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Kunnskap for en bedre
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EXPLORING URBAN MOBILITY TRENDS USING CELLULAR NETWORK DATA



Net-Zero Future 2024

19th – 21st June 2024

Oluwaleke Yusuf
Adil Rasheed
Frank Lindseth



PERSEUS
Doctoral programme



MARIE CURIE ACTIONS

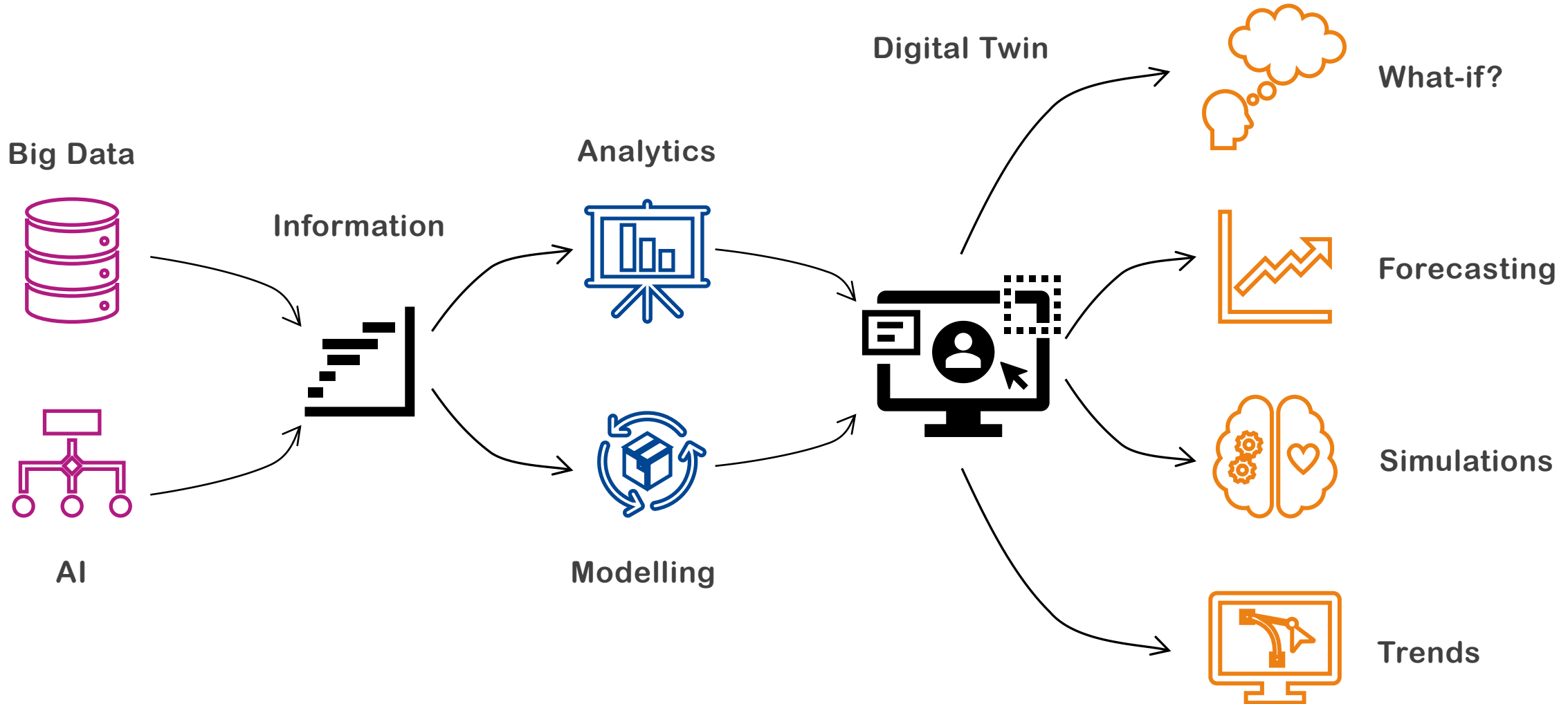
M₀ST



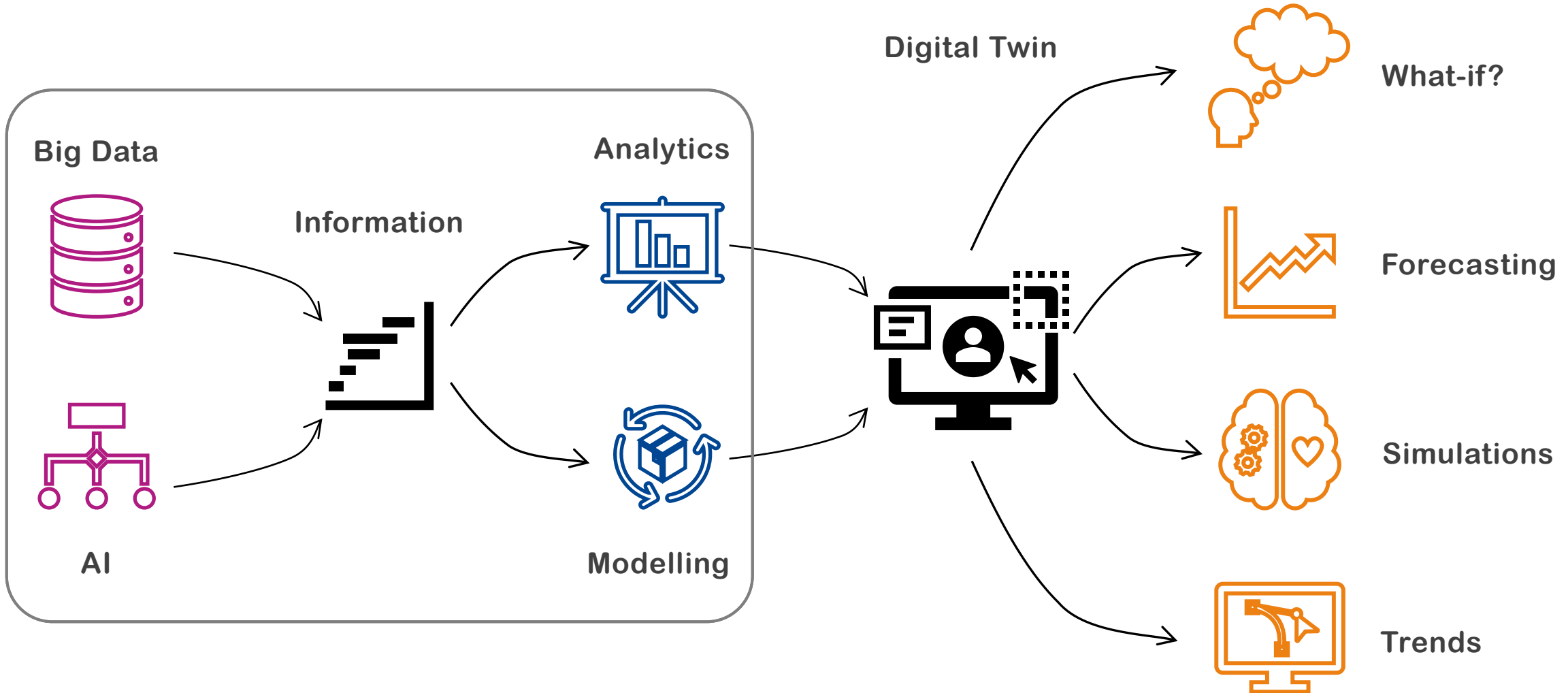
NTNU

Department of Engineering
Cybernetics

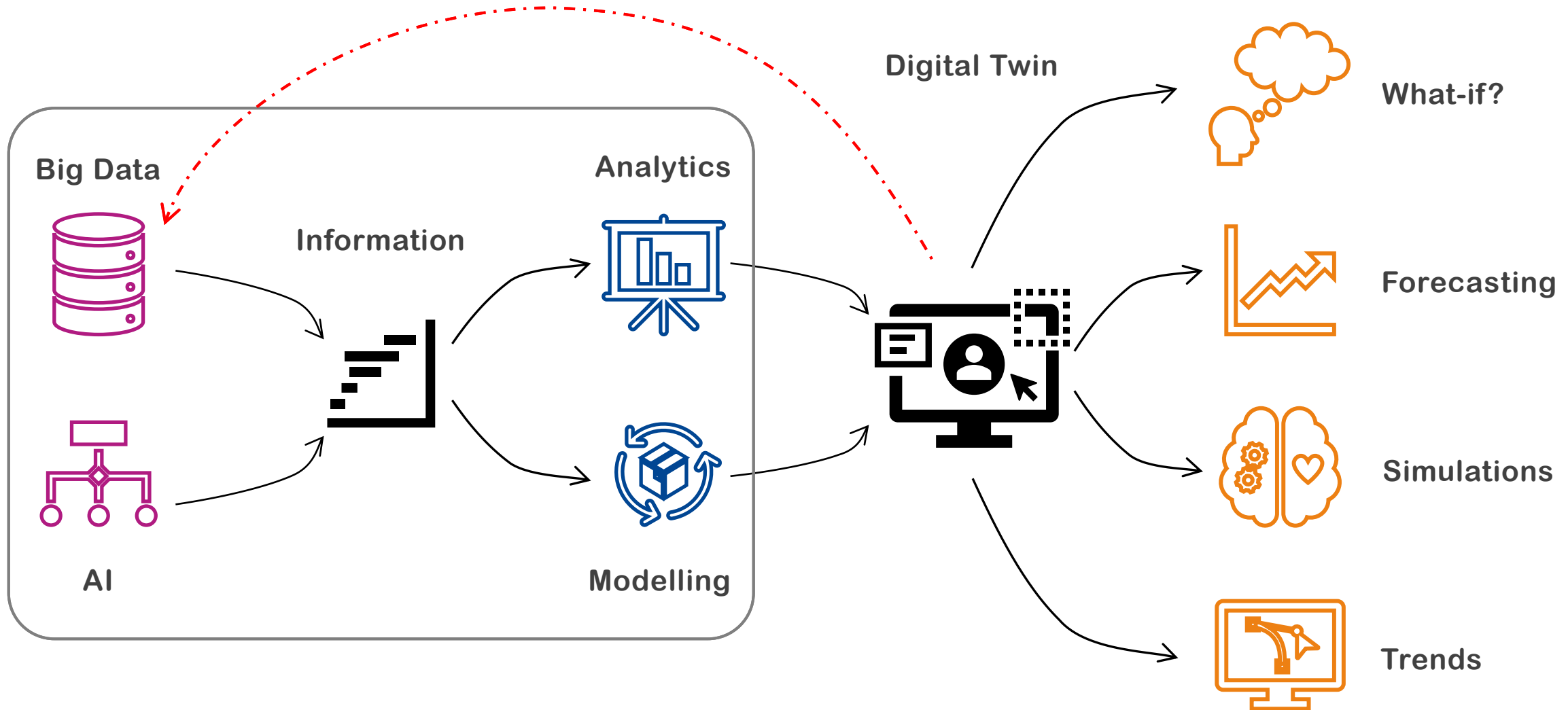
MOBILITY SYSTEM: DYNAMIC DIGITAL TWIN



