F25: Planning Methods (URP 506)

Course Staff and Schedule

Instructor: Prof. Xiaofan Liang

Email: xfliang@umich.edu

Teaching Assistant: Maina Wachira

Email: mwachira@umich.edu

Slack: um-fa25-f25-urp506.slack.com

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

Interactive Syllabus:
https://www.xiaofanliang.com/f25urp506

Lecture: T/Th 10:00am-11:30am, 1360 A&AB

Office: 2364 A&AB

Instructor Office Hours: Tuesday 9-10am & 1:30-2:30pm. Thursday 4-5pm. OH are in-person and pre-booked. Virtual is available by request. Each slot is 15mins and feel free to book multiple slots for longer conversations. Book office hours here.

TA Office Hours: Friday 12-1:00pm in person @ 2208K A&AB or by request for virtual. Book office hours here.

📜 Course Description

Understanding quantitative and qualitative methods is essential for urban planners, as these methods enable the analysis of urban data, the evaluation of policy impacts, and the development of evidence-based solutions to complex urban problems. This course provides students with essential methods and techniques integral to planning practice and urban research, with a strong emphasis on data analysis and statistical concepts. Students will learn how to match appropriate methods to specific planning and urban policy research problems and effectively communicate statistical arguments. The course is structured with a series of lectures to discuss statistical and research concepts and hands-on labs to teach technical skills and encourage critical thinking about the weekly topics.

The course covers a range of subjects, including research design, descriptive statistics, probability distribution, statistical tests, multivariate regression, survey design, data ethics, data analysis and communication.

Basic knowledge of intermediate algebra and mathematics is required. Prior knowledge of R or Python is not required, but is advantageous.

🔑 Learning Objectives

Knowledge: Understand how various statistical methods collect, analyze, and interpret data from a variety of sources common to the planning profession.

Skills: Learn to use R for data wrangling, statistical tests, and data visualization.

Critical Thinking: Analyze empirical, data-driven arguments related to contemporary planning issues, and recognize both the underlying systems of values they promote and the specific factual claims they rely upon.

📖 Course Materials

Reading: Lectures will follow the Ewing & Park's textbook below closely, but purchase is not required. You can access a digital copy of this book online through UMich library. You are also encouraged to read Gaber's textbook on qualitative methods, but only two chapters will be included in the required reading. A physical copy of this book is available through UMich library. Both of these textbooks are grounded through planning examples and practices. All other readings will either have an open-access link in the syllabus, or a PDF copy on Canvas. All readings

will be linked in corresponding weekly folder. There is also an Appendix of weekly reading appended at the end of this syllabus.

- Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners*. Routledge. https://search.lib.umich.edu/catalog/record/018244852.

- Gaber, J. (2020). *Qualitative Analysis for Planning & Policy: Beyond the numbers*. Routledge. https://search.lib.umich.edu/catalog/record/990184724390106381

Computer: Bringing your own computer is recommended on Tuesday lectures and is required on Thursday 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	≡ Topic
📒 Week 1	@08/26/2025	Lesson	Introduction to Planning Methods
🖥 Lab 1	@08/28/2025	Lab	Introduction to R
📒 Week 2	@09/02/2025	Lesson	Research Design and Data Sources
🖥 Lab 2	@09/04/2025	Lab	U.S. Census Data Manipulation

