Instructor
Andres Sevtsuk, Associate Professor of Urban Science and Planning.
asevtsuk@mit.edu

Weekly Schedule
Tuesday 2.00-3.30PM
Thursday 2.00-3.30PM

Instructor's Office Hours
Weds 2-4PM.

First Class
Tuesday, Feb 1st 2.00-3.30PM

Location:
Room 10-400
Course Description

The course investigates the interaction between pedestrian activity, urban form and land-use patterns in urban environments. Informed by recent literature on pedestrian mobility, behavior and biases, we take a hands-on view and learn how to operationalize and model pedestrian activity in built environments using software tools and analysis methods. Rather than engaging in comprehensive travel demand modeling across all modes, we use simplified, yet powerful and scalable network analysis methods that focus uniquely on pedestrians. Emphasis is placed on not only modeling or predicting pedestrian activity in existing built settings, but also on analyzing and understanding how changes in the built environment—land use changes, density changes, connectivity changes—can affect pedestrian activity.

The course is structured around three experiments:

1. Pedestrian accessibility and patronage analysis.
2. Trip assignment and critical route detection.
3. Pedestrian impact assessment triggered by land use or development changes.

Each experiment runs for about four weeks, during which groups of participants are asked to tackle a real-world analysis 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 real-world walkability analysis work.

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 mid-term or final exam; each of the three experiments counts equally, distributing the workload throughout the semester. Class meetings introduce participants to both relevant theory and software applications needed for each experiment.

It is recommended that participating students have taken at least one basic quantitative reasoning (i.e. statistics) course. Prior knowledge of Rhinoceros and ArcGIS are helpful too, though not required.

The course is very hands-on. We use multiple software platforms including Rhino, ArcGIS and Excel, along with Urban Network Analysis tools that are new and experimental. If you are willing to embrace learning by doing, you should experience enough to become a self-sufficient learner in urban analytics and pedestrian modeling, and might discover a whole new lens through which to study, plan and design built environments.

Learning Objectives

- Understand and be able to operationalize spatial accessibility from a pedestrian perspective.
- Use applied urban analysis techniques to understand, analyze and predict pedestrian flows in built environments.
- Explain how each of the analysis technique works in detail to stakeholders.
- Understand and explain how urban form, land uses, urban design, and public policy can affect pedestrian flows on city streets.
- Formulate analysis projects from beginning to end, presenting the findings with clarity and precision.
- Learn how to solve problems in teams (all experiments are in teams)

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.
Grading
Reading + discussion  20%
Three experiments (20% each)  60%
Peer evaluation by team members  20%

Ethics
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.

Recommended prior courses
Quantitative Methods / Reasoning (a basic stats class)
Prior knowledge of Rhino and GIS is also highly recommended.

Schedule:
Week 1 Notes: #N/A

CLASS : 1 Tue 1-Feb-22

Form teams for E1 and hand out Experiment 1 brief.
Hand out individual Exercise 1 A and B.

Week 2 Notes: #N/A

CLASS : 3 Tue 8-Feb-22

Complete:

Week 3 Notes: #N/A

CLASS : 5 Tue 15-Feb-22

BEFORE CLASS:
Read:

IN CLASS:
Understanding Accessibility (2). What are different accessibility indices and their parameters. How do we use them and what do they tell us?

IN CLASS:
Accessibility modeling (Rhino). Reach, Gravity Access, Closest Facility.

IN CLASS:
https://doi.org/10.1068/b12977

BEFORE CLASS:
Read:
https://doi.org/10.1080/01944360308976328
https://doi.org/10.1068/b12977

BEFORE CLASS:
Install UNA software and watch:
a) UNA installation tutorial: https://vimeo.com/357187464
b) UNA introduction tutorial: https://vimeo.com/357187690
https://www.ted.com/talks/jeff_speck_the_walkable_city
https://www.ted.com/talks/jeff_speck_4_ways_to_make_a_city_more_walkable
IN CLASS:
Introduction to the Urban Network Analysis tools. Preparing networks, origins and destinations. Form teams for E1 and hand out Experiment 1 brief.
Hand out individual Exercise 1 A and B.

IN CLASS:
Understanding Accessibility (1). What is accessibility and what factors affect it?
IN CLASS:
How is the study of walking important for city design, planning and policy making?
IN CLASS:
How does the built environment shape accessibility outcomes?
IN CLASS:
Team consultations for Experiment 1.

BEFORE CLASS:
Read:

IN CLASS:
Understanding Accessibility (2). What are different accessibility indices and their parameters. How do we use them and what do they tell us?

BEFORE CLASS:
Read:

IN CLASS:
Accessibility modeling (Rhino). Reach, Gravity Access, Closest Facility.

BEFORE CLASS:
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BEFORE CLASS:
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IN CLASS:
Understanding Accessibility (2). What are different accessibility indices and their parameters. How do we use them and what do they tell us?
**Week 4 Notes**: Monday classes held

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**Week 5 Notes**: #N/A

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**BEFORE CLASS**:

Read:


**IN CLASS**:

Urban facility patronage and Huff model.
Team consultations

**Week 6 Notes**: #N/A

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**BEFORE CLASS**:

Read:


**IN CLASS**:

Introduction to Experiment 2
Individual exercise 3 (Walk routes to nearest stations in Cambridge) handed out.

**Week 7 Notes**: #N/A

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**BEFORE CLASS**:

Complete:
Individual exercise 2: facility location allocation in Punggol, SG.
Watch tutorial video on measuring closest facilities and patronage: https://vimeo.com/359339455

**IN CLASS**:

Introduction to patronage analysis.

**Week 8 Notes**: #N/A

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**BEFORE CLASS**:

Complete:

**IN CLASS**:

Experiment 1 presentations

**Week 9 Notes**: #N/A

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**BEFORE CLASS**:

Read:


**IN CLASS**:

Urban facility patronage and Huff model.
Team consultations

**Week 10 Notes**: #N/A

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**BEFORE CLASS**:

Read:


**IN CLASS**:

Introduction to Experiment 2
Individual exercise 3 (Walk routes to nearest stations in Cambridge) handed out.

**Week 11 Notes**: #N/A

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**BEFORE CLASS**:

Read:


**IN CLASS**:

Betweenness analysis for modeling pedestrian flow.
Understanding parameters.
Week 7
CLASS : 13 Tue 15-Mar-22
BEFORE CLASS:
IN CLASS:
Environmental factors affecting route choice.

Week 8
CLASS : 15 Tue 22-Mar-22
BEFORE CLASS:
Read:
IN CLASS:
Competing destinations and patronage betweenness.

Week 9
CLASS : 17 Tue 29-Mar-22
BEFORE CLASS:
Read:
IN CLASS:
Patronage betweenness analysis for modeling pedestrian flow to competing destinations.
Team consultations
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**BEFORE CLASS:**

**IN CLASS:**

Comparing before/after impact scenarios.

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**BEFORE CLASS:**

**IN CLASS:**

Walkability and sustainability in future cities.

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**BEFORE CLASS:**

**IN CLASS:**

Team consultations