HARVARD
UNIVERSITY

GRADUATE
SCHOOL

OF
DESIGN

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updated 1/27/25

Master in Urban Planning
Urban Analytics Concentration
2024-2025

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The Urban Analytics concentration introduces students to describing, analyzing, and prescribing solutions to urban planning problems using spatial data and analysis methods. An increasing share of urban planning work today addresses spatial interactions between numerous geographically bound actors and processes that are too complex to visualize and analyze without computational tools. The availability of "big data" and other administrative datasets is rapidly expanding and requires both proficiency and care when processing and applying them to planning and policy interventions. There are increasingly urgent ethical, institutional, and practical challenges to navigate and manage. Urban analytic tools are now used in a wide range of settings: Geographic Information Systems, spatial statistics, and algorithmic approaches to spatial data analysis are used in public and private planning practices at the local, regional and international scales.

A range of urban and spatial analytics courses are available at the GSD and other Harvard schools, especially the Engineering School, FAS, the School of Public Health, Kennedy School, and the Graduate School of Education. Students can also enlist in courses at MIT. The Harvard Center for Geographic Analysis offers data and software support as well as focused seminars and conferences relevant to the concentration topic.

Please be aware that course offerings are subject to change. New courses may be introduced, while some of the approved courses listed here may not be available every year. This memo is subject to revisions based on course availability. Courses that are not mentioned in this memo do not automatically have approval and may only be approved after a review and written permission from the Concentration Advisor(s).

The courses listed below have already been approved to fulfill the Urban Analytics concentration. The courses with an asterisk (*) cover institutional, political, or ethical topics related to big data and analytics. **It is recommended that students take at least one course on these topics as part of fulfilling the Urban Analytics concentration.**

FALL 2024 APPROVED COURSES:

SCHOOL	COURSE NUMBER	COURSE TITLE	UNITS	FACULTY
GSD	6472	Visualization **(at SEAS)**[1]	4	Pfister
GSD	6492	Quantitative Aesthetics: Introduction to Machine Learning for Design	4	Michalatos
FAS	CS50	Introduction to Computer Science	4	Malan
FAS	CS 109A	Data Science 1: Introduction to Data Science[2]	4	Protopapas
FAS	ECON 1346	Closed Borders and Crowded Buses: The Economics of Human Mobility[3]	4	Kreindler
FAS	GOV 1008	Introduction to Geographic Information Systems	4	Chen
FAS	SOCIOL 3313	Urban Theory and Data Lab[4]	4	Legewie, Sampson
HKS	API 201	Quantitative and Empirical Methods[5]	4	Borck
HKS	API 203	Analytic Frameworks for Policy	4	Zeckhauser
HKS	API 205*	Politics and Policies: What is the Impact of Data and AI	4	Hughes Hallett
HKS	API 222	Machine Learning and Big Data Analytics[6]	4	Saghafian
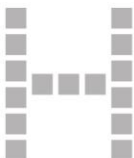
HSPH	BST 260	Introduction to Data Science[7]	4	Irizarry
HSPH	HPM 559	Introduction to Qualitative Research Methods for Public Health **(priority to HSPH students)** [8]	2	Aveling
HSPH	SBS 245	Social and Behavioral Research Methods[9]	4	Chen
HSPH	SBS 288	Qualitative Research Methods in Public Health**(Fall 1)**[10]	2	Goldman
MIT	6.100A	Introduction to Computer Science Programming in Python **(Fall 1)**	2	Bell
MIT	6.100B	Introduction to Computational Thinking and Data Science **(Fall 2)**[11]	2	Bell
MIT	6.1010	Fundamentals of Programming[11]	4	Miller
MIT	11.205	Introduction to Spatial Analysis and GIS **(Fall 1)**	2	Huntley
MIT	11.458	Crowdsourced City: Civic Technology Prototyping	4	D'Ignazio
MIT	11.520	Workshop on Geographic Information Systems (GIS) **(Fall 2)**[12]	2	Huntley, Cong
MIT	11.523	Fundamentals of Spatial Database Management **(Fall 1)**[12]	2	Huntley
MIT	11.524	Advanced Geographic Information System Project **(Fall 2)**[13]	Contact Registrar	Huntley

1. Prerequisites: Students are required to have basic programming experience (e.g., Computer Science 50). Web programming experience (HTML, CSS, JS) is a plus.

