

## Summary Report

### Andres Sevtsuk

- Project Name:** Developing a pedestrian model for Lisbon to plan for low-carbon mobility
- Area:** Sustainable Cities
- MIT PI(s):** **Associate Prof. Andres Sevtsuk** – Department of Urban Studies and Planning
- MIT CO-PI: Prof. Christoph Reinhart** – Department of Architecture
- PT Collaborator(s):** **Associate Prof. Filipe Moura** – Department of Civil Engineering and Architecture, Instituto Superior Técnico, University of Lisbon
- Prof. Paulo Ferrão** – Instituto Superior Técnico – University of Lisbon, President of IN+, Center for Innovation, Technology and Policy Research.
- Abstract:** The project will initiate the development of a pedestrian mobility model for Lisbon, which can estimate the amount of foot-traffic on city streets at different representative time periods (AM peak, Lunch, PM peak, Weekend) based on land uses, urban form, pedestrian infrastructure and demographics of each area. We use the Urban Network Analysis software, developed at the MIT City Form Lab, to estimate pedestrian flows, and will calibrate the model on observed and anonymize pedestrian counts from NOS cell-phone positioning data, available via the C-Tech project in selected neighborhoods. The calibrated model can be used to analyze how upcoming urban developments and infrastructure changes are likely going to impact foot-traffic around them, helping direct pedestrian infrastructure investments and upgrades to sidewalks, cross-walks and public spaces that benefit most constituents, and more broadly, increasing the city’s zero-carbon mobility share. The work will complement the existing C-Tech project through specific focus on the urban mobility sector.
- Summary:** The year-long project involved three phases: data collection (Sept 2022-January 2023), a workshop (June 2023), and paper-writing (June-August 2023). In the first six months of the project, the MIT and IST team worked on collecting geospatial data about pedestrian infrastructure, land uses and urban form in Lisbon, as well as Boston. Together with Prof. Reinhart’s team from MIT, we also engaged with NOS—the mobile operator in Portugal, who had agreed to share people counting data from their anonymized mobile phone records in our study areas in Lisbon, which we planned to use to calibrate a pedestrian flow model for Lisbon. We were successful in collecting geospatial pedestrian infrastructure data (sidewalks networks, home and business locations, transit locations, parks, schools and

institutions, which form key origins and destinations for pedestrian mobility in both cities), but we were not successful in obtaining data from NOS. Maryam Hosseini and Rounaq Basu from my team, and Nada Tarkhan from Prof. Reinhart's team participated in tens of weekly meetings with NOS partners from Portugal, but despite continued efforts, in the spring of 2023, it became clear that the NOS was not going to share their data. Despite this, we set up estimated pedestrian flow models for both Lisbon and Boston, which contributed to the publications listed below.

### Workshops:

From June 15-16, 2023, Prof. Moura from IST Lisbon and Prof. Sevtsuk from MIT also co-organized a collaborative Urban Network Analysis Training Workshop at IST Técnico Lisboa, taught by Prof. Sevtsuk from MIT. This workshop introduced participants to the concepts of modeling pedestrian flows over spatial networks using Urban Network Analysis (UNA) tools. The workshop described the capabilities and application areas of UNA tools in walkability planning and design, provided hands-on tutorials of the different software functionalities available, and introduced participants to training exercises using pre-prepared datasets. Participants examined how built environments produce pedestrian mobility and how changes in built environments can alter pedestrian mobility, with applications in policy, mobility planning, urban design, and city planning.

#### Thursday, June 15

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9.00-10.00	Introductory lecture.
10.00-12.00	Software installation, introduction to setting up networks. Examining pedestrian accessibility on networks. <b>Exercise 1</b> handed out and completed in class.
12.00-13.00	Lunch
13.00-16.00	Introduction to pedestrian flow modeling. <b>Exercise 2</b> handed out and started in class (continued as homework). (A) modeling trips to single destinations. (B) Handling destination choice with competing destinations <b>spatial patronage</b> .
16.00-17.00	

#### Friday, June 16

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9.00-12.00	Estimating pedestrian flow with competing destinations continued.
9.00-12.00	Introduction to <b>Exercise 3</b> and custom segment costs
12.00-13.00	Lunch
13.00-14.30	Introduction <b>Exercise 4</b> to model detours and “frustration points” for pedestrians in spatial networks.
14.30-15.30	Discussion and wrap up.

**Conferences:**

From October 5-7, 2023, Prof. Sevtsuk organized an International Seminar on Modeling Urban Pedestrian at MIT, with invited presenters from US, Canada, Sweden, Portugal, Hong Kong, Kenya, South Africa, Chile, India and Switzerland: <http://cityform.mit.edu/projects/modeling-pedestrian-mobility-seminar-2023> Prof. Filipe Moura, my co-PI from the MIT-Portugal seed grant, and a member of his research team Rosa Felix, were among the workshop invitees, and presented their work on modeling pedestrian and bike mobility in Lisbon. This conference offered a platform to continue our collaboration beyond the MIT-Portugal seed grant.

**Publications**

During the summer 2023, we worked on two separate papers supported by this grant, which were both submitted and accepted for presentation at the Transportation Research Board's (TRB) annual meeting in Washington DC in January 2024, and which we subsequently submitted to peer-reviewed journals (both are currently in review):

Basu, R., Colaninno, N., Alhassan, A., & Sevtsuk, A. (2023). Hot and Bothered: Exploring the Effect of Heat on Pedestrian Behavior and Accessibility. *Cities*, in review.

Colaninno, N., Basu, R., Hosseini, M., Alhassan, A., Liu, L., & Sevtsuk, A. (2023). A sidewalk-level urban heat risk assessment framework using pedestrian mobility and urban microclimate modeling. *Environment and Planning B*, in review.

Both papers will be presented on January 10<sup>th</sup>, 2024 at [TRB in Washington DC](#).