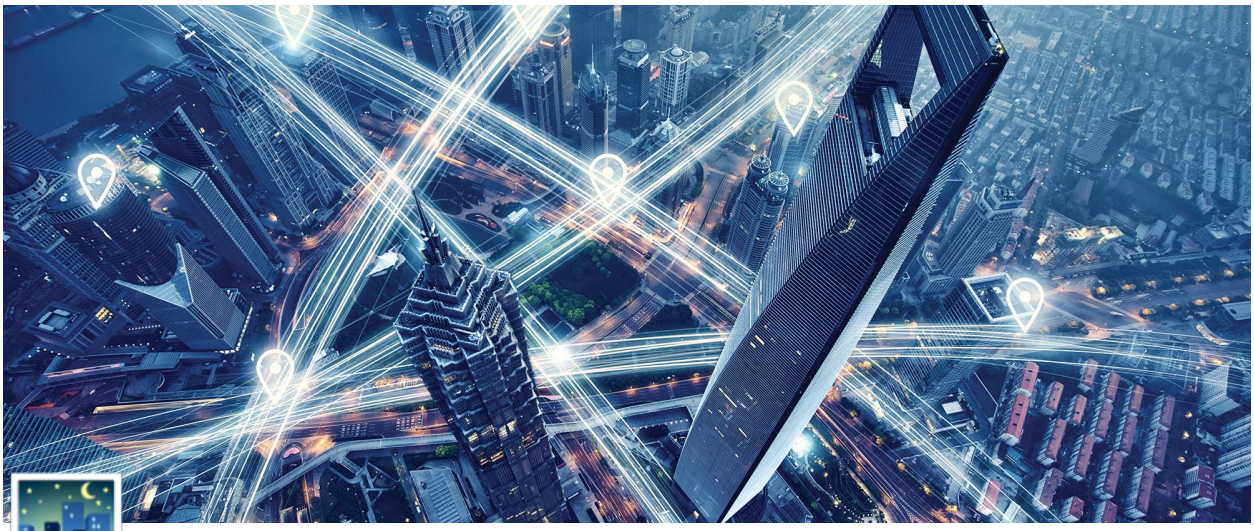

Urban Informatics (URP 535/SI 536/URP 402)

Course Staff and Schedule

Instructor: Prof. Xiaofan Liang

Email: xfliang@umich.edu (email handle includes: URP 535)

Slack: https://umich.enterprise.slack.com/

Canvas: https://canvas.it.umich.edu/

Interactive Syllabus: https://www.xiaofanliang.com/urp535

Lecture: M/W 11:30am-1:00pm, 2108 A&AB

Office: 2364 A&AB

Office hours: M/W 2:00-3:00pm in person, or by request for virtual. M is open to drop-in. W is reserved for 1-on-1 appointments (book here).

📜 Course Description

This urban informatics course introduces students to the emerging field of urban informatics that utilizes data and technology to analyze, plan, and manage cities. The course is structured with a series of lectures to discuss readings and provide

context on the topics and hands-on labs to teach technical skills and encourage critical thinking about the weekly topics.

The lectures cover a range of subjects, including urban epistemology, data politics and ethics, data infrastructure, participatory methods, smart city, platform urbanism, and so on. The technical labs focus on teaching R, spatial data wrangling, analysis, visualization, spatial network analysis, web maps, and more.

Students are encouraged to utilize class assignments as an opportunity to create their own individual or group portfolio projects. Although the course primarily emphasizes the use of the R language, experienced Python users are also permitted to submit Python projects.

While the course does not require programming or statistics prerequisites, students will benefit from familiarity with programming languages such as R or Python and basic statistical knowledge (e.g., descriptive statistics, regression, etc.).

🗝️ Learning Objectives

Theory: Gain a basic understanding of diverse epistemologies to approach cities and urban informatics, as well as the policy and ethical concerns related to the application of data and technology in urban contexts.

Method: Apply technical skills to urban topics, such as retrieving data through APIs, web scraping, and OpenStreetMap, wrangling data, compiling indicators, conducting network analysis, and visualizing web maps.

Practice: Create individual or group portfolio project(s) that demonstrate technical ability to access, analyze, and visualize data, as well as critical thinking skills to discuss the ethical and policy implications of urban analytics and technologies.

📖 Course Materials

Readings: There is no required textbook for the course. All the readings will have open-access links or have PDFs uploaded on Canvas. Due to the interdisciplinary nature of the course, you will not only read from scholars in urban planning, but also scholars in digital media, engineering, geography, computer science, and social sciences. The “reading” materials may come in multimedia formats.

