Chapter 7 dives—with a bit more specificity—into three (slightly more recent) points of confluence in the histories of mapping practice/technology and urban planning and design practice/technology.

Pickles, John. "Ch 5. Cadastres and Capitalisms: The emergence of a new map consciousness." In *A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World*. London ; New York: Routledge, 2004. Pp. 92-106.

-----, "Ch 6. Mapping the Geo-body: State, Territory, and Nation." Pp. 107-123.

-----, "Ch 7. Commodity and Control: Technologies of the Social Body." Pp. 124-141.

Week 7
T 26 Oct

INTRODUCTION TO SPATIAL STATISTICS & CLUSTERING

Assignments

Lab Assignment 3 is due online at 9AM Tuesday, 26 Oct.

Project Paragraph Peer Discussion is due by 9AM Tuesday, 26 Oct.

Lab Assignment 4 is distributed.

Readings

This week's topic is rather technical; as a result, I'm breaking up the "technical readings" into three distinct sections to help make sense of it all.

The Getis chapter in the LGMR text traces the background of spatial statistics, its logics and challenges, to its current and common uses. Excerpts from the Mitchell textbook covers the concepts and techniques included in the lecture this week. It's an excellent reference to keep with you in your research (particularly, but not exclusively) for students without a strong mathematical background—i.e., clear descriptions and definitions and loads of graphic examples.

*Getis, A. 2005. "Spatial Statistics." In *LGMR*, 239-251.

*Mitchell, Andy. 2005. *The Esri Guide to GIS Analysis. Volume 2: Spatial Measurements and Statistics*. Redlands, CA: ESRI Press, 63-181.

After those initial readings, things will quickly get more math-heavy. Chapters 5 and 6 in FBC include mathematical descriptions of the statistical approaches discussed in lecture (and of a few not covered in lecture). Paez and Scott's article also reviews approaches and techniques, and does so with attention to analytical issues particular to spatial analysis and relative to the MAUP. For the less statistically inclined, feel free to skim the explicitly mathematical in this paper; it is the critical and conceptual discussion that is important (and why the article has an asterisk).

FBC. "Chapter 5. Local Analysis." 93-129.
 ----. "Chapter 7. Spatial Regression and Geostatistical Models." 162-183.
 *Paez, Antonio and Darren M Scott. 2004. "Spatial Statistics for Urban Analysis: A Review of Techniques with Examples." In *GeoJournal*. 61(1): 53-67.

While spatial statistics are often included in a methodology once a research question is crafted, Anselin's chapter in the LGMR text (2005a) discusses the importance of GIS-based statistical analysis and data visualization in exploratory analysis as well. His chapter (2005b) provides an overview of spatial autocorrelation and regression. Ogneva-Hillelberger and Cooperman's articles is a straightforward example study that employs spatial stats to test for clustering. (Other examples are included in the Additional References section below.)

Anselin, Luc. 2005a. "Interactive Techniques and Exploratory Spatial Data Analysis." In *LGMR*, 253-266.
 ----. 2005b. "Chapter 5. Spatial Statistical Modeling in a GIS Environment." In Maguire, D J, et al (eds.) *GIS, Spatial Analysis, and Modeling*. Redlands, CA: ESRI Press, 93-111.
 *Ogneva-Hillelberger, Yelena and Brian Cooperman. 2010. "Spatio-Temporal Analysis of Noise Pollution near Boston Logan Airport: Who Carries the Cost?" in *Urban Studies*. 47(1): 169-182.

Lastly, a little historical context: The identification of (socio-)spatial clusters certainly predates the statistics we use for such identification today—as do the interpretation of patterns and the meaning of spatial clustering (and resulting responses in urban design, planning, and policy). The impetus toward statistical mapping and the interpretations drawn from such practices are particularly complex when analyzing social phenomena. The recommended chapters from Vaughan's book give some foundational insight into these practices. (Their chapter titles are rather self-explanatory.)

Vaughan, Laura. "Ch 1. Mapping the Spatial Logic of Society." *Mapping Society: The Spatial Dimensions of Social Cartography*. London: UCL Press, 2018. Pp. 1-23.
 ----. "Ch 2. Disease, Health, and Housing." Pp. 24-60.
 ----. "Ch 3. Charles Booth and the Mapping of Poverty." Pp. 61-92.

