

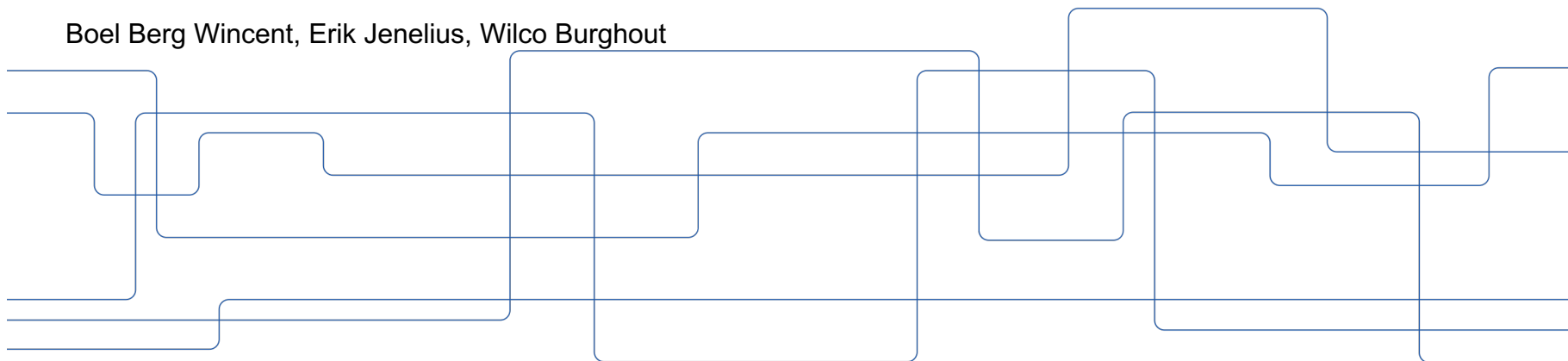
# Modelling of micro-mobility (M3)

Travel patterns, potential and design of shared e-scooter services



## Access distance to e-scooters: Analysis of trip and app use data in Stockholm

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# Modelling of micro-mobility (M3)



## Project aim:

- Understanding of **how people use the service**
- Determine what their **travel patterns look like**
- Identify the **type of travel** that constitutes the market niche in total mobility
- Describe **potentials of the service**

## Project outcome

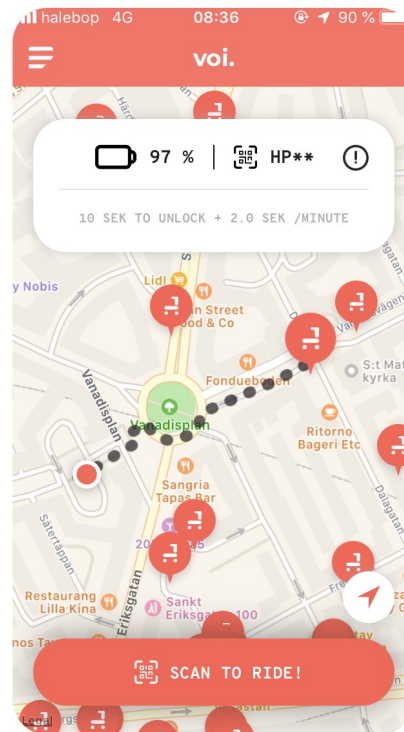
Outputs that can help improve service design strategies

# Why do we need to know the access distance?

- User travel behavior
- Catchment area
- Further analysis of interaction with public transportation
- Parking regulations

The study answers the questions:

