

**New York University**  
**Department of Politics**  
**Topics in Urban Management: Urban Science for Data-Driven Policy**  
**and Planning**

**Course No.: POL-GA 2334, Section 2**  
**Semester: Spring 2019 (TBC)**

Instructor:

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Course Description

This course introduces students to the emerging field of urban science. Students are exposed to a range of data science and machine learning methods, urban data sources (including social media, geolocation data, 311 complaints, energy use, and many others), and urban policy and planning from the perspective of data-driven decision-making. Issues of city governance, structure, and history are presented to understand how to identify and assess urban problems, collect and organize appropriate data, utilize suitable analytical approaches, and ultimately produce results that recognize the constraints faced by city agencies and policymakers. This is not an easy task, and requires an understanding of urban social and political dynamics and a significant appreciation of data governance, privacy, and ethics. Specific attention is given to domain areas of energy and building efficiency; transportation and mobility; public health and emergency response; waste; and social connectivity and resilience, as well as the deployment of urban technology at the neighborhood scale. The role of civic engagement and community participation in the context of open data and citizen science is explored, as well as the evolving relationship between, and influence of, big data on urban politics and governance. Top-down and bottom-up models of innovative service delivery are discussed and debated in the context of public decision-making. Case studies and best practice examples from and global cities are used extensively, with a particular focus on New York City.

Cities are increasingly data-rich environments, and data-driven approaches to operations, policy, and planning are beginning to emerge as a way to address global social challenges of sustainability, resilience, social equity, and quality of life. Understanding the various types of urban data and data sources – structured and unstructured, from land use records to social media and video – and how to manage, integrate, and analyze these data are critical skills to improve the functioning of urban systems, more effectively design and evaluate policy intervention, and support evidenced-based urban planning and design. While the marketing rhetoric around Smart Cities is replete with unfulfilled promises, and the persistent use (and mis-use) of the term Big Data has generated confusion and distrust around potential applications, the reality remains that disruptive shifts in ubiquitous data collection (including mobile devices, GPS, social media, and synoptic video) and the ability to store, manage, and analyze massive datasets require students to have new capabilities that respond to these innovations.

Prerequisites: POL-GA 1120 or equivalent. Students should be familiar with probability and statistics and have a basic understanding of regression analysis and statistical modeling.

## Course Objectives

- Understand the overall structure and governance of data-driven urban management, policy, and planning
- Develop knowledge of data sources and the application of analytics to city challenges
- Explore how social and political dynamics impact the adoption and efficacy of data-driven decision-making
- Critically evaluate the use of data and technology in urban governance and public sector decision-making
- Understand the role of information and communications technologies in cities and opportunities and constraints to employing ICT to improve the effectiveness of city policy and planning

## Course Requirements

In addition to weekly readings and lectures, the course requirements include two problem set assignments and a team project with presentation. Class discussion is an integral part of the course and will factor into the final grade. Students are expected to attend all classes and complete all readings prior to the session indicated in the course outline below. The two problem sets are designed to test your ability to bring analytical tools to urban problems.

### *Data*

Data for assignments or course discussion will be posted on a class GitHub repository or on NYU Classes. This will be announced in class.

### *A Note on Written Submission and Presentation Requirements:*

All written work will be submitted at the beginning of class. Word or LaTeX are acceptable. For Word submission, please use 1.5-spacing in Times New Roman 12-point font, with 1” margins. All charts, graphs, and tables should be embedded in the paper and appropriately referenced in the text. Pages and charts should be numbered appropriately. All sources used should be appropriately cited in the text and included in a list of references at the end of the paper. Spelling, grammar, format, and style of the written work will all factor into the grade, so please be make sure to leave sufficient time to proof-read and edit your work.

Weekly innovation updates are brief (1-page maximum) summaries of novel data science or technological approaches to topics relevant to the week the update is due. Each student will do a total of three (3) weekly innovation updates, including the Week 2 discussion paper. More details on the final team project (including specific written submission and presentation requirements) will be distributed during the first weeks of the semester.