Computer: Bringing your own computer is recommended on Monday lectures and is required on Wednesday labs.

Three-in-one: Students should have three links handy in the bookmarks: 1) the interactive Notion syllabus for course schedule, readings, and lab and assignment descriptions, 2) Canvas for work submission, reading PDFs, and lecture slides, 3) Slack for discussions and for technical help.

🗓️ Course Schedule

> 📌 Click `All` to see all entries. Click `Lessons` , `Labs`, and `Assignments` to switch to those entries separately. Click `Calendar` to see all due date in the calendar view. Hover over a weekly folder and click `↗ OPEN` to see topics, readings, lecture slides, and to-do lists for the week. **This schedule is subject to change. Please check periodically.**

Schedule

Aa Week	Dates	Type	Module	Topic
📒 Week 1	@01/10/2024	Lesson	Foundation	Introduction to Urban Informatics
📒 Week 2 (NA)	@01/15/2024	No Class	N/A	MLK Day (No Class)
💻 Lab 2	@01/17/2024	Lab	Foundation	Introduction to R
📒 Week 3	@01/22/2024	Lesson	Foundation	Urban Epistemology
💻 Lab 3	@01/24/2024	Lab	Foundation	Data Manipulation
📒 Week 4	@01/29/2024	Lesson	Foundation	Data Politics and Representation
💻 Lab 4	@01/31/2024	Lab	Foundation	Data Visualization
📒 Week 5	@02/05/2024	Lesson	Analytics	Data Infrastructure

Aa Week	Dates	Type	Module	Topic
Lab 5	@02/07/2024	Lab	Analytics	Census API and Web Scraping
Week 6	@02/12/2024	Lesson	Analytics	Points of Interest
Lab 6	@02/14/2024	Lab	Analytics	Point Pattern Analysis and Yelp API
Week 7	@02/19/2024	Lesson	Analytics	Spatial Networks
Lab 7	@02/21/2024	Lab	Analytics	Spatial Network Analytics
Week 8 (NA)	@02/26/2024	No Class	N/A	Spring Break (No Class)
Lab 8 (NA)	@02/28/2024	No Lab	N/A	Spring Break (No Lab)
Week 9	@03/04/2024	Lesson	Analytics	Participatory Methods
Lab 9	@03/06/2024	Lab	Analytics	OpenStreetMap (Optional)
Data Analytics	@03/10/2024	Assignment	Analytics	Topic of Interests
Week 10	@03/11/2024	Lesson	Analytics	Global Perspectives
Lab 10	@03/13/2024	Lab	Analytics	Web Map Visualization
Week 11	@03/18/2024	Lesson	Governance	Smart City and Governance
Lab 11	@03/20/2024	Lab	Governance	Group-led Discussions #1
Week 12	@03/25/2024	Lesson	Governance	Platform Urbanism
Lab 12	@03/27/2024	Lab	Governance	Group-led Discussions #2
Final Proposal	@03/31/2024	Assignment	Synthesis	Topic of Interests
Week 13	@04/01/2024	Presentation	Synthesis	Final Project Pitch
Lab 13	@04/03/2024	Lab	Synthesis	Final Project Help

Aa Week	Dates	Type	Module	Topic
Week 14	@04/08/2024	Lesson	Synthesis	Guest Lecture
Lab 14	@04/10/2024	Lab	Synthesis	Final Project Help
Week 15	@04/15/2024	Lesson	Synthesis	Guest Lecture
Lab 15	@04/17/2024	Presentation	Synthesis	Final Presentation
Week 16	@04/22/2024	Presentation	Synthesis	Final Presentation
Final Project	@04/26/2024	Assignment	Synthesis	Topic of Interests

💯 Grading

Breakdown

Participation: **10 pt**
Labs:
30 pt
Data Analytics Assignment:
20 pt
Final Proposal:
10 pt
Final Project:
30 pt

Scale

A 90-100 pt

B 80-89 pt

C 70-79 pt

D 60-69 pt

F < 60 pt

Participation

Attendance at lectures and labs is required. Students who wish to receive credits for missed classes or labs should follow the following procedures:

1. Notify the instructor at least a week ahead, or as early as possible, to request access to a Zoom-based lecture or lab on a case-by-case basis.
2. If joining a lecture through Zoom is not possible, prepare a 300-word write-up summarizing the assigned readings for the missed lecture and explaining their

relevance to the class content. Email the write-up to the instructor before the next lecture. If joining a lab through Zoom is not possible, go through the lab materials at your own time.

