Instructor
Andres Sevtsuk, Associate Professor of Urban Science and Planning.
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Teaching Assistant
TBD

Weekly Schedule
Mondays 2-5PM, Room 9-217

Instructor’s Office Hours
Wed 2-4PM, Room 10-485.

TA Office Hours
TBD

First Class
Monday, September 9th, 1.30-4.30PM in room 9-217.

Limited Enrollment to 12 or 16 participants, depending on demand.
Instructor approval required.
Course Description
The course investigates a number of qualitative and quantitative methods to measure and analyze urban spatial problems relevant to contemporary urban planning and design practice. The course is based in part on literature on spatial analysis and in part on newly emerging topics in urban analytics. The course aims to offer students tools for integrating spatial information and decision making with planning and design solutions. It is structured around three experiments:

- Pedestrian flow and route choice analysis
- Understanding business (or other spatial facility) location and patronage
- Explaining spatial activity patterns in large datasets.

Each experiment will run for four to five weeks, during which groups of participants are asked to tackle a real-world urban analytics exercise from beginning to end, starting with an introduction of theory and methods, followed by data collection and analysis and ending with a presentation of findings in class. By exposing class participants to different experimental set-ups that move from conceptualization and experimental design, to data collection, analysis, to the presentation and interpretation of findings, the course aims to prepare students for applied urban analysis projects.

Each experiment is conducted in teams. A positive and constructive attitude for team-work is essential for a successful completion of the course.

There is no midterm or final exam; each of the experiments counts equally, distributing the workload throughout the semester. Class meetings introduce students to both relevant theory and software applications needed for each experiment.

The course is very hands-on. We use multiple software platforms including Rhino, ArcGIS and Excel, along with some functionality that is new and experimental. If you do not enjoy experimentation and have no interest in quantitative analysis, this is probably not the right course for you. But if you are willing to explore and embrace some uncertainty, you should experience enough to become a self-sufficient learner in urban analytics and visualization, and might discover a whole new lens through which to study, plan and design built environments.

Prerequisites
Prior experience with Rhinoceros3D, ArcGIS and Excel is required. Each of these platforms is extensively used for quantitative analysis to conduct the experiments. If you have no experience in these software platforms, this course is likely too challenging for you. Adobe CS is also used for presentation purposes.

It is recommended that registering students have taken the following prior courses (or demonstrate comparable skills and experiences to the instructor):

- VIS 2129 Spatial Analysis and the Built Environment
- SES 5215 Analytic Methods of Urban Planning: Quantitative
- SCI 6322 Mapping: Geographic Representation and Speculation

Learning Objectives
By the end of the course, students will be able to:

- Use powerful urban analysis techniques in practice: pedestrian route modeling, location accessibility analysis, comparative mapping, and data visualization.
- Explain how each of the analysis technique works in detail to stakeholders.
• Apply these methods in architecture, urban planning, design, public policy and real-estate development.
• Formulate analysis projects from beginning to end, presenting the findings with clarity and precision.

Measurable Outcomes
Each of the three experiments uses different analysis methods and produces a team presentation. The presentations are key evidence for grading. We also use an online reading discussion platform called Perusall in class, where individual reading comments are assessed. Participants' understanding of class topics will be measured by how well students:

• Demonstrate their understanding of data collection, computational spatial analysis and results interpretation as demonstrated via experiment presentations.
• Utilize appropriate spatial analysis methods to solve given urban analysis problems.
• Formulate the given problems in reports.
• Explain their analytics choices and solutions with clarity.
• Analyze the strengths and weaknesses of proposed spatial analysis solutions.
• Make meaningful comments to course readings in an online discussion forum.
• Team members are also asked to assess the contributions of each other in each experiment.

Requirements
In order to ensure a successful completion of the class, I ask for a) your weekly presence and participation in classes, b) completion and commenting of reading materials in an online class forum, and d) a delivery of team presentations for each of the three experiments.

Experiment 1: Pedestrian Route Choice
The first experiment focuses on walkability in Cambridge and analyzes pedestrian route choices. Using spatial network analysis methods, participants are asked to determine how far pedestrian are willing to walk, how far observed walks deviate from shortest paths, and to identify which environmental qualities explain such deviations.

Experiment 2: Location and Patronage
The second experiment focuses on retail business locations and aims to explain how and why shop patronage to identical stores varies from one location to another. By comparing detailed spatial accessibility metrics to different customer sources at each location, the experiment utilizes more advanced spatial network analysis to capture location qualities around each study area and uses basic bivariate correlations and multivariate linear regressions to estimate how much different location attributes contribute to the patronage of various establishments in an urban context.

Experiment 3: Big Data
Explaining spatial activity patterns in big datasets.

The third experiment exposes students to newly emerging big data for urban analysis and asks participants to visualize and explain people’s spatial activity patterns in big datasets. We look at data from New York City, including real estate transactions and movement patterns from shared bikes and Uber rides. Before analyzing the observed patterns, students are asked to develop informed hypothesis about what they expect to find and why in the pattern of digital activity traces. These expectations are tested using real-world data.