### ***Final Project***

The purpose of your Final “Social Impact” Project is to give you the opportunity to work through identifying and solving problems facing the City of New York using actual NYC data. Through team-based work, you will cover the full range of a data project—from problem identification to solution implementation. This experiential learning exercise will help you define and conduct an analytics project that integrates your technical training and prepares you for future data projects.

### *Deliverables for Final Project*

There are five deliverables for the project. They are sequenced to build on each other.

## **Session 6** (due at the beginning of class)

Problem Identification due – Written summary of problem, approach, and data inventory. The written summary should address, in a write-up of approximately 5 pages:

### **Overview**

- City of NYC Context and background
- Description of challenge or opportunity

### **Objectives and Goals**

- Problem statement
- Project objectives, including how it is linked to social relations
- Conceptual approach and methods
- Description of end projects (including format)

### **Data Inventory**

- Types and sources
- Access and availability
- Legal and privacy considerations

## **Session 9**

Literature review due – Complete literature review including bibliography. You should include studies that are relevant to both the *context* of your problem, and the *methods* used to solve similar questions. The literature review should be approximately 3 pages in the required format.

## **Session 12**

Methods and descriptive analysis due – Complete methodological and data description section, as well as initial descriptive results from your analysis of the data. The methods section and descriptive results should be approximately 5 pages in the required format.

## **Session 14**

**Draft FINAL paper sent out for peer review**

## **Session 15**

**FINAL paper due and presentation day.** The final paper will combine your conceptual framework with the technical methods and results. Your report will explain the technical methods in the context of the selected problem and how your approach leads to a potential solution. The report should describe the data used; techniques for cleaning and data wrangling; analytical methods; and data outputs and results. The group final paper should be no more than 15 pages in the required format.

A one-page (maximum) Executive Summary is required, which highlights key findings, takeaways, and recommendations.

### Grading

All requirements must be completed by the date specified and handed in at the beginning of class or they will not be counted toward the final grade. No late assignments will be accepted.

- Weekly “Urban Analytics” Update – 10%

- Problem Set Assignments – 30% (15% each)
- Final Team Project and Presentation – 50%
  - Breakdown of Final Project grading: Milestone deliverables – 10% each; Peer review – 10%; Final Presentation – 20%; Final paper – 40%
- Class Participation and Attendance – 10%

### NYU Classes

You must have access to the NYU Classes site (<http://classes.nyu.edu/>). All announcements and class-related documents (supplemental and suggested readings, discussion questions, etc.) will be posted there.

Some class announcements will be distributed via NYU e-mail. Thus, it is important that you actively use your NYU e-mail account, or have appropriate forwarding set up on NYU Home (<https://home.nyu.edu/>).

### Required Readings (subject to change)

All readings listed in the Course Outline below are required, unless noted as optional.

*Required readings are available through NYU online libraries on Google Scholar or ScienceDirect. Some readings will be posted on NYU Classes or distributed in class.*

### Recommended/Suggested Readings

Batty, M. (2013). *The new science of cities*. MIT Press.

Goldsmith, S., & Crawford, S. (2014). *The responsive city: Engaging communities through data-smart governance*. John Wiley & Sons.

Glaeser, E. (2011). *Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. Penguin.

Revell, Keith. *Building Gotham: Civic Culture and Public Policy in New York City, 1898-1938*, Baltimore: Johns Hopkins Press: 2003

Doig, Jameson. *Empire on the Hudson: Entrepreneurial Vision and Political Power at the Port of New York Authority*, New York: Columbia University Press, 2001

Caro, Robert. *The Power Broker: Robert Moses and the Fall of New York*, New York: Vintage Books, 1975.

Vernon, Raymond. *Metropolis 1985: An Interpretation of the Results of the New York Metropolitan Region Study*, Cambridge; Harvard University Press, 1960.

Jacobs, Jane. *The Death and Life of Great American Cities: The Failure of City Planning*

Castells, Manuel. *Rise of the Network Society*. 2<sup>nd</sup> edition. Oxford: Blackwell: 2000

Frieden, Bernard and Lynne Sagalyn (1989). *Downtown, Inc.: How America Rebuilds Cities*. Cambridge, MA: MIT Press.