Week	Dates	Type	Topic
📒 Week 3	@09/09/2025	Lesson	Sampling and Descriptive Statistics
🖥️ Lab 3	@09/11/2025	Lab	U.S. Census Continued, Descriptive Statistics
📒 Week 4	@09/16/2025	Lesson	Probability Distributions and Data Visualization
🖥️ Lab 4	@09/18/2025	Lab	Probability Distributions and Data Visualization
📒 Week 5	@09/23/2025	Lesson	Hypothesis Testing
🖥️ Lab 5	@09/25/2025	Lab	Hypothesis Testing
📒 Week 6	@09/30/2025	Lesson	ANOVA and Chi-square Tests
🖥️ Lab 6	@10/02/2025	Lab	ANOVA and Chi-square Tests
📒 Week 7	@10/07/2025	Lesson	Correlation and OLS Linear Regression
🖥️ Lab 7	@10/09/2025	Lab	Correlation and OLS Linear Regression
📒 Week 8 (NA)	@10/14/2025	No Class	Fall Break (No Class)
🖥️ Lab 8	@10/16/2025	Lab	Census Analysis Assignment Help (Optional)
📊 Census Analysis	@10/19/2025	Assignment	Census Analysis (Individual)
📒 Week 9	@10/21/2025	Lesson	Survey Design and Administration
🖥️ Lab 9	@10/23/2025	Lab	DEMACS Survey Analysis (No Lab; Optional Bonus for 3pt)
📒 Week 10	@10/28/2025	Lesson	Prediction and Regression Diagnostics
🖥️ Lab 10	@10/30/2025	Lab	Prediction and Regression Diagnostics
📒 Week 11	@11/04/2025	Lesson	Communication, Ethics, and Critical Thinking on Data & Statistics + Debate Group Meetup
🖥️ Lab 11	@11/06/2025	Lab	Statistics Debate Group Work

Aa Week	📅 Dates	⊙ Type	☰ Topic
📔 Week 12	@11/11/2025	Lesson	Applied Planning Methods (Guest Lecture) + Statistics Debate Interim Submission
🖥 Lab 12	@11/13/2025	Lab	Statistics Debate Group Work
📔 Week 13	@11/18/2025	Presentation	Statistics Debate (Group)
🖥 Lab 13	@11/20/2025	Presentation	Statistics Debate (Group) - Room change to 2104
📣 Statistics Debate	@11/23/2025	Assignment	Statistics Debate Report and Reflection (Group)
📔 Week 14	@11/25/2025	Lesson	Final Exam Review
🖥 Lab 14 (NA)	@11/27/2025	No Lab	Thanksgiving Break
📔 Week 15	@12/02/2025	Lesson	(Optional) Study Help
📄 Final Exam	@12/04/2025	Final Exam	Final Exam

💯 Grading

Breakdown

Participation: **10 pt**
Labs: **24 pt**
Census Analysis: **20 pt**
Statistics Debate and Reflection: **26 pt**
Final Exam: **20 pt**

Scale / Minimum %

A+	100	A	95
A-	90	B+	87
B	83	B-	80
C+	77	C	73

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 listed concepts for the missed lecture in the weekly, such as what it is, why it is used, when it is used, how to use it. 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 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.

Peer Help

This class highly encouraged peer help and collaborative learning. You are encouraged to help your peers to debug code, explain concepts, and work together on lab practice questions and assignments. You are also encouraged to post questions and solicit helps from your peers on Slack. **Up to two 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. If the help happened offline, you can email a paragraph of endorsement to the instructor to describe how your peer(s) have helped you in this class. The only portions that need to be completed independently are 1) lab quizzes, and 2) final exam.

Labs

The instructor refers to the Thursday time slot as the "lab" time. **Only 8 labs in this course are graded (Lab 1 to 7, Lab 10).** Each lab worths 3 points (24 points in total). For each of the technical labs (coding with R), 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 may not be continuous integers.

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. Teaching assistant 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 completed with substantial individual efforts by the next lab (a week from the current lab)**. You may ask your peers or instructor for help on debugging code. 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 and lab quiz early, you are welcome to leave early or stay to help your peers.

Individual Assignment

Students will complete an individual, 📊 Census Analysis assignment. You will be asked to pick one or a few Census variables and conduct statistical analyses. You are allowed to solicit help from your peers, the instructor, and the TA. Please see 📊 Census Analysis for details on instructions and grading metrics.

Group Assignment

Students will complete a group project which involves two parts: 1) 🔬 Statistics Debate presentation, and 2) 🔬 Statistics Debate Report and Reflection. Students will be divided into groups that will take opposite position on a controversial planning topic and will need to use data to support their positions and present their arguments in class. After in-class presentations, students will be asked to

reflect on the debate and think critically about how quantitative/qualitative arguments can be contested. More details will be provided.

Final Exam

The final exam will be **open-book**, but not open to the internet. It means that you can reference readings, lecture slides, and lab materials during the exam, but you are not allowed to search on the internet or use any GenAI tools. The scope of the exam will focus on conceptual understanding of statistical methods as applied to planning problems.

R... or Excel?