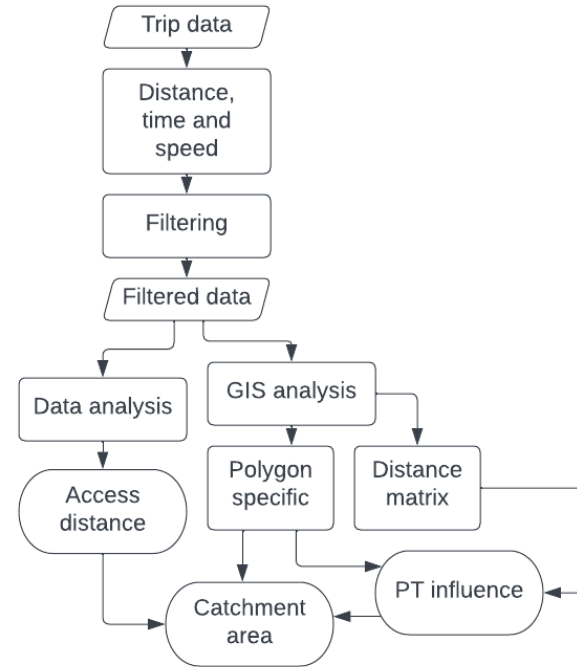
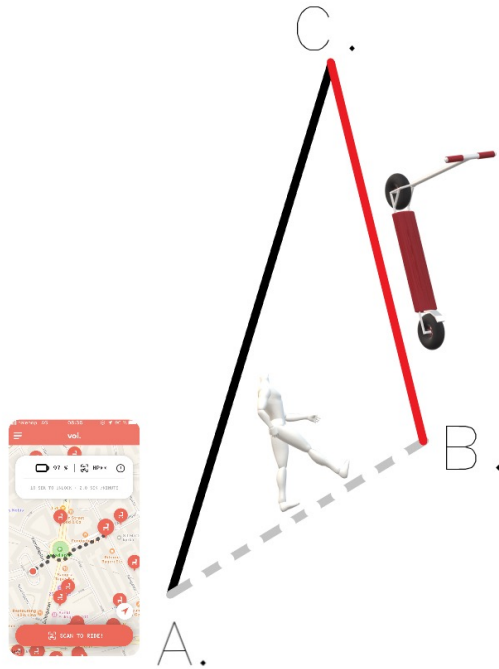
- 1. How far do users of shared e-scooters walk to utilize the service?**
- 2. How does the distance to public transportation influence the access distance?**
- 3. What is the catchment area of the micromobility service?**