3. Additionally, students are responsible for reviewing lecture slides afterward, submit lab quiz questions on time, and catch up with classmates on notes and announcements.

Beyond attendance, students are encouraged to **post in the #general and #lab channels in Slack**. These posts can be any materials that are conducive for understanding the weekly topics, such as interpretations and thoughts around the readings, useful resources for labs, and news related to the weekly topics, and so on.

You are also highly encouraged to post questions and solicit helps from your peers on Slack. **Bonus participation points** will be given to students who actively participate in lectures, labs, and Slack, such as posting questions and sharing resources, interacting with the instructor (or guest lecturers), and helping your peers.

Labs

The instructor refers to the Wednesday time slot as the “lab” time. **Only 10 labs in this course are graded (from Lab 2 to Lab 12). Lab 2 to 10 are technical labs that require coding and Lab 11 and 12 are group-led discussions.** Each lab worths 3 points (30 points in total). For each of the technical labs, you will receive a lab folder that contains the lab lecture slides, any necessary data, and a R html file with examples and starter code. Lab materials will be posted on Canvas before the lab time. Note that the lab numbers correspond to the week numbers and are not continuous integers. For example, there is no Lab 1.

During each technical lab session, the first 20 minutes will be dedicated to a brief lecture that explains the code and provides technical examples. The remaining time will be allocated for self-guided work on the lab examples and practice questions. The instructor will be present in the room to offer assistance. If you require assistance with the practice questions, do not hesitate to seek help from the instructor. Labs are designed to provide practice opportunities for learning.

Each technical lab will have **three practice questions** and **three lab quiz questions**. The lab practice questions are designed to practice what you have

learned and get help if needed; they resemble the lab quiz questions which must be completed **independently by the next lab (a week from the current lab)**. To submit your lab quiz questions and your R (or ipynb) file, please go to the Canvas course page ➡️ Assignments ➡️ Labs.

The labs are designed to be completed, or at least mostly completed, within the allocated lab time. If you consistently find it difficult to finish the labs, please don't hesitate to ask for help during the lab time, either from me or from your peers.

If you finish a lab early, you are welcome to work on other tasks related to this course (such as readings and assignments) while remaining in the room.

Data Analytics Assignment

Students will complete an individual 📊 Data Analytics assignment. They are encouraged to utilize any analytical methods learned in previous labs or methods learned on their own.

This assignment has four main components: 1) research question and methods, 2) data acquisition, 3) data analysis and interpretation, and 4) data visualization and visualization. You cannot submit work completed for other classes to count towards this assignment. However, significant extensions of that work are allowed.

The grading of the data analytics assignment will be based on effort, completeness of the three components, and the depth to which you applied the skills.

Final Proposal / Project

Students will complete the ✏️Final Proposal and 📄 Final Project individually or in groups of no more than two other peers (maximum three people per group). A written final proposal and final project must be submitted before the due dates. The final proposal pitch and final project presentation will not be graded, but students are highly encouraged to present as much of their thoughts and work as possible to receive feedback.

The final project can be one of the two tracks. The first track is to create an interactive web map that critically engages with data infrastructure, data ethics, or data representation on a topic of your interest and discuss the findings in relation to readings. The second track is to conduct data analytics on a research topic of

interest and discuss how the analyses extend or challenge insights from the readings and inform urban planning. More instructions will be provided.

Similarly, the grading of the final project will be based on effort, completeness of the the grading components, and the depth of applications. Expectations for group projects will increase proportionally with group size.

R... or Python?

Both R and Python are commonly used in industry and academia for analytics. There is a slight preference for R in social science research, and a slight preference for Python in computer science, especially for simulations, machine learning, and large data processing.

Most tasks in this course can be completed using either R or Python. The instructor has a preference for R, but want to provide flexibility for students. Therefore, this course allows Python submissions in the Jupyter Notebook format (ipynb files).

There are advantages to using Python, such as leveraging existing skills and exploring libraries or analytics that are exclusively available in Python (which you can do in your final project). However, it is important to consider the potential drawbacks of using Python for this class. Here are some bullet points to help you think about them:

- **Do you have experience with Python?** You are responsible for learning all the R labs in Python, and your instructor and peers may not be able to assist you.
- **Are you willing to invest additional time in searching for materials and adapting the labs to Python?** The R labs come with starter code, but if you choose to use Python, you will need to write your own. Even for experienced Python users, you may be surprised by the amount of time required to find a suitable library or code to perform the same analyses.
- **Are you prepared for solo projects?** Since your peers are learning R, they may not be able to divide analytical tasks across two languages in order to collaborate with you.
- **Do you want to learn a second language?** Having knowledge of both R and Python on your resume can make you more attractive in the job market.