Most of the lab quizzes and assignments are approach-agnostic, which means that you can use any softwares or tools to answer the questions. There is a strong preference for R in this class because the instructor wants to introduce computational thinking and advanced tools of data wrangling and visualization. R is also a powerful programming language that is widely used in industry and academia for analytics. Compared with traditional point-and-click software (e.g., Excel), R enables your analysis to be replicable, traceable, and scalable, which increases the reliability of analysis.

However, if you felt overwhelmed by R and would like to opt for a point-and-click software interface, you are welcome to use Excel. Before you gave up on R, think about the following points:

- **Are you struggling due to R programming language or statistical concepts?** Sometimes not knowing what to do is more about not knowing how to break down a problem than not knowing how to write code.

- **Are you willing to invest additional time in learning a useful tool and way of thinking?** The learning curve for a programming language can be sharp for some people, especially if you have no STEM background. Yet, the sharp learning curve also means that you are growing by breaking your boundaries and mindsets.

- **Are you planning on taking other data-driven urban planning class?** Most of the data-driven urban planning courses taught by Prof. Xiaofan Liang (e.g., Introduction to Urban Informatics, Urban Networks, etc.) will require knowledge of R or Python.

- **Have you talked to the instructor about your struggles?** If you are not sure, please sign up for an office hour and I can help you find the best way forward.

🔍 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.

- **Art, Architecture, & Engineering Library**: This library hosts many useful research guides for students who need to find reading or data resources. Some of the guides include *Urban and Regional Planning Research Guide*, *Detroit Research Guide*, and *GeoSpatial Data Research Guide*. The recommended point of contact is Rebecca Price <rpw@umich.edu>.

- UM Central Student Government offers **free student subscription** to New York Times and the Wall Street Journal. Others such as Financial Times, the Washington Post, and the Atlantic are also available through library database. Some instructions are given in the link above.

Technical Materials

- Wheelan, C. (2013). *Naked statistics: Stripping the dread from the data*. WW Norton & Company.

- R for Data Science (2nd Edition)

- Stack Overflow

Scholarship, Grants, and Opportunities

- Taubman College Scholarship / Fellowship Opportunities

- Arts Engine

- Taubman Career Network

📎 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 in the comment section of the submission.**

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 for the following activities in this course. **Overall, usage with high human agency for conceptual understanding and learning is allowed.**

- Brainstorming and refining your ideas
- Fine tuning your research questions
- Finding information on your topic
- Checking grammar and style
- Explaining technical terms and concepts
- Generate interactive Q&A to help with test or debate preparation

The use of generative AI tools for the following activities are strictly prohibited in this course to ensure effective learning. **Overall, the use of AI tools with low human agency to actually "do" the work is prohibited.**

- Creating code and answers for lab quizzes, assignments, and the final exam
- Generating interpretations for statistical outcomes
- Generating paragraphs for writing with outlines
- Summarizing readings
- Generate literature citations

The following activities are **strongly discouraged as they contain important learning lessons for beginners but may use AI as a last resort help**:

- Debugging. AI tools can be helpful for debugging and iterating on code for future work, but it is important to develop these skills independently first. You are discouraged to use AI for debugging in this class, unless you exhaust all other approaches (e.g., asking for help from peers and instructors). **AI should NOT be the excuse for last minute work help due to poor time management.**

Overall, your instructor and peers are the recommended sources for assistance. 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:

- Aniko Varga is a CAPS Embedded Psychologist who offers counseling here at Taubman College (anikov@med.umich.edu). She reside at 2226 Taubman College.

- 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 Planning Methods

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 1, p.1-8; Chapter 2). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (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

Week 2: Research Design and Data Sources

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 3, 4 & 5). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (SKIM) Gaber, J. (2020). *Qualitative analysis for planning & policy: Beyond the numbers* (Chapter 1: Introduction, p.1-11). Routledge.

- (TECHNICAL RESOURCE) Getting Started with Your Search on data.census.gov. U.S. Census Bureau. https://www.youtube.com/watch?v=QtdmnysIKcQ

- (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 3: Sampling, Descriptive Statistics, Data Visualization

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 6 & 7). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (SKIM) Gaber, J. (2020). *Qualitative analysis for planning & policy: Beyond the numbers* (Chapter 1: Introduction, p.11-15). Routledge.