# What does current literature say?

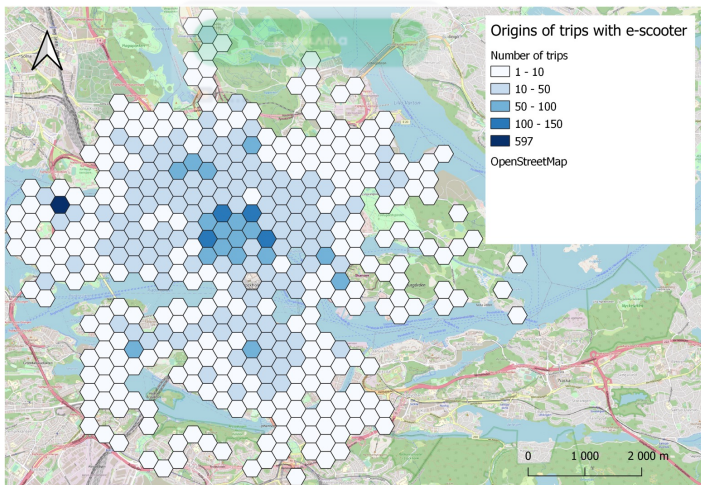
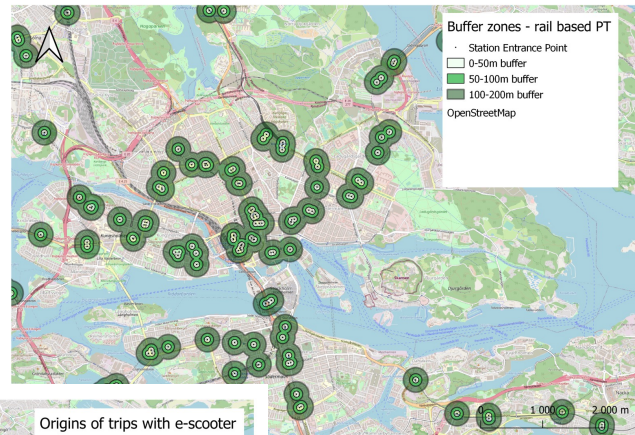
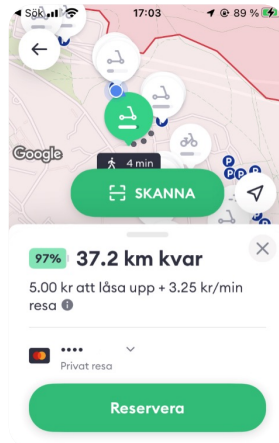
- Zurich: willing to **walk 60 m on average and 210 m at maximum** to access a vehicle<sup>1</sup>
  - Paris: users do not walk for more than **3-4 minutes** to find an available e-scooter<sup>2</sup>
  - Two studies of public station-based bike-share system in Beijing
    - **The average walking distance was 144m**, to or from a public transportation station was 120m<sup>3</sup>
    - Only 5 percent walked more than 200m. The willingness to use a shared bike by a transportation hub decreased rapidly when the distance was greater than 60 m<sup>4</sup>
1. Reck, D. J., H. Martin, and K. W. Axhausen, Mode choice, substitution patterns and environmental impacts of shared and personal micro-mobility. *Transportation Research Part D: Transport and Environment*, Vol. 102, 2022, p. 103134.
  2. Christoforou, Z., A. de Bortoli, C. Gioldasis, and R. Seidowsky, Who is using e-scooters and how? Evidence from Paris. *Transportation Research Part D: Transport and Environment*, Vol. 92, 2021, p. 102708.
  3. Bian, Y., D. Wu, S. Shu, J. Rong, and Y. Tang, Study on travel characteristics of public bicycles in Beijing. In *CICTP 2014: Safe, Smart, and Sustainable Multimodal Transportation Systems*, 2014, pp. 3331–3343.
  4. Shu, S., Y. Bian, J. Rong, and D. Xu, Determining the exact location of a public bicycle station—The optimal distance between the building entrance/exit and the station. *PLoS one*, Vol. 14, No. 2, 2019, p. e0212478.

# Methodology



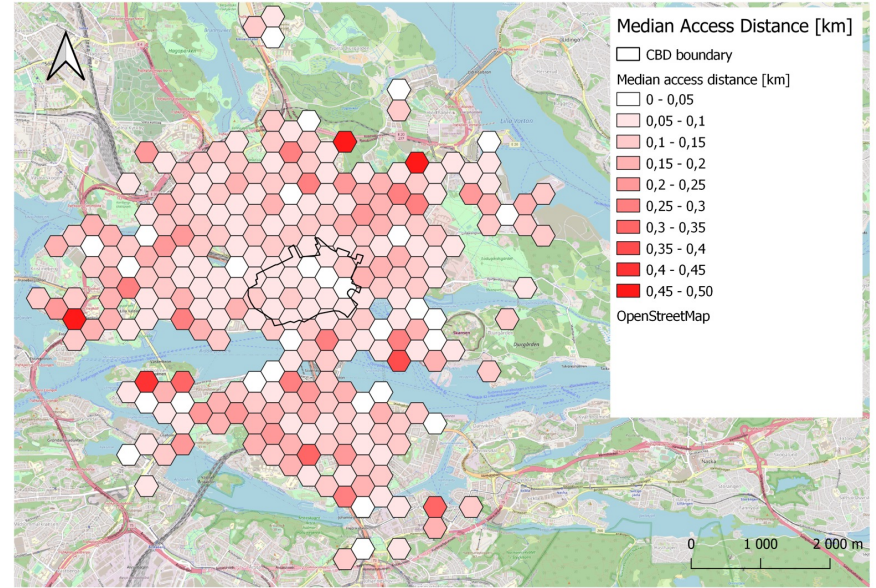
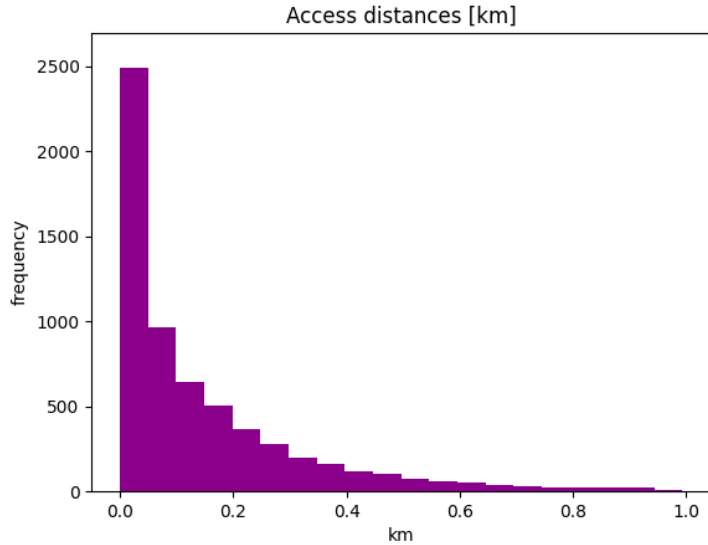
# Data