Grading

Class participation 40%
Team Assignments one (20%), two (20%) and three (20%). 60%

Ethics
As you probably know, plagiarism and cheating are considered academic crimes at MIT. Never turn in an assignment that you did not write yourself, never submit an assignment for this seminar that you already submitted for another course, and never borrow or take information from another author without permission or citation. Doing so may lead to serious consequences in line with recognized institute procedures. Please familiarize yourselves with the university guidelines for meeting the standards of academic integrity online or ask the instructors if you have further questions.

Entry to the class requires instructor approval. Suggested prerequisites include:

11.205 Introduction to Spatial Analysis
11.520 Workshop on GIS
11.220 Quantitative Reasoning
Prior knowledge of Rhino 3D is also highly recommended.

If you have taken other classes and/or think you are well-prepared for the class, please see instructor.
### WEEK 1  Monday  Sept 9.  (First Class)  Experiment 1

#### In class (lecture)
Course Introduction, overview, logistics. Introduction to Experiment One: Pedestrian Flow Modeling.

#### In class (workshop)
Install course software. Form teams.

#### Assignment
- Install required software and make sure it works.
- Watch Jeff Speck’s TED talk on walkability: [https://www.ted.com/talks/jeff_speck_the_walkable_city](https://www.ted.com/talks/jeff_speck_the_walkable_city)

### WEEK 2  Monday  September 16.  Experiment 1

#### Read and comment on Perusall before class


#### In class (lecture)
Pedestrian flow modeling and factors of influence. Introduction to the methodology, data collection.

#### In class (workshop)
Urban Network Analysis tools in Rhino.

#### Assignment
Choose a site for your survey, start designing the experiment. Talk to instructor about your experiment. Design your survey instrument, pilot test the survey, plan survey logistics.

### WEEK 3  Monday  September 23.  Experiment 1

#### Read and comment on Perusall before class


#### In class (lecture)
Design and policy for walkability.

#### In class (workshop)
Urban Network Analysis tools in Rhino.

#### Assignment
Implement the pedestrian count survey in person. Digitize survey results in Excel.
WEEK 4  Monday  September 30.  Experiment 1

Read and comment on Perusall before class

In class (lecture)
Team consultations

In class (workshop)
Team consultations

Assignment
Prepare the final presentations for E1. All teams’ presentations in PDF format due before the beginning of next next class.

WEEK 5  Monday  October 7.  Experiment 1

In class
Experiment 1 presentations.

WEEK 6  Monday  October 21.  Experiment 2

Read and comment on Perusall before class


In class (lecture)
Introduction to Experiment 2: Location and Patronage. Retail location theory.

In class (workshop)
Understanding spatial accessibility.

Assignment
Complete Assignment 2A before next class.

WEEK 7  Monday  October 28.  Experiment 2

Read and comment on Perusall before class


In class (lecture)
Huff model of facility patronage.

In class (workshop)
Understanding Betweenessness and distributed demand.

Assignment
Complete Assignment 2B before next class.
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<tr>
<th>WEEK 8</th>
<th>Monday, November 4.</th>
<th>Experiment 2</th>
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<tbody>
<tr>
<td>Read and comment on Perusall before class</td>
<td>Sevtsuk, A. (2018). Brick and Mortar: The hidden structure of retail location patterns and vibrant streets. Penn Press. (Chapters 4 - clustering - and 6 - location ).</td>
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**In class (lecture)**
- Team consultations

**In class (workshop)**
- Team consultations

**Assignment**
- Prepare the final presentations for E2. All teams’ presentations in PDF format due before the beginning of next class.

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<th>WEEK 9</th>
<th>Monday, November 18.</th>
<th>Experiment 2</th>
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**In class**
- Experiment 2 presentations.

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<th>WEEK 10</th>
<th>Monday, November 25.</th>
<th>Experiment 3</th>
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**In class (lecture)**
- Introduction to Experiment 3: Making sense of Big Data. Intro to Social Explorer and SimplyMap.

**In class (workshop)**
- Refresher on statistical analysis, variables and dummy variables. Interpreting effects and results. Using GeoDa and Excel Analysis package.

**Assignment**

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<th>WEEK 11</th>
<th>Monday, December 2.</th>
<th>Experiment 3</th>
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**In class (lecture)**
- Analyzing movement over time. Real Time Rome.

**In class (workshop)**
- SQL/Python data analysis workshop.

**Assignment**
- Team work on E3.
### WEEK 12  Monday, December 9.

**Read and comment on Perusall before class**


**In class (lecture)**

Introduction to Carto DB webmapping.

**In class (workshop)**

Team consultations

**Assignment**

Prepare the final presentations for E3. All teams' presentations in PDF format due before the beginning of next class.

### WEEK 13  Monday, December 16.

**In class**

Experiment 3 final presentations.