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MOBILITY MODES: DATA EXPLORATION

As much **data** as possible from as many **sources** as possible.



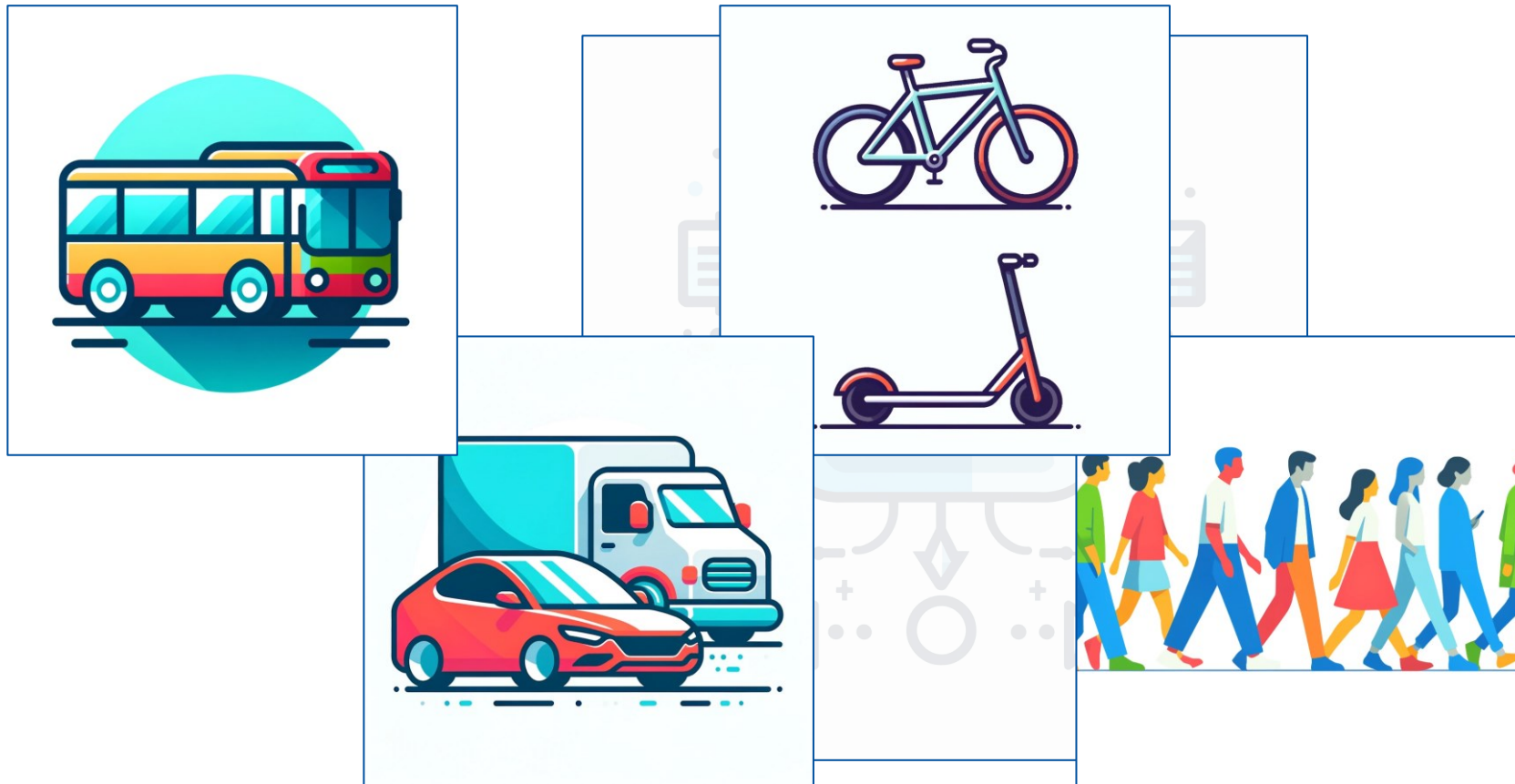
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CELLULAR NETWORK DATA