- 11598 trips by Voi from one week in May 2019
- Information about
  - App opens
  - Origin
  - Destination
- Location information about station entrances on the street level
- 6188 trips remain after filtering



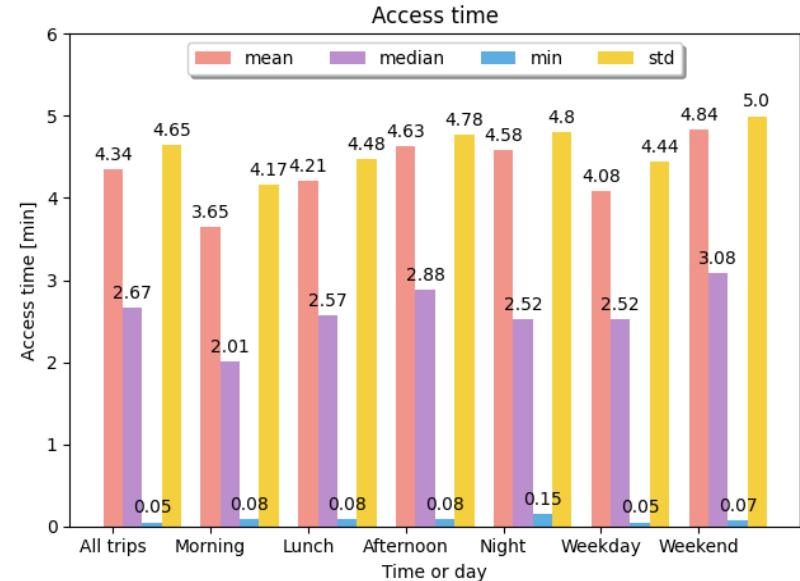
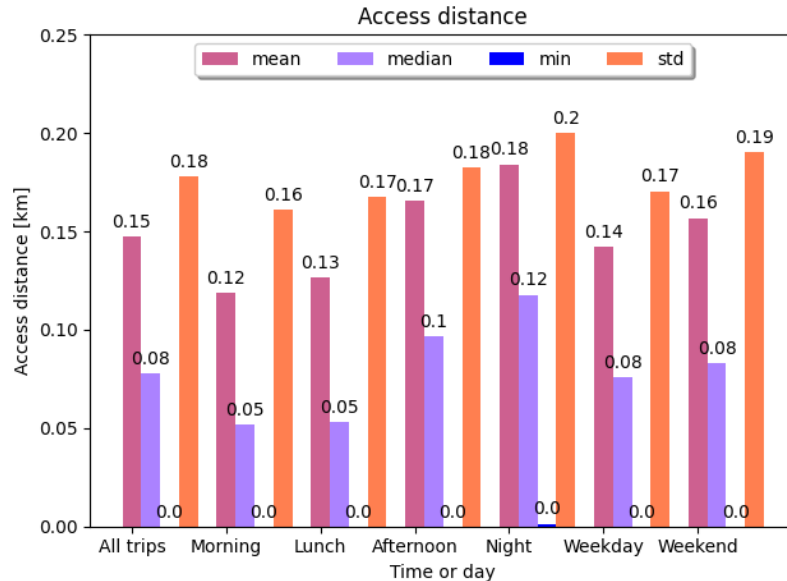