You can switch back to R at any time during the semester or use Python for any labs or assignments. If you complete a significant portion of labs and assignments in Python, you will receive **3 bonus points** added to your final grade to recognize your efforts.

🔎 Resources

Institutions

- **Spatial and Numeric Data Services (SAND) Lab:** The University Library's Spatial and Numeric Data Services (SAND) provides assistance with spatial data, numeric data, and statistics for the University of Michigan community. SAND also provides access to and assistance with data from the Inter-university Consortium for Political and Social Research (ICPSR), Roper Center for Public Opinion Research, Europa World Plus, Global Insight, Geolytics, the U.S. Census Bureau, the U.S. Geological Survey, and other sources.
- **UM Clark Library Digital Projects Studio:** A resource providing tutorials and support for visualization work on campus. Includes resources on data analysis and mapping using R and Python, web mapping with Leaflet, network analysis using Cytoscape, and more.
- **Michigan Institute for Data Science:** A university-wide institute which fosters work in data science and artificial intelligence, and hosts many events and other resources available to students.

Technical Materials

- R for Data Science (2nd Edition)
- Geocomputation with R
- Geocomputation with Python
- Spatial Social Networks (SSN) Visualization and Metrics with R
- Wheelan, C. (2013). *Naked statistics: Stripping the dread from the data*. WW Norton & Company.
- Stack Overflow

Scholarship and Grants

- Taubman College Scholarship / Fellowship Opportunities
- Arts Engine

📎 Course Policy

Late Submissions

One late submission within 24 hours of the due time will be automatically excused. After that, late work will be deducted **5%** per twenty-four hour period that passes after the due time. No late submissions are allowed for the final project submission. Late work may be excused due to unavoidable personal or family emergencies or religious observance. In these cases, students are expected to communicate with the instructor as soon as possible to arrange accommodations. **Do not email me the late submission. Proceed to submit on Canvas (even though it may show you grade deduction at first) and attach explanatory notes.**

Plagiarism

The Rackham Graduate School policy states: "Integrity in research and scholarship is a fundamental value of the University of Michigan. It is the responsibility of all students to conduct research and scholarly activities in an ethical manner at all times." This requires that you are honest in all your course work.

Plagiarism is the use of someone else's words, ideas, or work as one's own in writing or presentations, and failing to give full and proper credit to the original source. It is failing to properly acknowledge and cite language from another source, including paraphrased text. Plagiarism is a serious offense that will lead to grade penalties and a record filed with Taubman College. It may lead to failing a course or expulsion from the university.

These policies apply to all Taubman College students as well as non-Taubman College students who take courses within the college.

Since this course involves a significant amount of coding, it can be challenging to differentiate between peer support, online resources, and plagiarism. Recommended practices will be explained with examples in Lab 2. In general, you

must provide proper credit to online posts or peers (e.g., Stack Overflow, blog posts, the names of your peers) that inform your code.

Generative AI tools

The use of generative AI tools (e.g., ChatGPT) is permitted with disclosure for the following activities in this course:

- Brainstorming and refining your ideas
- Fine tuning your research questions
- Finding information on your topic
- Checking grammar and style
- Explaining technical terms and concepts
- Consulting implementation pathways (e.g., how to implement X in Y?)
- Generating conceptual images for presentations

Overall, usage for conceptual understanding and learning is allowed. If you use generative AI tools for the above usages, **an explanatory appendix is required for each and every unique usage to describe in clear steps how such a machine was used, including which machine, iteration of prompts, editing, etc.** Violation of the explicit disclosure requirement may subject students to misconducts with penalties to grades.

The use of generative AI tools for the following activities are strictly prohibited in this course to ensure effective learning:

- Creating code and answers for labs, assignments, and final projects
- Debugging code for labs, assignments, and final projects
- Generating paragraphs for assignments and final projects with prompts
- Summarizing readings
- Automating discussion posts
- Finding literature citations

Overall, the use of AI tools to actually "do" the work is prohibited. Your instructor and peers are the recommended sources for assistance. AI tools can be

helpful for debugging and iterating on code for future work, but it is important to develop these skills independently first. In addition, AI tools are known for providing false references and incorrect information, so it is the responsibility of students to fact-check the AI responses. Similarly, penalties to grades will apply if unauthorized uses of AI tools are detected.