Week 8
T 2 Nov

UNIVERSITY ELECTION HOLIDAY

Assignments

Reading Response: A Map is due at 9AM on Wednesday, 3 Nov.

Notes for Class

There is no lecture this week given the Election Holiday, but all lab sections do meet.

Lab Sections will be devoted to desk crit sessions for the development of Final Project topic proposals. Lab sections scheduled to meet on Tuesday will be rescheduled and/or additional office hours will be provided for student meetings to discuss topic proposals.

Please note that LM is not holding office hours this week. Any changes to lab instructors' office hours and TA hours will be announced in (earlier) classes. As always, appointments can be made by email.

Week 9
T 9 Nov

INTRODUCTION TO NETWORKS

Assignments

Research Project Proposal is due at 9AM Tuesday, 9 Nov.

Readings

Chang's chapter covers many of the concepts we will discuss and explore this week. The primary focus should be on the latter half of the chapter (Networks). Still, the first half provides a basis for raster-based approaches to similar questions and techniques. More advanced, but well worth the reminder that a street network's topology is an authored, abstracted

representation: Porta, et al., propose and discuss an approach to determining a network's graph that allows one to more specifically analyze a city's street morphology.

*Chang, Kang-Tsung. 2010. "Chapter 17. Least-Cost Path Analysis and Network Analysis." In *Introduction to Geographic Information Systems. 5th Edition*. Dubuque, IA: McGraw-Hill, 372-394.

Porta, Sergio, et al. 2006. "The Network Analysis of Urban Streets: A Dual Approach." In *Physica A: Statistical Mechanics and its Applications*. 369(2):853-866.

Better than buffers?! Of course, generating network-based service area polygons alone might not be enough for your analysis. Oliver, et al., compare the results of analyzing walkability and health outcomes when using different types of buffers (network and not). Upchurch, et al. provide a useful alternative to radial buffers using network analysis, including comparisons and translating results to raster data.

*Oliver, Lisa N, Nadine Schuurman, and Alexander W Hall. 2007 "Comparing Circular and Network Buffers to Examine the Influence of Land Use on Walking for Leisure and Errands." In *International Journal of Health Geographics*. 6(41)

*Upchurch, Chris et al. 2004. "Using GIS to Generate Mutually Exclusive Service Areas Linking Travel On and Off a Network." In *Journal of Transport Geography*. 12: 23-33.

For more on specific applications of GIS-based network analysis: Nyerges's chapter discusses these approaches within a detailed context of transportation planning, with examples. Sultana and Weber use network analysis to study the relationship between urban/suburban sprawl and commuting patterns.

Nyerges, Timothy L. 2004. "Chapter 7. GIS in Urban-Regional Transportation Planning." In Hanson, S and G Giuliano (eds). *The Geography of Urban Transportation, 3rd Edition*. New York: The Guilford Press, 163-195.

Sultana, Selima and Joe Weber. 2007. "Journey-to-Work Patterns in the Age of Sprawl: Evidence from Two Midsize Southern Metropolitan Areas." In *The Professional Geographer*. 59(2): 193-208.

Part 3 | Making Data

Week 10
T 16 Nov

COLLECTION, CREATION, AND UNCERTAINTY

Assignments

Lab Assignment 4 is due at 9AM, Tuesday 16 November.

Readings

The MZ chapter quickly covers the technical topics covered in this week's lecture on Making Data. For additional references (and explicit software skills), refer to the LM's tutorials. (There is a link in Canvas.) But by now we know that GIS data collection and creation is more than plotting points and drawing boundaries. Schuurman's chapter offers opportunities for a richer and more complex reading of GIS metadata, beyond the obligatory chore of responsible reporting.

*MZ. "Chapter 7. Mapping Databases." 181-189.

Schuurman, Nadine. "Metadata as a Site for Imbuing GIS with Qualitative Information." In Cope, Meghan, and Sarah Elwood, eds. *Qualitative GIS: A Mixed Methods Approach*. 1st ed. Thousand Oaks, CA: Sage, 2009. Pp. 41-56.