Fainstein, Susan S. (1994). *The City Builders: property, politics, and planning in London and New York*. Oxford: UK; Cambridge, MA.: Blackwell.

Sassen, Saskia (1991). *The Global City: New York, London, Tokyo*. Princeton, NJ: Princeton University Press.

Nagle, R. (2013). *Picking Up: On the Streets and Behind the Trucks with the Sanitation Workers of New York City*. Macmillan.

Noveck, B. S. S. (2009). *Wiki government: how technology can make government better, democracy stronger, and citizens more powerful*. Brookings Institution Press.

Flood, Joe. *The Fires: How a Computer Formula, Big Ideas, and the Best of Intentions Burned Down New York City--and Determined the Future of Cities*. New York: Riverhead Books: 2010.

Katz, Bruce and Jennifer Bradley. *The Metropolitan Revolution: How Cities and Metros Are Fixing Our Broken Politics and Fragile Economy*. Washington, D.C.: Brookings Institution Press: 2013.

#### Statement of Academic Integrity

NYU values both open inquiry and academic integrity. Students are expected to follow standards of excellence set forth by the University. Such standards include respect, honesty, and responsibility. The University does not tolerate violations to academic integrity including:

- Plagiarism
- Cheating on an exam
- Submitting your own work toward requirements in more than one course without prior approval from the instructor
- Collaborating with other students for work expected to be completed individually
- Giving your work to another student to submit as his/her own
- Purchasing or using papers or work online or from a commercial firm and presenting it as your own work

Students are expected to familiarize themselves with the University's policy on academic integrity and plagiarism as they will be expected to adhere to such policies at all times.

The University's policies concerning plagiarism, in particular, will be strictly followed. Please consult the *Chicago Manual of Style* for guidelines on citations. Do not hesitate to ask if you have any questions regarding writing style, citations, or any academic policies.

## Course Outline (subject to change)

### SECTION 1: SENSING THE CITY

#### **Session 1 – Data and Cities – Limits and Opportunities**

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- Topics: Introduction; New York City and the physical, social, and economic patterns of urban growth; Innovation in cities; Course overview – assignments and grading, outline, expectations, etc.
- Readings: Anderson, Chris. The End of Theory: The Data Deluge Makes the Scientific Method Obsolete, *Wired Magazine*, June 23, 2008.  
[http://archive.wired.com/science/discoveries/magazine/16-07/pb\\_theory/](http://archive.wired.com/science/discoveries/magazine/16-07/pb_theory/)
- Bettencourt, L. and G. West. 2010. A unified theory of urban living. *Nature* 467 (7318), 912-913.
- Kontokosta, C.E. 2018. Urban Informatics in the Science and Practice of Planning. *Journal of Planning Education and Research*.

#### **Session 2 – Understanding Cities: Perspectives from the Political, Physical, Natural, and Social Sciences**

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- Topics: A brief history and theory of cities; the “smart city” discourse in context; urban science, urban informatics, and a science of cities.
- Readings: Davis, K. The Origin and Growth of Urbanization in the World. *The American Journal of Sociology*, 60 (5), 429-437.
- Jacobs, J. *Death and Life of Great American Cities*. Chapter 22.
- Klosterman, Richard. 1985. "Arguments For and Against Planning," *Town Planning Review* 56: 5-20.
- Allwinkle, S., & Cruickshank, P. (2011). Creating smart-er cities: An overview. *Journal of Urban Technology*, 18(2), 1-16.

**Assignment: Discussion paper due (5 pages max.). Please respond to the following question: *Do urban data scientists need theory to inform their work and have impact? Why or why not?***

#### **Session 3 – Urban Data – Sources, Types, Uses, and Limits**

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- Topics: The implications of large-scale data on city operations and planning; Understanding urban data – sources, quality, uses; Transparency and open data; Civic engagement, privacy, and ELSI issues.
- Readings: Batty, M. (2012). Smart cities, big data.

Zheng, Y., Capra, L., Wolfson, O., & Yang, H. (2014). Urban computing: concepts, methodologies, and applications. *ACM Transactions on Intelligent Systems and Technology (TIST)*, 5(3), 38.