# Overall and spatial distribution



- Large std (177 m) -> median values

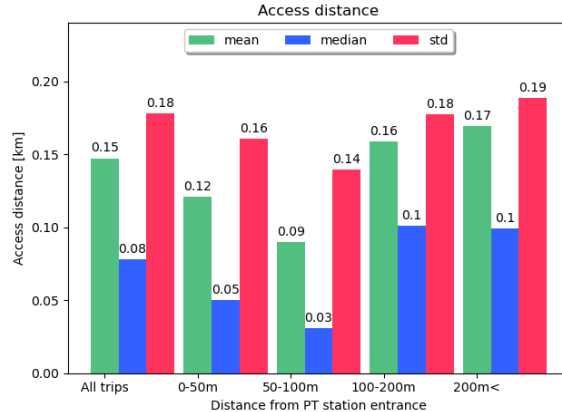
# Temporal variations



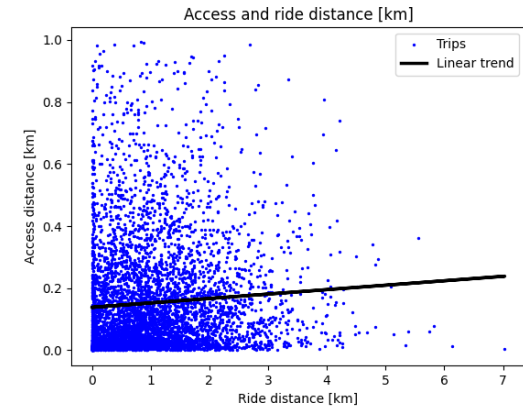
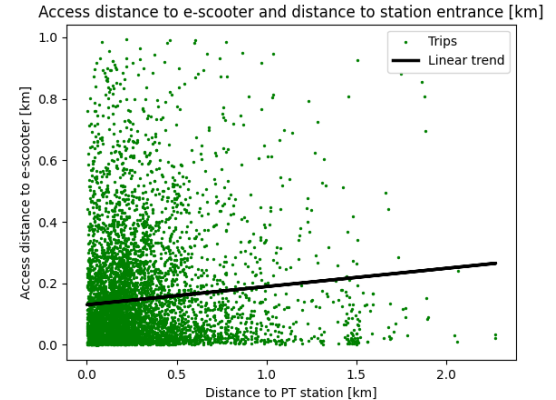
- Longer distances and time as the day progresses -> fleet placement and dispersion
- E-scooter users walk shorter and slower



# Influence of ride distance and public transportation



- The access distance is shorter by public transportation
- Users walk slightly further to an e-scooter when further from public transportation
- Users walk slightly further to an e-scooter when taking longer trips



# Catchment area and conclusion

		Percentiles of access distances (m)									
Area	Percentile	50th	55th	60th	65th	70th	75th	80th	85th	90th	95th
All trips		78	97	120	143	170	203	246	301	389	531
100 m radius of PT station		37	46	60	78	99	128	165	213	275	425
CBD		65	75	92	112	136	163	201	245	320	444

- Variations in access distance and catchment area
- Users of e-scooters **walk on average 147 m and 4.3 minutes** to use an e-scooter. However, the **median values of 77 m and 2.7 minutes** are more representative.
- Time-of-day pattern
- A travel time minimizing behavior - to some extent
- Distance to public transportation significantly impacts the access distance to e-scooters



# Limitations and future studies

- Data limitations
  - 2019
  - Only one week
  - Only one operator



- Has the access distance changed?
  - More operators
  - Change in fleet size management
  - New parking regulations

- We know how far users walked, not willingness to walk



- Elasticity of access distance with respect to the supply of vehicles



- Optimal design and location of designated e-scooter parking



**Thank you  
for listening.**

**Questions?      Frågor?**