



Urban Informatics II

UP 316

Spring 2025

Learning Outcomes

This class equips students with a theoretical foundation and practical skills in Urban Informatics. It takes you on a journey that starts from fundamental and traditional statistical and econometric methods to cutting-edge machine learning and AI techniques. Emphasizing a hands-on approach, this class blends lectures, discussions of application case, and lab sessions foster a deep understanding of addressing real-world urban planning challenges through data and analyses. By actively engaging with data, students will develop the analytical proficiency needed to address concrete issues in urban environments.

After successfully completing this course, you will be able to:

- Develop a strong theoretical foundation in urban informatics with a focus on practical applications
- Acquire data literacy skills to effectively collect, manage, and manipulate data
- Apply data analysis to address urban planning challenges
- Create compelling data visualizations and communicate insights clearly to a range of audiences
- Gain familiarity with cutting-edge urban informatics tools and methods
- Become a proficient R user

Resources

All materials, including readings, assignments, and discussion questions are available on the Canvas site.

Course Policies

Absence should be avoided whenever possible due to the fast pace of this course. You can easily fall off-track if you don't keep up. If absence is absolutely necessary, talk to me early on in the semester so that I can make proper arrangement. Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, official university activities, and students whose dependent children experience serious illness. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. If your absence with justified cause (e.g., work-restricted religious holy days) coincides with one or more of the major grading events (e.g., presentations, class activates), come talk to me **early on** in the semester so that we can make proper accommodation.

**Kerry Fang
(Instructor)**

kfang@illinois.edu

Maria Tejero (TA)

mtejero2@illinois.edu

Class Meets

Mon & Wed & Fri (lab)
11:00–11:50am
(MW) 227 Temple
Hoyne Buell Hall
(Fri) 101 901 W Oregon

Office Hours

Instructor: Mondays
2:00-3:00pm
232 Temple Hoyne Buell
Hall
Email me ahead of time
if you plan to come

TA: Fridays 11:50am-
12:50pm.
101 901 W Oregon

Prerequisites

UP116 or equivalent

Course Communication

I will send notifications through Canvas and students can reach me any time via emails. I respond within 24 hours unless on travel.

In this course, I will distribute a large number of materials to assist your study through Canvas. These materials are copyrighted and can only be used by you for the purpose of advancing your education. None of the course materials can be shared with people outside of this class.

University Policy

This course also abides by policies of the University of Illinois at Urbana-Champaign, such as the Academic Integrity, Mental Health, Community of Care, etc.

Academic Integrity

Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/>.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <https://studentcode.illinois.edu/article1/part4/1-401/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Mental Health

Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

Counseling Center (217) 333-3704

McKinley Health Center (217) 333-2700

National Suicide Prevention Lifeline (800) 273-8255

Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)

If you are in immediate danger, call 911.

Community of Care

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (217-333-0050 or <http://odos.illinois.edu/community-of-care/referral/>). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, as a Community of Care, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the Student Assistance Center (SAC) in the Office of the Dean of Students for support and referrals to campus and/or community resources.

Students with Disabilities

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible and provide the instructor with a Letter of Academic Accommodations

from Disability Resources and Educational Services (DRES). To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should apply for services with DRES and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-1970, e-mail disability@illinois.edu or visit the DRES website at <http://www.disability.illinois.edu/>. Here is the direct link to apply for services at DRES, <https://www.disability.illinois.edu/applying-services>.

Disruptive Behavior

Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office for Student Conflict Resolution (<https://conflictresolution.illinois.edu>; conflictresolution@illinois.edu; 333-3680) for disciplinary action.

Emergency Response Recommendations

Emergency response recommendations and campus building floor plans can be found at the following website: <https://police.illinois.edu/em/run-hide-fight/>. I encourage you to review this website within the first 10 days of class.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. Students should complete the Request for Accommodation for Religious Observances form should any instructors require an absence letter in order to manage the absence. In order to best facilitate planning and communication between students and faculty, students should make requests for absence letters as early as possible in the semester in which the request applies.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Learning Assessments

The grading structure for this course is as follows:

1. Final project: urban planning data journalism article (40%)

For your final project, apply the skills learned in this course to investigate an urban planning issue of your choice. You may work individually or in a group of up to three students. This project should

incorporate data collection, manipulation, analysis, and visualization to offer insights into your chosen urban planning topic.