Writing Assistance

Students are encouraged to use the University's resources for writing instruction and assistance. For our multilingual students, the ELI faculty offer office hours in our building. Students can seek assistance through the student services team.

The resources of the Sweetland Center for Writing are available for both undergraduate and graduate students. They offer classes, one--on--one assistance in a variety of modalities, and resource guides.

Sweetland Writing Center: http://lsa.umich.edu/sweetland

Link to resource guides (designed for undergraduates, but even grad students might find them useful):
http://www.lsa.umich.edu/sweetland/undergraduate/writingguides

Statement on Diversity, Equity, and Inclusion

Taubman College affirms the principles of diversity, equity, and inclusion as we organize resources and priorities that align with our values. We seek to have a diverse group of persons at all levels of the college - students, faculty, staff and administrators - including persons of different race and ethnicity, national origin, gender and gender expression, socioeconomic status, sexual orientation, religious commitment, age, and disability status. We strive to create a community of mutual respect and trust, a community in which all members and their respective backgrounds, identities, and views are represented without any threat of bias, harassment, intimidation, or discrimination. The College Compact is a description of the environment we wish to create and the behaviors we hope our community members will exhibit.

Mental Health

Taubman College is committed to advancing the mental health and wellbeing of its students. Studies and surveys indicate clearly that a variety of issues, such as

strained relationships, increased anxiety, alcohol/drug problems, and depression, directly impact student academic performance. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, please reach out to any of the following for assistance:

- Karen Henry is a CAPS Embedded Psychologist who offers counseling here at Taubman College (karhenry@umich.edu). Note that appointments may take place via phone call or BlueJeans when COVID-19 precautions are in place.
- Counseling and Psychological Services (CAPS) can be reached at (734) 764-8312 and https://caps.umich.edu/ during and after hours, on weekends and holidays. When precautions for COVID-19 are in place, please contact CAPS at caps-uofm@umich.edu or schedule online here: https://caps.umich.edu/article/caps-initial-consultation-request
- For medications, contact University Health Services (UHS) at (734) 764-8320 and https://www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see www.uhs.umich.edu/aodresources.
- For an extensive listing of mental health resources available on and off campus, visit: http://umich.edu/~mhealth/.
- To get help right away, if you or someone you know is in a crisis situation, please do one of the following: Call 911 or Call (734) 996-4747 (U-M Hospital Psychiatric Emergency).
- If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers many resources, some of which are listed at Resources for Student Well-being.

Disability Support

In compliance with the University of Michigan Rackham Graduate School policy, I am available to discuss appropriate academic accommodations that may be required for students with disabilities. Requests for academic accommodations should be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may

be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations. SSD (734-763-3000; http://ssd.umich.edu) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is private and confidential and will be treated as such.

Accommodations for Religious Holidays and Observances

The guidance on this issue issued by the Office of the Provost is as follows: "Although the University of Michigan, as an institution, does not observe religious holidays, it has long been the University's policy that every reasonable effort should be made to help students avoid negative academic consequences when their religious obligations conflict with academic requirements. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities. It is the obligation of students to provide faculty with reasonable notice of the dates of religious holidays on which they will be absent. Such notice must be given by the drop/add deadline of the given term. Students who are absent on days of examinations or class assignments shall be offered an opportunity to make up the work, without penalty, unless it can be demonstrated that a make-up opportunity would interfere unreasonably with the delivery of the course. Should disagreement arise over any aspect of this policy, the parties involved should contact the Department Chair, the Dean of the School, or the Ombudsperson. Final appeals will be resolved by the Provost."

Audio and Video Recordings and Protecting Privacy

The pandemic crisis may require that synchronous class activities be recorded and posted for students who are unable to participate in-person. But recording lectures, discussions, and other similar course-related activities raises important privacy concerns. Instructors must balance the need to include all class members against the need to protect privacy concerns. Recording may stifle discussion and interfere with the free exchange of ideas, particularly when discussing sensitive

subjects. Instructors may choose to have some sessions not recorded in order to encourage the free exchange of ideas, or they may choose to pause recording when discussion of sensitive subjects begins. Instructors will share recordings only with members of the class through a platform that is only accessible by members, such as Canvas, to ensure that only members of the class in which the recording was made can access the recording. Faculty should take steps, such as preventing downloading capability, in order to protect the privacy of the members. Recordings and chat sessions are private and cannot be shared outside the classroom. Sharing recordings or chat sessions with anyone outside of the class will be considered academic misconduct. Course activities may be audio or video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact the instructor the first week of class, or as soon as you enroll in the course, to discuss alternative arrangements. The university provides additional resources on recordings and privacy concerns.