Zook, M., Barocas, S., Crawford, K., Keller, E., Gangadharan, S. P., Goodman, A., ... & Nelson, A. (2017). Ten simple rules for responsible big data research. *PLoS computational biology*, 13(3), e1005399.

**Assignment: Weekly innovation updates start (based on group).**

#### **Sessions 4 and 5 – Solving Problems with Analytics: What Works?**

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Topics: The analytical toolkit; How cities, industry, and citizens use data; Understanding the urban problem typology – operations, policy, and planning.

Readings: Donella Meadows, Dancing with Systems. *Handout*.

Lindblom, Charles. 1959. "The Science of 'Muddling Through'," *Public Administration Review* 19: 79-88.

Provost, F., & Fawcett, T. (2013). Data science and its relationship to big data and data-driven decision making. *Big Data*, 1(1), 51-59.

Case Study: HBS New Urban Mechanics

**Assignment: Project - Problem selection and data inventory due.**

### **SECTION 2: URBAN OPERATIONS**

#### **Session 6 – 311 & e-Government – Bias and Machine Learning**

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Topics: Self-reported data for city service delivery; bias and representativeness; predictive modeling

Readings: Minkoff, S. L. (2016). NYC 311: A Tract-Level Analysis of Citizen–Government Contacting in New York City. *Urban Affairs Review*, 52(2), 211-246.

Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly*, 27(3), 264-271.

Case Study: HBS NYC311

#### **Session 7 – Crime – Spatial Prediction Models**

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Topics: Predictive policing and data-driven crime prevention strategies; challenges of spatial correlation

Readings: Weisburd, D., Mastrofski, S. D., McNally, A., Greenspan, R., & Willis, J. J. (2003). Reforming to Preserve: CompStat and Strategic Problem Solving in American Policing. *Criminology & Public Policy*, 2(3), 421-456.

Goel, S., Rao, J. M., & Shroff, R. (2016). Precinct or prejudice? Understanding racial disparities in New York City's stop-and-frisk policy. *The Annals of Applied Statistics*, 10(1), 365-394.

Case Study: HBS ShotSpotter

**Assignment: Problem Set #1 due.**

### **Session 8 – Pedestrian Mobility – Wifi, Cell Phone, and Social Media Data**

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Topics: Real-time population dynamics and trajectories using WiFi, social media, and count data; What drives pedestrian activity in cities?

Readings: Kontokosta, C. E., & Johnson, N. (2017). Urban phenology: Toward a real-time census of the city using Wi-Fi data. *Computers, Environment and Urban Systems*, 64, 144-153.

Gonzalez, M. C., Hidalgo, C. A., & Barabasi, A. L. (2008). Understanding individual human mobility patterns. *Nature*, 453(7196), 779-782.

Qian, C., Kats, P., Malinchik, S., Hoffman, M., Kettler, B., Kontokosta, C., & Sobolevsky, S. (2017, July). Geo-Tagged Social Media Data as a Proxy for Urban Mobility. In *International Conference on Applied Human Factors and Ergonomics* (pp. 29-40). Springer, Cham.

## **SECTION 3: POLICY**

### **Session 9 – Energy Efficiency – Behavior, Markets, and Policy**

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Topics: Building energy efficiency; energy supply and demand management; incentives and regulations for efficiency; energy markets and pricing; green building labels and certifications (and their limits).

Readings: Kontokosta, C. E. (2013). Energy disclosure, market behavior, and the building data ecosystem. *Annals of the New York Academy of Sciences*.

Kontokosta, C. E. (2015). A market-specific methodology for a commercial building energy performance index. *The Journal of Real Estate Finance and Economics*, 51(2), 288-316.

Palmer, K., & Walls, M. (2017). Using information to close the energy efficiency gap: a review of benchmarking and disclosure ordinances. *Energy Efficiency*, 10(3), 673-691.