And by now we certainly know that GIS data collection and creation carry social and political impact. (Hint: This is the part of the semester when we start to reflect on the broad list of topics we've covered.) The Easton book traces the history of the GPS. The Horn and Monmonier chapters both discuss the intersection of GIS with electoral politics through manipulations of representation and gerrymandering. Zacks and Weizman discuss the mapping process (from information collection through public response) for a 2002 map of Israel's West Bank settlements, complicating and implicating the way we discuss the authority

afforded to and power wielded by mapping. Hillier's article is a study that evaluates redlining practices relative to the creation of HOLC maps in 1930s Philadelphia. (Heads up: I will definitely ask about Hillier's article in class.) Vélez and Solórzano's chapter uses these HOLC maps as the starting point of an example case study of critical race spatial analysis (CRSA). Lastly, Corner's chapter reviews some of the cartographic theory we've previously covered, framed in a discussion with particular relevance to architecture and urban design students. (In reading this, I urge you to remember that the practices we call "mapping" include collecting and creating the data with which we draw.) You may also want to revisit the Offenhuber article in the Week 2 list.

- Corner, James. "The Agency of Mapping: Speculation, Critique, and Invention." In Cosgrove, Denis E., ed. *Mappings*. Reprint. Critical Views. London: Reaktion Books, 2002. Pp. 213-252.
- Easton, Richard D. 2013. *GPS Declassified: From Smart Bombs to Smartphones*. Lincoln, Nebraska: Potomac Books, an imprint of the University of Nebraska Press.
- *Hillier, Amy E. "Redlining and the Home Owners' Loan Corporation." *Journal of Urban History* 29, no. 4 (May 2003): 394-420.
- Horn, M. 2005. "GIS and the Geography of Politics." In *LGMR*, 939-951.
- *Monmonier, Mark. 1995. "Chapter 6. Maps, Votes, and Power." In *Drawing the Line*. New York: Henry Holt and Company, 189-219.
- Vélez, Verónica N., and Daniel G. Solórzano. "Critical Race Cartographies: Exploring Map-Making as Anti-Racist Praxis." In *Understanding Critical Race Research Methods and Methodologies*, edited by Jessica T. DeCuir-Gunby, et al, 150-65. Routledge, 2018.
- Zacks, Stephen and Eyal Weizman. "Contested Terrain." In Abrams, Janet, and Peter Hall, eds. *Else/Where: Mapping: New Cartographies of Networks and Territories*. Minneapolis: Univ. of Minnesota Design Institute, 2008. Pp. 220-227.

Week 11
T 23 Nov

PARTICIPATION. And PRIVACY and PROTECTIONS.

Notes for Class

There are no lab sessions this week in observance of the university's Thanksgiving Holiday. LM's office hours are also cancelled this week. Any changes to lab instructors' office hours and TA hours will be announced in (earlier) classes. As always, appointments can be made by email.

Readings

Just as "participatory planning" and "participatory design" might each mean several different things, participatory GIS (pGIS) takes many forms. Steinberg and Steinberg offer a foundational overview of pGIS approaches. Shiffer expands those approaches, evaluating different combinations of GIS and other media in participation processes. Talen synthesizes GIS-facilitator-led participatory processes as "Bottom-Up GIS" with in a very practical paper.

- Shiffer, M J. 2005. "Managing Public Discourse: Towards the Augmentation of GIS with Multimedia." In *LGMR*, 723-732.
- Steinberg, S. L., and S. J. Steinberg. "Chapter 8. Public Participation GIS." In *GIS Research Methods: Incorporating Spatial Perspectives*. Redlands, Calif: ESRI Press, 2010.
- *Talen, Emily. 2000. "Bottom-Up GIS." In *Journal of the American Planning Association*. 66(3): 279-294.

Frankly, a discussion of pGIS is best served by looking at examples—more than I can list here for us. Shutz et al and Kingston both examine (with examples) online mapping and data visualization as a means of facilitating community input. Together, let these serve as our examples of classic expert-facilitator-led practices.

- Kingston, Richard. 2007. "Public Participation in Local Policy Decision-Making: The Role of Web-based Mapping." In *The Cartographic Journal*. 44(2) 138-144.
- *Shutz, Lars, Susanne Raabe, Korinna Bade, and Matthias Pietsch. "Using Visual Analytics for Decision Making." *Journal of Digital Landscape Architecture* 2 (2017): 94-101.