Deliverables of the final project include:

- **Data Journalism Article:** Present your findings in the form of a data-driven article. Your article should feature compelling data visualizations to effectively communicate the issue you explored. The format is flexible and may be a PDF document, a Word document with accompanying graphics, or a website that integrates your text and visualizations.
- **Process Memo:** Document the steps you took to complete the project. This memo should include:
 - Sources and methods of data collection
 - Details of data preparation and transformation steps
 - Any analyses performed
 - Explanations of the visualizations and tools used
- **Supporting Files:** Submit all datasets, code files, and other materials used to produce the analysis and visualizations. This documentation will allow others to replicate your work.

This project is an opportunity to apply and showcase the data literacy, analysis, and visualization skills developed throughout the course. Detailed requirements are available on the Canvas site.

2. Mini-projects: regression, data visualization, and machine learning (20%)

These mini-projects assess your understanding of regression, data visualization, and machine learning by challenging you to critically engage with real-world examples. For each mini-project, select an article or visualization that applies one of these methods and complete the following tasks:

- **Detailed Analysis:** Write a review that explains what the article or visualization aims to achieve, evaluates its strengths, and offers a critique of its approach. Discuss any limitations or areas for improvement.
- **Replication Attempt:** Attempt to replicate the results or visualization as closely as possible, using the same data and similar methods. Document your process, including: the steps you took to reproduce the analysis or visualization; any challenges you encountered, where you got stuck, and why.

Each student should complete two out of three mini-projects (one each on regression, data visualization, or machine learning). If you choose to complete all three, only the two highest scores (each 10%) will count. These projects are designed to deepen your understanding of the methods covered in this course and demonstrate how they can be applied to real-world issues.

3. Lab assignments (20%)

Most weeks include a lab assignment due before the next lab session, one week later. Each assignment is worth 2% of your final grade, with a total of 11 assignments throughout the course. You may skip one lab assignment if you earn full scores on all others, or complete all 11 to reach the maximum score of 20%. Additionally, some labs include an optional assignment. Completing these optional assignments earns you 1% bonus credit per optional assignment. At the end of the semester, your cumulative lab scores will be capped at a maximum of 20%.

4. Class participation (20%)

Active participation is expected in class discussions and activities, including presentations, leading discussions, and preparing questions related to course readings. To support your preparation, readings will be posted on the Canvas site one week in advance.

Grades

Grades are not given but earned. Your grade is determined by your performance on the learning assessments in the course and is assigned individually (not curved). If earning a particular grade is important to you, please speak with me at the beginning of the semester so that I can offer some helpful suggestions for achieving your goal. All assessment rubrics and scores will be posted on the course Canvas site. If you have questions about how something was scored, please email me to schedule a time for us to meet in my office.

Late work will ***not*** be accepted for course credit so please plan to have it submitted before the scheduled deadline. I am happy to discuss any of your grades with you, and if I have made a mistake I will immediately correct it. Any formal grade disputes must be submitted in writing and within one week of receiving the grade.

Final letter grades are assigned based on the percentage of total assessment points earned. To be fair to everyone I have to establish clear standards and apply them consistently, so please understand that being close to a cutoff is not the same this as making the cut ($89.99 \neq 90.00$). It would be unethical to make exceptions for some and not others.

Final Grade Cutoffs									
+	98	+	88	+	78	+	68		
A	92	B	82	C	72	D	62	F	<60
-	90	-	80	-	70	-	60		

Get Some Help!

You are expected to take personal responsibility for you own learning. This includes acknowledging when your performance does not match your goals and doing something about it. If you find yourself in need, please visit Connie Frank CARE Center <https://odos.illinois.edu/community-of-care/CAREcenter> to seek for expert help. Tutoring is available through OMSA <http://omsa.illinois.edu/programs/tutoring/> and writing support is available through the University of Illinois Writers Workshop <https://online.illinois.edu/getting-started/other-important-info-for-online-students/writing-support>. Finally, if you just need someone to talk to, visit <https://counselingcenter.illinois.edu/>.