📚 Appendix: Week by Week Reading

Week 1: Introduction to Urban Informatics

- Boeing, G., Batty, M., Jiang, S., & Schweitzer, L. (2021). Urban Analytics: History, Trajectory, and Critique. *arXiv preprint* https://arxiv.org/abs/2105.07020
- Singleton, A. D., Spielman, S., & Folch, D. (2018). *Urban Analytics* (Chapter 2: Sensing the city). Sage Publication.
- (TECHNICAL RESOURCE) Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for Data Science (Section Prerequisites). O'Reilly Media, Inc. https://r4ds.had.co.nz/introduction.html#prerequisites
- (TECHNICAL RESOURCE) Wheelan, C. (2013). *Naked Statistics: Stripping the Dread from the Data*. WW Norton & Company. Book PDF.

Week 3: Urban Epistemology

- Batty, M. (2022, June). The New Urban Science, Complexity, and Big Data [Video]. YouTube (hosted by Urban AI). https://www.youtube.com/watch?v=LsMA9qF1m4o

- Mattern, S. (2021). A City Is Not a Computer: Other Urban Intelligences (Chapter 1 and 2, p.18-72). Routledge.
- Scott, J. C. (1998). Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed (Chapter 2, p.53-63). Yale University Press.
- (TECHNICAL RESOURCE) Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for Data Science (Section 3.1: Data Transformation; Section 5: Data tidying; Section 7: Data Import; Section 12-19: Transform). O'Reilly Media, Inc. https://r4ds.hadley.nz/data-transform

Week 4: Data Politics and Representation

- D'ignazio, C., & Klein, L. F. (2020). Data Feminism (Chapter 1, p.21-47). MIT press.
- Williams, S. (2020). Data Action (Chapter 3, p.89-135). MIT Press.
- Loukissas, Y. A. (2019). All Data Are Local: Thinking Critically in a Data-driven Society (Chapter 5, p.130-140). MIT press.
- (TECHNICAL RESOURCE) Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for Data Science (Section 1: Data Visualization; Section 9-11: Visualize). O'Reilly Media, Inc. https://r4ds.hadley.nz/data-visualize
- (TECHNICAL RESOURCE) Tennekes, M., Nowosad, J. (2021). Elegant and Informative Maps with tmap. https://r-tmap.github.io/tmap-book/

Week 5: Data Infrastructure, Census API, and Web Scraping

- Kitchin, R. (2014). The Data Revolution: Big Data, Open Data, Data Infrastructures & Their Consequences (Chapter 1: p.23-30; Chapter 2: p.15-22). SAGE Publications Ltd.
- Sieber, R. E., & Johnson, P. A. (2015). Civic Open Data at a Crossroads: Dominant Models and Current Challenges. *Government Information Quarterly*, *32*(3), 308-315.
- Weister, T. (2020, July). Demystifying the Census API (time 2:20 - 38:29) [Video]. YouTube (hosted by U.S. Census Bureau). https://www.youtube.com/watch?v=dlOUZcrqiUA&t=140s. Additionally, you can explore Census data through: https://data.census.gov/.

- Sign up for Census API key through the link below. https://api.census.gov/data/key_signup.html
- (TECHNICAL RESOURCE) Walker, K. (2023). Analyzing US Census Data: Methods, Maps, and Methods in R. https://walker-data.com/census-r/index.html
- (TECHNICAL RESOURCE) Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for Data Science (Section 24: Web Scraping). O'Reilly Media, Inc. https://r4ds.hadley.nz/webscraping

Week 6: Points of Interest

- Psyllidis, A., Gao, S., Hu, Y., Kim, E. K., McKenzie, G., Purves, R., Yuan, M. & Andris, C. (2022). Points of Interest (POI): A Commentary on the State of the Art, Challenges, and Prospects for the Future. *Computational Urban Science*, *2*(1), 20. https://link.springer.com/article/10.1007/s43762-022-00047-w (open-access)
- Latham, A., & Layton, J. (2019). Social Infrastructure and the Public Life of Cities: Studying Urban Sociality and Public Spaces. *Geography Compass*, *13*(7), e12444. https://compass.onlinelibrary.wiley.com/doi/full/10.1111/gec3.12444 (open-access)
- (EXPLORE) Liang, X., & Andris, C. (2022). Measuring McCities: Landscapes of Chain and Independent Restaurants in the United States. *Environment and Planning B: Urban Analytics and City Science*, *49*(2), 585-602. https://journals.sagepub.com/doi/full/10.1177/23998083211014896 (open-access)
- (EXPLORE) Moro, E., & Pentland, A. (2019). The Atlas of Inequality [Web Map]. https://inequality.media.mit.edu/#
- (TO-DO) Sign up YELP Fusion API. https://docs.developer.yelp.com/docs/fusion-authentication

