POL- GA 2342 Urban Science for Data-Driven Policy and Planning
Fall 2020

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.

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

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 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 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


**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

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.


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

Topics: A brief history and theory of cities; the “smart city” discourse in context; urban science, urban informatics, and a science of cities.


Jacobs, J. Death and Life of Great American Cities. Chapter 22.


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

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.


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

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

**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.*


**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**

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


**Case Study:** HBS NYC311

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

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


Case Study: HBS ShotSpotter

Assignment: Problem Set #1 due.

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

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


**SECTION 3: POLICY**

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

**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).


Assignment: Literature review section due.
Session 10 – Waste – Designing Equitable Incentive Structures for Zero Waste Goals

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.


Case Study: HBS BigBelly

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

Topics: Low-income housing provision and policy; homelessness and shelter systems; residential segregation and discrimination


Assignment: Problem Set #2 due.

SECTION 4: PLANNING AND URBAN DEVELOPMENT

Session 12 – Urban Development and Gentrification – Impact Modeling

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


Assignment: Project - Methods and descriptive analysis section due.
Session 13 – Sustainability and Resilience – Metrics and Measurement

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


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

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.


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

Session 15 – Wrap-up and Final Presentations

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.