2. Programming knowledge at the level of CS 50 or above and statistics knowledge at the level of Stat 100 or above (Stat 110 recommended). Not to be taken in addition to Applied Computation 209, or Applied Computation 209A, or Statistics 109A, or Statistics 121, or Statistics 121A.

3. Prerequisites: Economics 1010a or 1011a and familiarity with econometrics (at a level of economics 1123 or 1126) or permission of the instructor.

4. Enrollment requires permission of instructor.

5. Enrollment is restricted to MUP/MPP dual degree students.

6. Prerequisites: An understanding of intermediate-level statistics and probability theory (e.g., API-201, API-202, or equivalent courses)

7. Students not matriculated in an HSPH Biostatistics (HDS SM60, BIO SM80 / SM60 / SM1, and CBQG SM80) graduate program will be required to pass a diagnostic test testing basic math, probability, statistics, and programming to enroll in the course. Lab or section times to be announced at first meeting.

8. Students enrolled in the MPH-EPI program have priority enrollment in this course. MPH-GEN students will be automatically added to the waitlist. All other students must request permission from the instructor.

9. A multivariate statistics course is strongly recommended; course primarily for doctoral students. PHS2000A and PHS2000B (PHS PhD students) OR BST210 or BST211 or BST213 (DrPH or SM students)

10. **Registration by instructor permission only**: By August 25, 2023, interested students must request instructor permission in my.harvard and write a brief explanation about why they want to take this course. Selected students will be approved by September 1, 2023.

11. Prerequisite: 6.100A or permission of instructor

12. Prerequisite: 11.205 or permission of instructor

13. Prerequisite: 11.205 and 11.220; or permission of instructor

SPRING 2025 APPROVED COURSES:

SCHOOL	COURSE NUMBER	COURSE TITLE	UNITS	FACULTY
GSD	5394	Travel Behavior and Forecasting	4	Voulgaris
GSD	5441*	Policy Analysis: A Tool for Evidence-Based Decision Making	4	Meltzer
HGSE	EDU S030	Intermediate Statistics for Educational Research: Applied Linear Regression[1]	4	Eidelman
HGSE	EDU S052	Intermediate and Advanced Statistical Methods for Applied Educational Research[2]	4	Rucinski
HGSE	EDU S057	Making Data Count	4	Conaway
HGSE	EDU S513	Introduction to Qualitative Program and Policy Evaluation	4	Sacks

FAS	CS50	Introduction to Computer Science *(for students unable to take in fall term)*	4	Malan
FAS	CS 109B	Data Science 2: Advanced Topics in Data Science[3]	4	Protopapas
FAS	ECON 50	Using Big Data to Solve Economic and Social Problems *(jointly offered by HKS)*	4	Bruich
FAS	GOV 51*	Data Analysis and Politics	4	Liu
FAS	GOV 1009	Advanced Geographical Information Systems Workshop	4	Chen
FAS	SOCIOL 3313	Urban Theory and Data Lab[1]	4	Legewie, Sampson
HKS	DPI 662*	Digital Government **(Spring 1)**[4]	4	Roy
HKS	DPI 678M*	Product Management, Tech, and Society **(Spring 1)**[4]	2	Pham
HKS	MLD 620M*	The Data Smart City: Driving Innovation with Technology **(Spring 2)**	2	Goldsmith
HKS	SUP 135*	Using Big Data to Solve Economic and Social Problems *(jointly offered by FAS)*[5]	4	Bruich
HSPH	GHP 504	Introduction to Qualitative Research for Global Health **(Spring 1; priority to HSPH students)**[6]	2	Yousafzai
MIT	1.200 11.544 IDS.675	Transportation Systems Analysis: Performance and Optimization[7]	4	Wu
MIT	4.557* MAS.552	City Science[1]	4	Larson
MIT	1.C01	Machine Learning for Sustainable Systems[8]	2	Amin
MIT	6.C01	Modeling with Machine Learning: from Algorithms to Applications[9]	2	Barzilay, Jaakkola
MIT	6.100A	Introduction to Computer Science Programming in Python **(Fall 1)**	2	Bell
MIT	6.100B	Introduction to Computational Thinking and Data Science **(Spring 2)**[10]	2	Bell
MIT	6.1010	Fundamentals of Programming[10]	4	Miller
MIT	11.205	Introduction to Spatial Analysis and GIS **(Spring 1)**	2	Huntley, D'Ignazio
MIT	11.318*	Senseable Cities[1]	4	TBA
MIT	11.320*	Digital City Design Workshop[1]	4	Ratti
MIT	11.321	Data Science and Machine Learning for Real Estate	4	Duarte
MIT	11.454	Big Data, Visualization, and Society	4	D'Ignazio, Williams
MIT	11.520	Workshop on GIS **(Spring 2)**[11]	2	Huntley
MIT	11.521	Spatial Database Management and Advanced GIS[12]	4	TBA