Course Schedule (By Week)

The course is structured around weekly themes, with three sessions each week. On Mondays, students engage in interactive lectures focused on core methods. Wednesdays are dedicated to discussing assigned readings, emphasizing the application of Monday's methods to real-world examples. Fridays feature lab sessions where students practice hands-on exercises using R or other relevant software tools. All readings and assignments are due before class unless otherwise noticed.

DUE BEFORE CLASS		DURING OUR CLASS MEETING
Week 1		Overview 1/22 <ul style="list-style-type: none"> • Icebreaking: Introduction of the instructor, TA, and students • An overview of the course and urban informatics

		<ul style="list-style-type: none"> • A taste of urban informatics <p>1/24</p> <ul style="list-style-type: none"> • Getting back on horse <p>Readings:</p> <ul style="list-style-type: none"> •Boeing, G., Batty, M., Jiang, S., & Schweitzer, L. (2022). "Chapter 30: Urban analytics: History, trajectory and critique". In <i>Handbook of Spatial Analysis in the Social Sciences</i>. Cheltenham, UK: Edward Elgar Publishing. Retrieved Oct 25, 2024, from https://doi.org/10.4337/9781789903942.00039 • Data@Urban’s Top Posts of 2023. https://urban-institute.medium.com/data-urbans-top-posts-of-2023-104dd278fed
Module I: Laying the Foundation: Data Manipulation, Statistics, and Spatial Analysis		
Week 2		<p>Data Detectives: Exploring & Shaping Data with Descriptive Analysis I</p> <p>1/27</p> <ul style="list-style-type: none"> •Obtaining, understanding, and cleaning Data •Typical descriptive analysis I <p>1/29</p> <ul style="list-style-type: none"> •Understanding data and the use of descriptive analysis <p>1/31</p> <ul style="list-style-type: none"> •Data Access and manipulation: tidycensus (Census and ACS) and five verbs I <p>Readings:</p> <ul style="list-style-type: none"> •Jurjevich, J. R., Griffin, A. L., Spielman, S. E., Folch, D. C., Merrick, M., & Nagle, N. N. (2018). Navigating Statistical Uncertainty: How Urban and Regional Planners Understand and Work With American Community Survey (ACS) Data for Guiding Policy. <i>Journal of the American Planning Association</i>, 84(2), 112–126. https://doi.org/10.1080/01944363.2018.1440182 • Rural Population Grows for Second Consecutive Year https://dailyonder.com/rural-population-grows-for-second-consecutive-year/2024/04/02/
Week 3	Lab 1 due 2/7 before class	<p>Data Detectives: Exploring & Shaping Data with Descriptive Analysis II</p> <p>2/3</p> <ul style="list-style-type: none"> •Typical descriptive analysis II <p>2/5</p>

		<ul style="list-style-type: none"> •Understanding data and the correct use of descriptive analysis to represent the data <p>2/7</p> <ul style="list-style-type: none"> •Data manipulation: five verbs II <p>Readings:</p> <ul style="list-style-type: none"> •Map: The Most Common Job In Every State https://www.npr.org/sections/money/2015/02/05/382664837/map-the-most-common-job-in-every-state •Opinion: No, ‘truck driver’ isn’t the most common job in your state https://www.marketwatch.com/story/no-truck-driver-isnt-the-most-common-job-in-your-state-2015-02-12
Week 4	<p><i>Lab 2 due 2/12 before class</i></p>	<p>Uncovering Relationships: Linear Regression Analysis</p> <p>2/10</p> <ul style="list-style-type: none"> •What is regression analysis? •How to estimate a regression? •How to interpret a regression? •Assumptions and violations <p>2/12</p> <ul style="list-style-type: none"> •How to design a regression analysis? •How to interpret a regression? <p>2/14</p> <ul style="list-style-type: none"> •Replicate a small part of the regression analysis in the reading <p>Readings:</p> <ul style="list-style-type: none"> •Hamidi, S., Sabouri, S., & Ewing, R. (2020). Does Density Aggravate the COVID-19 Pandemic? Early Findings and Lessons for Planners. <i>Journal of the American Planning Association</i>, 86(4), 495–509. https://doi.org/10.1080/01944363.2020.1777891
Week 5	<p><i>Lab 3 due 2/21 before class</i></p>	<p>Variations of Regression Analysis: Logistic/Panel</p> <p>2/17</p> <ul style="list-style-type: none"> •What is logistic regression? •What is panel data analysis? •How to interpret these regressions? <p>2/19</p> <ul style="list-style-type: none"> •How to design a logistic and panel data regression analysis? •How to interpret these regressions? <p>2/21</p> <ul style="list-style-type: none"> •Replicate a small part of the regression analysis in the readings