Week 7: Spatial Networks

- Liang, X., & Kang, Y. (2021). A Review of Spatial Network Insights and Methods in the Context of Planning: Applications, Challenges, and Opportunities. In

Geertman, S. C. M., Pettit, C., Goodspeed, R., & Staffans, A. (Eds.), *Urban Informatics and Future Cities* (pp.71-91). Springer.

- Liang, X., Baker, J., DellaPosta, D., & Andris, C. (2023). Is Your neighbor Your Friend? Scan Methods for Spatial Social Network Hotspot Detection. *Transactions in GIS,* 27(3), pp.607-625.
- (EXPLORE) Chetty, R., Jackson, M., Kuchler, T., Strobel, J., Hiller A., Oppenheimer, S., et al. (2022). Social Capital and Economic Mobility [Non-technical research summary]. https://opportunityinsights.org/wp-content/uploads/2022/07/socialcapital_nontech.pdf
- (EXPLORE) Chetty, R., Jackson, M., Kuchler, T., Strobel, J., Hiller A., Oppenheimer, S., et al. (2023). Social Capital Atlas [Web Map]. https://socialcapital.org/
- (EXPLORE) Badger, E., & Bui, Q. (2018, September 19). *How connected is your community to everywhere else in America?*. The New York Times. https://www.nytimes.com/interactive/2018/09/19/upshot/facebook-county-friendships.html
- (EXPLORE) Schöttler, S., Yang, Y., Pfister, H., & Bach, B. (2021). Geospatial Network Visualization. https://geonetworks.github.io/
- (TECHNICAL RESOURCE) Spatial Social Networks (SSN) Visualization and Metrics with R
- (TECHNICAL RESOURCE) SSNtools
- (DATA) Facebook Social Connectedness Index
- (DATA) LEHD Origin-Destination Employment Statistics (LODES) - Commute Networks
- (DATA) Census Migration and Mobility dataset
- (DATA) Safegraph between Census Tracts, Counties, and States Mobility Flow Data (Developed for COVID-19 Tracking, 2019-2021)
- (DATA) SNAP (Stanford Large Network Dataset Collection)
- (DATA) Network Data Collections
- (DATA AND TOOLS) Social Network Mapping Nexus (SNoMaN)

- (DATA AND TOOLS) OpenStreetMap (OSMnx: Python for Street Networks)

Week 9: Participatory Methods, Crowdsourcing, OpenStreetMap

- Goodchild, M. F. (2007). Citizens as Sensors: The World of Volunteered Geography. *GeoJournal*, *69*, 211-221.
- Wilson, A., & Tewdwr-Jones, M. (2021). Digital Participatory Planning: Citizen Engagement, Democracy, and Design (Chapter 4: p.83-113). Routledge.
- (EXPLORE) Ushahidi Public Deployments. https://www.ushahidi.com/in-action/deployments/
- (SKIM) Rotich, J. (2017). Ushahidi: Empowering Citizens through Crowdsourcing and Digital Data Collection. *Field Actions Science Reports*, 16. https://journals.openedition.org/factsreports/4316
- (TO-DO) Register an account at OpenStreetMap. https://www.openstreetmap.org/user/new
- (TECHNICAL RESOURCE) `osmdata` R package (Download and import OSM data as `sf` or `sp` objects). https://cran.r-project.org/web/packages/osmdata/osmdata.pdf
- (TECHNICAL RESOURCE) `ohsome` R package (Interact with the ohsome API for OpenStreetMap history data aggregation and extraction). https://github.com/GIScience/ohsome-r
- (TECHNICAL RESOURCE) OpenStreetMap Wiki Beginners' Guide. https://wiki.openstreetmap.org/wiki/Beginners'_guide

Week 10: Perspectives from the Global South, Humanitarian Mapping, Interactive Web Map

- Herfort, B., Lautenbach, S., Porto de Albuquerque, J., Anderson, J., & Zipf, A. (2021). The evolution of humanitarian mapping within the OpenStreetMap community. *Scientific reports*, *11*(1), 3037. https://www.nature.com/articles/s41598-021-82404-z (open-access)
- Thomson, D. R., Kuffer, M., Boo, G., Hati, B., Grippa, T., Elsey, H., Linard, C., Mahabir, R., Kyobutungi C., Maviti, J., Mwaniki, D., Ndugwa, R., Makau, J., Sliuzas, R., Cheruiyot S., Nyambuga, K., Mboga, N., Kimani, N. W.,