But "community input" even carries meanings beyond "participatory design processes" and raises new concerns. Dodge and Kitchen's article outlines questions surrounding

crowdsourcing in GIS. I'm including several brief chapters from the same book involving a range of public, democratic, and "open" practices as well as mapping for advocacy, self-representation, and resistance. I suggest skimming each (the drawings are stunning) and reading those with greater relevance to your interests. Note for the Hagen et al chapter, we will be discussing the Map Kibera project in lecture. Lastly, the Williamson and Connolly chapter details a robust, early participatory GIS endeavor, notable for its grounding in folksonomy, ethnography, and openness over crowdsourcing.

Dodge, Martin, and Rob Kitchin. "Crowdsourced Cartography: Mapping Experience and Knowledge." *Environment and Planning A* 45, no. 1 (January 2013): 19–36.

*Kollektiv Orangotango+. *This Is Not an Atlas: A Global Collection of Counter-Cartographies*. Sozial- Und Kulturgeographie, volume 26. Bielefeld: Transcript Verlag, 2018. [excerpts listed below]

- Anti-Eviction Map, Erin McElroy. "Mapping the Anti-Eviction Struggle in the San Francisco Bay Area." Pp.40-47.
- Projeto Nova Cartografia Social da Amazonia, Alfredo Wagner Berno de Almeida, Sheilla Borges Dourado, and Carolina Bertolini. "A New Social Cartography: Defending Traditional Territories by Mapping in the Amazon." Pp. 48-55.
- Forum de Juventudes do Rio de Janeiro. "Militarization of Rio de Janeiro's Favelas: Measuring Impacts on the Lives of Young Black Men and Women through Social Cartography." Pp. 68-73.
- Hyderabad Urban Lab, Harsha Devulapalli, Indivar Jonnalagadda. "A Civic Mapping Project in an Indian Megacity." Pp. 122-127.
- Hagen, Erica, Julian Stenmanns, Till Straube. "Emancipatory Mapmaking: Lessons from Kibera." Pp.230-235.

*Williamson, Dominica and Emmet Connolly. "*theirwork*: The Development of Sustainable Mapping." In Dodge, Martin, et al, Eds. *Rethinking Maps: New Frontiers in Cartographic Theory*. London: Routledge, 2011. Pp. 97-112.

Part 4 | Conclusions & Implications

Week 12
T 30 Nov

BACKWARD and ONWARD.

Assignments

All Extra Credit assignments are due by 9AM on Tuesday, 30 November.

Note that this is the final week to accrue participation points (in class or online).

Notes for Class

LM will not be giving a formal lecture during our lecture session this week. Instead, students should arrive prepared for active participation in discussion (one or many groups).

Readings

Remember John Pickles's and Matt Wilson's discussions of the Friday Harbor meeting? (If not, revisit Week 2's reading list, before proceeding.) You'll notice that five articles listed below are found in a special issue of Cartography and Geographic Information Systems. (You might also recall that the Aitken and Michel reading appeared in Week 1's reading list.) Read through those before moving on to Thatcher et al, a paper that resulted from a meeting that revisited Friday Harbor more than twenty years later.

*Aitken, Stuart C., and Suzanne M. Michel. "Who Contrives the 'Real' in GIS? Geographic Information, Planning and Critical Theory." *Cartography and Geographic Information Systems* 22, no. 1 (January 1995): 17–29.

*Crampton, Jeremy. 1995. "The Ethics of GIS." In *Cartography and Geographic Information Systems*. 22(1): 84-89.

*Curry, Michael R. 1995. "Rethinking Rights and Responsibilities in Geographic Information Systems: Beyond the Power of the Image." In *Cartography and Geographic Information Systems*. 22(1): 58-69.

*Miller, Roger P. 1995. "Beyond Method, Beyond Ethics: Integrating Social Theory into GIS and GIS into Social Theory." In *Cartography and Geographic Information Systems*. 22(1): 98-103.