		<p>Readings:</p> <ul style="list-style-type: none"> •Nong, Y., & Du, Q. (2011). Urban growth pattern modeling using logistic regression. <i>Geo-spatial Information Science</i>, 14(1), 62-67. • Yan, X., Tuo, H., & Lai, Y. (2022). A Two-Way Fixed Effects Estimation on the Impact of Industrial Land Supply on Environmental Pollution in Urban China. <i>International Journal of Environmental Research and Public Health</i>, 19(22), 14890.
Week 6	<p><i>Lab 4 due 2/28 before class</i></p>	<p>Let's Map It! Spatial Analysis</p> <p>2/24</p> <ul style="list-style-type: none"> •Why does spatial analysis matter? •What is spatial matrix? •What is global Moran's I? •How spatial correlation affects regression estimation? •A brief mention of LISA <p>2/26</p> <ul style="list-style-type: none"> •Why does spatial analysis matter? •What is spatial matrix? •How to interpret global Moran's I? <p>2/28</p> <ul style="list-style-type: none"> • Use R to map, generate spatial matrix, and calculate Moran's I • Show how global Moran's I equal the coefficient of the spatial autoregression analysis <p>Readings:</p> <ul style="list-style-type: none"> •Wang, B., Liu, Y., Tong, Z., An, R., & Xu, J. (2023). Spatiotemporal Dynamic Characteristics of Land Use Intensity in Rapidly Urbanizing Areas from Urban Underground Space Perspectives. <i>Sustainability</i>, 15(17), 13008.
Module II: Data Communication: Data Visualization and Journalism		
Week 7	<p><i>Lab 5 due 3/7 before class</i></p> <p><i>Mini-Project 1 due 3/3 before class</i></p>	<p>Producing Better, Clean Graphs</p> <p>3/3</p> <ul style="list-style-type: none"> •Principles of producing better, cleaner graphs <p>3/5</p> <ul style="list-style-type: none"> •Detect graphic problems •How to fix them <p>3/7</p> <ul style="list-style-type: none"> • ggplot • Clean theme • Replicate a clean graph <p>Reading:</p>

		<ul style="list-style-type: none"> • Schwabish, Jonathan A. (2014). An Economist's Guide to Visualizing Data. <i>Journal of Economic Perspectives</i>, 28 (1): 209–34.
Week 8	<i>Lab 6 due 3/14 before class</i>	<p>Bringing Data to Life: Interactive Graphs</p> <p>3/10</p> <ul style="list-style-type: none"> • Use of interactive graphs • Types and examples of interactive graphs • R and D3 <p>3/12</p> <ul style="list-style-type: none"> • Discussion of class reading. Which do you like the most? Why? What they did correctly? What can be improved? <p>3/14</p> <ul style="list-style-type: none"> • R shiny app, leaflet. • D3 application (optional) <p>Readings:</p> <ul style="list-style-type: none"> • 8 Incredible Examples of Interactive Data Visualization. https://www.datalabsagency.com/2024/04/15/8-incredible-examples-of-interactive-data-visualization/
Week 9		Spring Break; No Class
Week 10	<i>Lab 7 due 3/28 before class</i>	<p>Visual Storytelling: Data Journalism</p> <p>3/24</p> <ul style="list-style-type: none"> •What is data journalism? •Principles and best practices of data journalism •Avoid common pitfalls in data journalism <p>3/26</p> <ul style="list-style-type: none"> •Discussion of class reading. What’s great? What’s wrong? <p>3/28</p> <ul style="list-style-type: none"> •Discussion of final project <p>Reading:</p> <ul style="list-style-type: none"> • State lotteries transfer wealth out of needy communities. https://cnsmaryland.org/2022/07/01/state-lotteries-transfer-wealth/
Module III: At the Forefront: Machine Learning, POI, NLP, and Generative AI		
Week 11	<i>Mini-Project 2 due 3/31 before class</i>	<p>From Explanatory to Predictive Models</p> <p>3/31</p> <ul style="list-style-type: none"> • Machine learning as a broader framework, explanatory to predictive models • Classification and types and examples of machine learning