Albuquerque, J. P. & Kabaria, C. (2020). Need for an integrated deprived area “slum” mapping system (IDEAMAPS) in low-and middle-income countries (LMICs). *Social Sciences*, *9*(5), 80. https://www.mdpi.com/2076-0760/9/5/80 (open-access)

- Williams, S., White, A., Waiganjo, P., Orwa, D., & Klopp, J. (2015). The digital matatu project: Using cell phones to create an open source data for Nairobi's semi-formal bus system. *Journal of Transport Geography*, *49*, 39-51.
- (EXPLORE) Humanitarian OpenStreetMap Team (HOT)
- (EXPLORE) Humanitarian OSM Stats
- (EXPLORE) Integrated Deprived Area Mapping System
- (DATA) WorldPop: Open Spatial Demographic Data and Research
- (DATA) Microsoft Building Footprints
- (DATA) Google Open Building
- (DATA) GADM: Openly Available Administrative Boundaries for Countries and their Sub-Divisions.
- (DATA) Overture Maps (including POIs, Buildings, Transportation, and Administrative Boundaries layers)
- (TECHNICAL RESOURCE) Leaflet for R. https://rstudio.github.io/leaflet/
- (TECHNICAL RESOURCE) Interactive Maps (publishing tmap interactive maps on RPub). https://friendlycities-gatech.github.io/SSN_tutorial/advanced-aesthetics.html#interactive-maps
- (TECHNICAL RESOURCE) Working with Shiny for R. https://docs.posit.co/shinyapps.io/getting-started.html#working-with-shiny-for-r
- (TECHNICAL RESOURCE) How to visualize a billion rows of data in R with Apache Arrow. https://blog.djnavarro.net/posts/2022-08-23_visualising-a-billion-rows/

Week 11: Smart City, Data Governance, Autonomous Vehicle

- (GROUP #1) Artyushina, A. (2020). Is Civic Data Governance the Key to Democratic Smart Cities? The Role of the Urban Data Trust in Sidewalk Toronto. *Telematics and Informatics*, *55*, 101456.
- (GROUP #1) Sidewalk Toronto. https://www.sidewalklabs.com/toronto
- (GROUP #2) MetroLab (2023). Model Data Governance Policy and Practical Guide for Cities and Counties. https://metrolabnetwork.org/datagovernance-guide/
- (GROUP #3) Autonomous Vehicles and Cities. Urban Mobility Lab at MIT. https://mobility.mit.edu/av
- (GROUP #3) Michigan Economic Development Corporation. Cavnue/CAV (Connected and Automated Vehicle) Corridor. https://www.michiganbusiness.org/reports-data/success-stories/cavnue-cav-corridor/

Week 12: Sousveillance, Platform Economy, Responsibility and Ethics of Online Platforms

- (GROUP #4) Mann, S., & Ferenbok, J. (2013). New Media and the Power Politics of Sousveillance in a Surveillance-dominated World. *Surveillance & Society*, *11*(1/2), 18-34. https://ojs.library.queensu.ca/index.php/surveillance-and-society/article/view/veillance/veillance (open-access)
- (GROUP #4) McElroy, E., Cohen, N., Garcia-Salazar, P., Harris, G., Liquigan, A., Martignoni, M., McCarroll, M., Pan, L. L., Ramirez, A., Xu, S. C. (2023). San Francisco Landlord Tech Report (p.38-47). https://www.antievictionlab.org/sf-report
- (GROUP #5) Dewan, S., & Sanyal, K. (Eds.). (2023, May). Empowerment or Exploitation: Global Perspectives on Women's Work in the Platform Economy. JustJobs Network. https://justjobsnetwork.org/files/empowerment-or-exploitation-global-perspectives-on-womens-work-in-the-platform-economy_may-2023.pdf
- (GROUP #6) Helberger, N., Pierson, J., & Poell, T. (2018). Governing Online Platforms: From Contested to Cooperative Responsibility. *The Information Society*, *34*(1), 1-14.

- (GROUP #6) Delivery Workers, Trapped in the System. (2020, September). Renwu. [English Translation] https://chuangcn.org/2020/11/delivery-renwu-translation/. (Original Article in Mandarin: https://zhuanlan.zhihu.com/p/225120404)