1. Enrollment requires permission of instructor.
2. Prerequisites: Successful completion of a course or courses that include 12 or more full hours of class time on applied regression models beyond simple linear regression. Students who have not had this experience must discuss their previous training before or at the first class meeting. Students who do not meet the prerequisite should consider S-012, S-030, or S-040. See the syllabus at the instructor's website, https://scholar.harvard.edu/andrewho/classes, for more details.
3. Prerequisite: Must take CS 109A OR APCOMP 209A OR STAT 121A before taking CS 109B) AND (Not to be taken in addition to CS 109, OR APCOMP 209, OR APCOMP 209B, OR STAT 121, OR STAT 121B.)
4. Priority enrollment is given to HKS students and may not be available to GSD students
5. Please note, students registering under HKS SUP-135 must have a background in statistics/econometrics and can only take a section that requires that.
6. Students outside of HSPH must request instructor permission to enroll in this course. Cross-Registrants and Non-Degree Students will be enrolled on a space available basis after the enrollment deadline for the course.
7. Prerequisite: 1.000, (1.00 and 1.010) or permission of instructor.

8. Prerequisite: (1.000 and 1.010) or permission of instructor; Co-requirement: 6.C01.
9. Prerequisite: Calculus II (GIR) and 6.100A; Co-requisite: 1.C01, 2.C01, 3.C01[J], or 22.C01
10. Prerequisite: 6.100A or permission of instructor
11. Prerequisite: 11.205; or permission of instructor
12. Prerequisite: 11.205 and Coreq: 11.220; or permission of instructor.

APPROVED BUT NOT OFFERED IN 2024-2025:

For the below courses to be approved for the current academic year, they <u>must be offered with the same course number, title, and instructor</u>. The course must be reapproved if doesn't match the below version of the course.

SCHOOL	COURSE NUMBER	COURSE TITLE	UNITS	FACULTY
GSD	2314	Mapping: Geographic Representation and Speculation *(last offered 2023-2024)*	4	Sayegh
GSD	3356	Field Methods and Living Collections *(not offered after 2019-2020)*	4	Elkin
GSD	3483	Mapping Urbanization: Forms, Processes, and Systems *(last offered 2021-2022)*	4	Heller
GSD	6322	Mapping: Geographic Representation and Speculation *(last offered 2022-2023)*	4	Huntley
FAS	209B*	Autonomous Vehicles and Local Government Lab *(last offered 2021-2022)*	4	Duraisingh
FAS	GOV 1021	Spatial Models of Social Science *(last offered 2022-2023)*	4	Kelly
FAS	GOV 2014	Research Design in Political Science: Qualitative and Mixed Methods *(last offered 2023-2024)*	4	Hagapian
FAS	GOV 2018	Introduction to Machine Learning *(last offered 2023-2024)*	4	Liu
FAS	STAT 121A	Data Science 1: Introduction *(last offered 2019-2020)*	4	Sampson, Small
HGSE	EDU S504	Introduction to Qualitative Research *(only open to Doctoral Students after 2022-2023)*	4	Duraisingh
HKS	IGA 565M	Analytical Methods for Complex Adaptive Systems *(last offered 2022-2023)*	2	Siddiqi
HLS	2813*	City Use of Technology *(last offered 2022-2023)*	4	Crawford
MIT	11.545	Transportation Systems Analysis: Demand and Economics *(last offered 2021-2022)*	4	Wu
MIT	11.S944	Applied Urban Analytics *(last offered 2022-2023)*	4	Sevtsuk