Onsrud, Harlan J. 1995. "Identifying Unethical Conduct in the Use of GIS." In *Cartography and Geographic Information Systems*. 22(1): 90-97

*Thatcher, Jim, Luke Bergmann, Britta Ricker, Reuben Rose-Redwood, David O'Sullivan, Trevor J Barnes, Luke R Barnesmoore, et al. "Revisiting Critical GIS." *Environment and Planning A* 48, no. 5 (May 2016): 815-24.

Week 13
T 7 Dec

FINAL PROJECTS!

Notes for Class

A final review (in one or more sessions, as needed) will be scheduled for the last week of class.

Assignments

Final presentation ("Flash Talk") slides are due by 9AM on Monday, 6 December.

Research Project Reports and Datasets are due by 11:59PM on Tuesday, 14 December.

Appendix

Additional Resources

ACS Dataset References

US Census Bureau. 2009. "A Compass for Understanding and Using American Community Survey Data: What Researchers Need to Know." US Department of Commerce. Economics and Statistics Administration.

-----, 2009. "A Compass for Understanding and Using American Community Survey Data: What State and Local Governments Need to Know." US Department of Commerce. Economics and Statistics Administration.

Example Research on Urban Topics

Drewnowski, A, *et al.* 2014. "Food Environment and Socioeconomic Status Influence Obesity Rates in Seattle and in Paris." In *International Journal of Obesity*. 38(2): 306-314.

Erenstein, Olaf, Jon Hellin, Parvesh Chandna. 2010. "Poverty Mapping Based on Livelihood Assets: A Meso-level Application in the Indo-Gangetic Plains, India." In *Applied Geography*. 30(1): 112-125.

Gil-Garcia, J. Ramon, *et al.*, Eds. 2017. *Policy Analytics, Modelling, and Informatics: Innovative Tools for Solving Complex Social Problems*. New York, NY: Springer Science+Business Media.

Johnson, Michael P. 2005. "Spatial Decision Support for Assisted Housing Mobility Counseling." In *Decision Support Systems*. 41: 296-312.

Jones, Ken and Tony Hernandez. 2004. "Chapter 2. Retail Applications of Spatial Modelling." In J. Stillwell and G Clarke (eds). *Applied GIS and Spatial Analysis*. New York: John Wiley & Sons, 11-33.

Kumar, Dilip, R.B. Singh, and Ranjeet Kaur. 2019. *Spatial Information Technology for Sustainable Development Goals. Sustainable Development Goals Series*. Cham: Springer International Publishing.

McEntee, Jesse and Julian Agyeman. 2010. "Towards the Development of a GIS Method for Identifying Rural Food Deserts: Geographic Access in Vermont, USA." In *Applied Geography*. 30(1): 165-176.

Rylatt, M, S Gadsden, and K Lomas. 2001. "GIS-based Decision Support for Solar Energy Planning in Urban Environments." In *Computers, Environment, and Urban Systems*. 25(6): 579-603.

Rybarczyk, Greg and Changshan Wu. 2010. "Bicycle Facility Planning Using GIS and Multi-Criteria Decision Analysis." In *Applied Geography*. 30(2): 282-293.

Sudhira, H S, T V Ramachandra, and K S Jagadish. 2004. "Urban Sprawl: Metrics, Dynamics, and Modelling Using GIS." In *International Journal of Applied Earth Observation and Geoinformation*. 5(1): 29-39.

Cartography, Data Visualization, and Graphic Communication

MacEachran, Alan. 1995. *How Maps Work: Representation, Visualization, and Design*. New York: The Guilford Press.

National Aeronautics and Space Administration. *Graphics Standards Manual*. NHB 1430.2. NASA, January 1976.

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-----, "Chapter 4. Research Ethics and Spatial Inquiry."

Deadlines at-a-glance

28 Sep, 9AM	Lab Assignment 1
12 Oct, 9AM	Lab Assignment 2
19 Oct, 9AM	Research Project: Project Paragraph
26 Oct, 9AM	Lab Assignment 3
	Project Paragraph Peer Feedback
3 Nov, 9AM	Reading Response: A Map
9 Nov, 9AM	Research Project: Proposal
16 Nov, 9AM	Lab Assignment 4
30 Nov, 9AM	Extra Credit Assignments
6 Dec, 9AM	Research Project Flash Talk slides
14 Dec 11:59PM	Research Project: Report
	Research Project: Datasets