- (SKIM) Sampling Methods. Scribbr. https://www.scribbr.com/methodology/sampling-methods/

- (Optional) The Normal Distribution, Clearly Explained (5mins). StatQuest with Josh Starmer. https://www.youtube.com/watch?v=rzFX5NWojp0&list=PLblh5JKOoLUK0FLuzwntyYI10UQFUhsY9

- (TECHNICAL RESOURCE) The R Graph Gallery. https://r-graph-gallery.com/

Week 4: Probability Distribution

- (Optional) The Main Ideas Behind Probability Distributions (5mins). StatsQuest with Josh Starmer. https://www.youtube.com/watch?v=oI3hZJqXJuc&list=PLblh5JKOoLUK0FLuzwntyYI10UQFUhsY9&index=2

- (Optional) Sampling from a Distribution, Clearly Explained!!! (4mins). StatsQuest with Josh Starmer. https://www.youtube.com/watch?

v=XLCWeSVzHUU&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=10

- (Optional) The Central Limit Theorem, Clearly Explained!!! (7mins) StatsQuest with Josh Starmer. https://www.youtube.com/watch?v=YAlJCEDH2uY&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=25

- (Optional) Confidence Intervals, Clearly Explained!!! (6mins) StatsQuest with Josh Starmer. https://www.youtube.com/watch?v=TqOeMYtOc1w&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=35

- (Optional) Bootstrapping Main Ideas!!! (9mins) StatsQuest with Josh Starmer. https://www.youtube.com/watch?v=Xz0x-8-cgaQ&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=30

- (Optional) Population and Estimated Parameters, Clearly Exlained!!! (14mins) StatsQuest with Josh Starmer. https://www.youtube.com/watch?v=vikkiwjQqfU&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=6

- (Optional) Confidence Intervals Explained: Examples, Formula & Interpretation. SimplyPsychology. https://www.simplypsychology.org/confidence-interval.html

- (Optional) Z-Score: Definition, Formula, Calculation & Interpretation. SimplyPsychology. https://www.simplypsychology.org/confidence-interval.html

- (Optional) But What is the Central Limit Theorem? 3Blue1Brown. https://www.youtube.com/watch?v=zeJD6dqJ5lo&list=PL4cNQ1YkG5WhQGmPnRe4vDUImh_nviriy

- (Optional) Kunin, D. Seeing Theory: A visual introduction of probability and statistics (Section: Probability Distributions & Frequentist Inference).

Week 5: Hypothesis Testing

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 10). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (Optional) Hypothesis Testing and the Null Hypothesis, Clearly Explained!!! StatsQuest with Josh Starmer [Youtube]. https://www.youtube.com/watch?v=0oc49DyA3hU&list=PLblh5JKOoLUK0FLuzwntyYl10UQFUhsY9&index=10

- (Optional) p-values: What they are and how to interpret them. StatsQuest with Josh Starmer [Youtube]. https://www.youtube.com/watch?v=vemZtEM63GY

- (Optional) How to calculate p-values. StatsQuest with Josh Starmer [Youtube]. https://www.youtube.com/watch?v=JQc3yx0-Q9E

Week 6: ANOVA and Chi-square Tests

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 8 & 11). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (Optional) What Is An ANOVA Test In Statistics: Analysis Of Variance. SimplyPsychology. https://www.simplypsychology.org/anova.html

- (Optional) Chi-Square (X²) Test & How To Calculate Formula Equation. SimplyPsychology. https://www.simplypsychology.org/confidence-interval.html

- (Optional) What Is An ANOVA Test In Statistics: Analysis Of Variance. SimplyPsychology. https://www.simplypsychology.org/anova.html

- (Optional) Liang, X., Lee, S., Chen, H., de la Peña, B., & Andris, C. (2022). Characteristics of Jetters and Little Boxes: An Extensibility Study Using the Neighborhood Connectivity Survey. *Social Inclusion*, *10*(3), 221-232.