**Assignment: Literature review section due.**



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### Session 10 – Waste – Designing Equitable Incentive Structures for Zero Waste Goals

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- Topics: Urban solid waste management; predicting and modeling refuse and recycling; data-driven policy strategies.
- Readings: The Department of Sanitation's Residential and Street Basket Waste Characterization Study (WCS), 2004-2005, Executive Summary.
- Oskamp, S., Harrington, M. J., Edwards, T. C., Sherwood, D. L., Okuda, S. M., & Swanson, D. C. (1991). Factors influencing household recycling behavior. *Environment and behavior*, 23(4), 494-519.
- Case Study: HBS BigBelly

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### Session 11 – Homelessness, Housing, and Zoning – Policy Evaluation

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- Topics: Low-income housing provision and policy; homelessness and shelter systems; residential segregation and discrimination
- Readings: Shinn, M., Gottlieb, J., Wett, J. L., Bahl, A., Cohen, A., & Baron Ellis, D. (2007). Predictors of homelessness among older adults in New York City: Disability, economic, human and social capital and stressful events. *Journal of Health Psychology*, 12(5), 696-708.
- Kontokosta, C. E. (2014). MIXED-INCOME HOUSING AND NEIGHBORHOOD INTEGRATION: EVIDENCE FROM INCLUSIONARY ZONING PROGRAMS. *Journal of Urban Affairs*, 36(4), 716-741.

**Assignment: Problem Set #2 due.**

## SECTION 4: PLANNING AND URBAN DEVELOPMENT

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### Session 12 – Urban Development and Gentrification – Impact Modeling

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- Topics: Urban planning in practice; data-driven planning tools and strategies; evidenced-based design; regulations, zoning, and building codes; exclusionary zoning; financing growth and infrastructure investment; real estate and capital markets; Gentrification and neighborhood change
- Readings: Forester, John (1987). "Planning in the Face of Conflict." *Journal of the American Planning Association* Vol. 53, No. 3, (Summer).
- Glaeser, E. L., Gyourko, J., & Saks, R. (2003). *Why is Manhattan so expensive? Regulation and the rise in house prices* (No. w10124). National Bureau of Economic Research.
- Freeman, L., & Braconi, F. (2004). Gentrification and displacement New York City in the 1990s. *Journal of the American Planning Association*, 70(1), 39-52.

**Assignment: Project - Methods and descriptive analysis section due.**

### Session 13 – Sustainability and Resilience – Metrics and Measurement

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Topics: Understanding the balance between economics, environment, and equity; Carbon reduction and energy efficiency; buildings and the built environment; Resilience planning; hazard mitigation and vulnerability assessment

Readings: Campbell, S. (1996). Green cities, growing cities, just cities?: Urban planning and the contradictions of sustainable development. *Journal of the American Planning Association*, 62(3), 296-312.

Rosenzweig, C., Solecki, W., Hammer, S. A., & Mehrotra, S. (2010). Cities lead the way in climate-change action. *Nature*, 467(7318), 909-911.

L. M. A. Bettencourt, G. B. West [Bigger cities do more with less](#) Scientific American 305 (3), 52-53.

NYC Mayor's Office, *A Stronger, More Resilient New York* (read the impacts section and the section for the particular domain of interest)

### Session 14 – Social Equity and Environmental Justice

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Topics: Parks and urban trees and their impact on quality-of-life and real estate values; Equity issues in park planning and access; Intersection of open space and public health.

Readings: Wolch, J., Wilson, J. P., & Fehrenbach, J. (2005). Parks and park funding in Los Angeles: An equity-mapping analysis. *Urban geography*, 26(1), 4-35.

Conway, D., Li, C. Q., Wolch, J., Kahle, C., & Jerrett, M. (2010). A spatial autocorrelation approach for examining the effects of urban greenspace on residential property values. *The Journal of Real Estate Finance and Economics*, 41(2), 150-169.

**Assignment: Paper sent to reviewers – Tuesday, November 28<sup>th</sup> by 5pm.**  
**Peer review due – Friday, December 1<sup>st</sup> by 5pm.**

### Session 15 – Wrap-up and Final Presentations

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Topics: Wrap-up and discussion of the implications of data and technology on city operations, policy, and planning. Final presentations.

**Assignment: Final presentation and paper due.**