		<p>4/2</p> <ul style="list-style-type: none"> • Discussion of class reading. What is each of these algorithms? Which one do you like the most, and why? <p>4/4</p> <ul style="list-style-type: none"> • Lasso (required) and random forest (optional). <p>Reading:</p> <ul style="list-style-type: none"> • 10 Must-Know Machine Learning Algorithms for Data Scientists. https://johnvastola.medium.com/10-must-know-machine-learning-algorithms-for-data-scientists-adbf3272398a
Week 12	<p><i>Lab 8 due 4/11 before class</i></p>	<p>Web Scrapping: A Dive into Points of Interest</p> <p>4/7</p> <ul style="list-style-type: none"> •What is web scrapping? •Principles of web scrapping •What is POI? <p>4/9</p> <ul style="list-style-type: none"> •Discussion of class readings <p>4/11</p> <ul style="list-style-type: none"> •Use R (googleaway package) and other tools (such as Octoparse) to scrap POI •Other R web scrapping rvest <p>Readings:</p> <ul style="list-style-type: none"> • Psyllidis, A., Gao, S., Hu, Y., Kim, E. K., McKenzie, G., Purves, R., ... & Andris, C. (2022). Points of Interest (POI): A commentary on the state of the art, challenges, and prospects for the future. <i>Computational Urban Science</i>, 2(1), 20. •Liang, X., & Andris, C. (2022). Measuring McCities: Landscapes of chain and independent restaurants in the United States. <i>Environment and Planning B: Urban Analytics and City Science</i>, 49(2), 585-602.
Week 13	<p><i>Lab 9 due 4/18 before class</i></p>	<p>No Class, Professor at UAA.</p>
Week 14		<p>Text as Data: Text Mining</p> <p>4/21</p> <ul style="list-style-type: none"> • What is text mining? • How to use text mining? <p>4/23</p> <ul style="list-style-type: none"> • Discussion of class readings <p>4/25</p>

		<ul style="list-style-type: none"> • topic modeling using R • Introduction to VOSviewer <p>https://www.youtube.com/watch?v=9dTWkNRxUtw (optional)</p> <p>Readings:</p> <ul style="list-style-type: none"> • Schweitzer, L. (2014). Planning and social media: a case study of public transit and stigma on Twitter. <i>Journal of the American Planning Association</i>, 80(3), 218-238. • Fang, L., & Ewing, R. (2020). Tracking our footsteps: Thirty years of publication in JAPA, JPER, and JPL. <i>Journal of the American Planning Association</i>, 86(4), 470-480.
Week 15	<p><i>Lab 10 due 5/2 before class</i></p>	<p>Generative AI: ChatGPT</p> <p>4/28</p> <ul style="list-style-type: none"> • What is generative AI? • What is behind generative AI? • How to use generative AI in planning? And what to avoid? <p>4/30</p> <ul style="list-style-type: none"> • Discussion of class reading <p>5/2</p> <ul style="list-style-type: none"> • Replicate a part of the class reading • Final project troubleshooting <p>Readings:</p> <ul style="list-style-type: none"> • Fu, X., Wang, R., & Li, C. (2023). Can ChatGPT Evaluate Plans? <i>Journal of the American Planning Association</i>, 90(3), 525–536. https://doi.org/10.1080/01944363.2023.2271893
Week 16	<p><i>Lab 11 due 5/9 by 11am</i></p> <p><i>Mini-Project 3 due 5/12 midnight</i></p> <p><i>Final project due 5/12 midnight</i></p>	<p>5/5 & 5/7</p> <p>Final Project Presentation</p>

Note: Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.