Week 7: Correlation and OLS Linear Regression

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 9 & Chapter 12). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (Optional) Kunin, D. Seeing Theory: A visual introduction of probability and statistics (Section: Regression Analysis). https://seeing-theory.brown.edu/regression-analysis/index.html#section1

- (Optional) Zhe, Y. (2021). Interactive Visualization of Linear Regression. https://observablehq.com/@yizhe-ang/interactive-visualization-of-linear-regression

- (Optional) Powell, V. & Lehe, L. Ordinary Least Squares Regression Explained Visually. https://setosa.io/ev/ordinary-least-squares-regression/

Week 9: Prediction and Regression Diagnostics

- (SKIM) Ewing, R., & Park, K. (Eds.). (2020). *Basic Quantitative Research Methods for Urban Planners* (Chapter 12, p.231 - p.268). Routledge. (PDF on Canvas; Or https://search.lib.umich.edu/catalog/record/018244852.x)

- (Optional) 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.

- (Optional) Liang, X., Hidalgo, C. A., Balland, P. A., Zheng, S., & Wang, J. (2024). Intercity connectivity and urban innovation. *Computers, Environment and Urban Systems*, *109*, 102092.

- (Optional) Bureau of Transportation Statistics. Local Area Transportation Characteristics for Households (LATCH Survey). https://www.bts.gov/latch/latch-methodology

Week 10: Survey Design and Administration

- (SKIM) Singleton, R.A. & Straits, B. (1999). Survey Instrumentation. In *Approaches to Social Research*, 5th Ed. Oxford University Press.

- (TECHNICAL RESOURCE) Detroit Metro Area Communities Study. University of Michigan. https://detroitsurvey.umich.edu/about/

- (TECHNICAL RESOURCE) Detroit Metro Area Communities Study (DMACS) Wave 18, Final Questionnaire (on Canvas)

- (TECHNICAL RESOURCE) Detroit Metro Area Communities Study (DMACS) Wave 18, Final Questionnaire Code Book (on Canvas)

- (TECHNICAL RESOURCE) Detroit Metro Area Communities Study (DMACS) Wave 16, Michigan, 2023 (ICPSR 38892). https://www.icpsr.umich.edu/web/ICPSR/studies/38892

- (Optional) NACTO Bike Share Intercept Survey Toolkit (2016). https://nacto.org/interceptsurveytoolkit/

Week 11: Data Communication and Ethics

- (SKIM) Schadt, Rob. "Communicating Your Ideas: Designing and Delivering Technology Enhanced Presentations." Online Resource (PDF). https://sphweb.bumc.bu.edu/otlt/schadt/Communicating-Your-Ideas.pdf

- (Optional) Wachs, M. (1989). When planners lie with numbers. *American Planning Association. Journal of the American Planning Association*, *55*(4), 476.

- (Optional) Wachs, M. (1985). Ethical dilemmas in forecasting for public policy. In *Ethics in planning* (pp. 246-258). Routledge.

- (Optional) David, G., Warmington, P., & Demack, Sean (2018). QuantCrit: education, policy, 'Big Data' and principles for a critical race theory of statistics. *Race Ethnicity and Education* 21 (2): 158-179. (PDF on Canvas)

- (SKIM) Eviction Lab. Methods Q & A. https://evictionlab.org/methods/

- (SKIM) Desmond, M., Gromis, A., Edmonds, Lavar., Hendrickson, J., Krywokulski, K., Leung, L., & Porton, A. *Eviction Lab Methodology Report: Version 1.0*. Princeton: Princeton University, 2018. (Sections I and II, Pages 1-9). https://evictionlab.org/updates/research/our-methodology-report/

- (SKIM) Daniela, A., Bates, L., Graziani T., Herring, C., Maharawal, M., McElroy, E., Phan P., & Purser, G. 2018. "Eviction Lab Misses the Mark." *Shelterforce*. https://shelterforce.org/2018/08/22/eviction-lab-misses-the-mark/

Week 12: Applied Planning Methods

- (SKIM) Goodspeed, R (2019). Scenario Planning. Embracing Uncertainty to Make Better Decisions. Lincoln Institute of Land Policy. https://www.lincolninst.edu/publications/policy-briefs/scenario-planning

- (SKIM) Population Analysis for Planners. Measure Evaluation. https://www.measureevaluation.org/resources/training/online-courses-and-resources/non-certificate-courses-and-mini-tutorials/population-analysis-for-planners.html

- (EXPLORE) Population Pyramids. U.S. Census. https://data.census.gov/app/population_pyramids