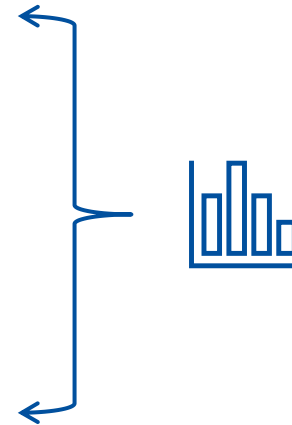
Methodology:

- Temporal data from routine subscriber activities.
- Data anonymization & aggregation.
- Geospatial position estimates from network cell coverage.
- Data filtering & extrapolation.
- Signal classification into dwells and transits.

CELLULAR NETWORK DATA

Methodology:

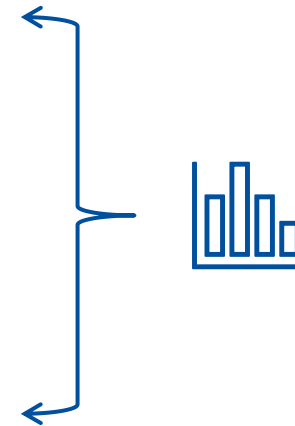
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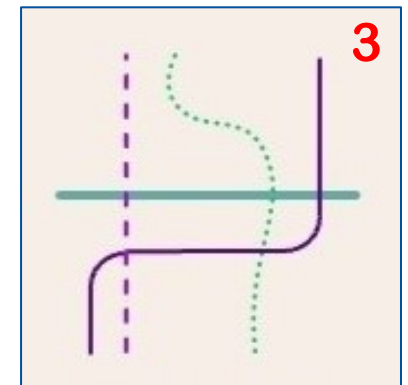
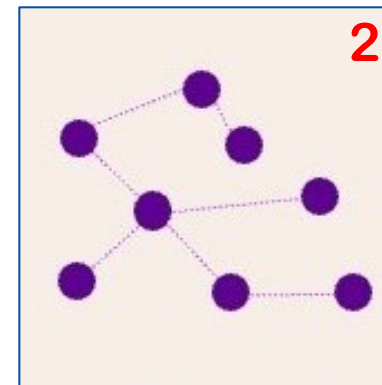
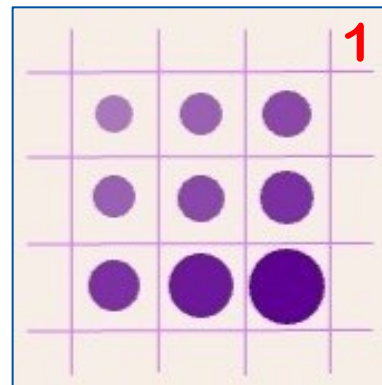
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Outputs:

1. Activity Reports
2. Trip Reports
3. Routing Reports



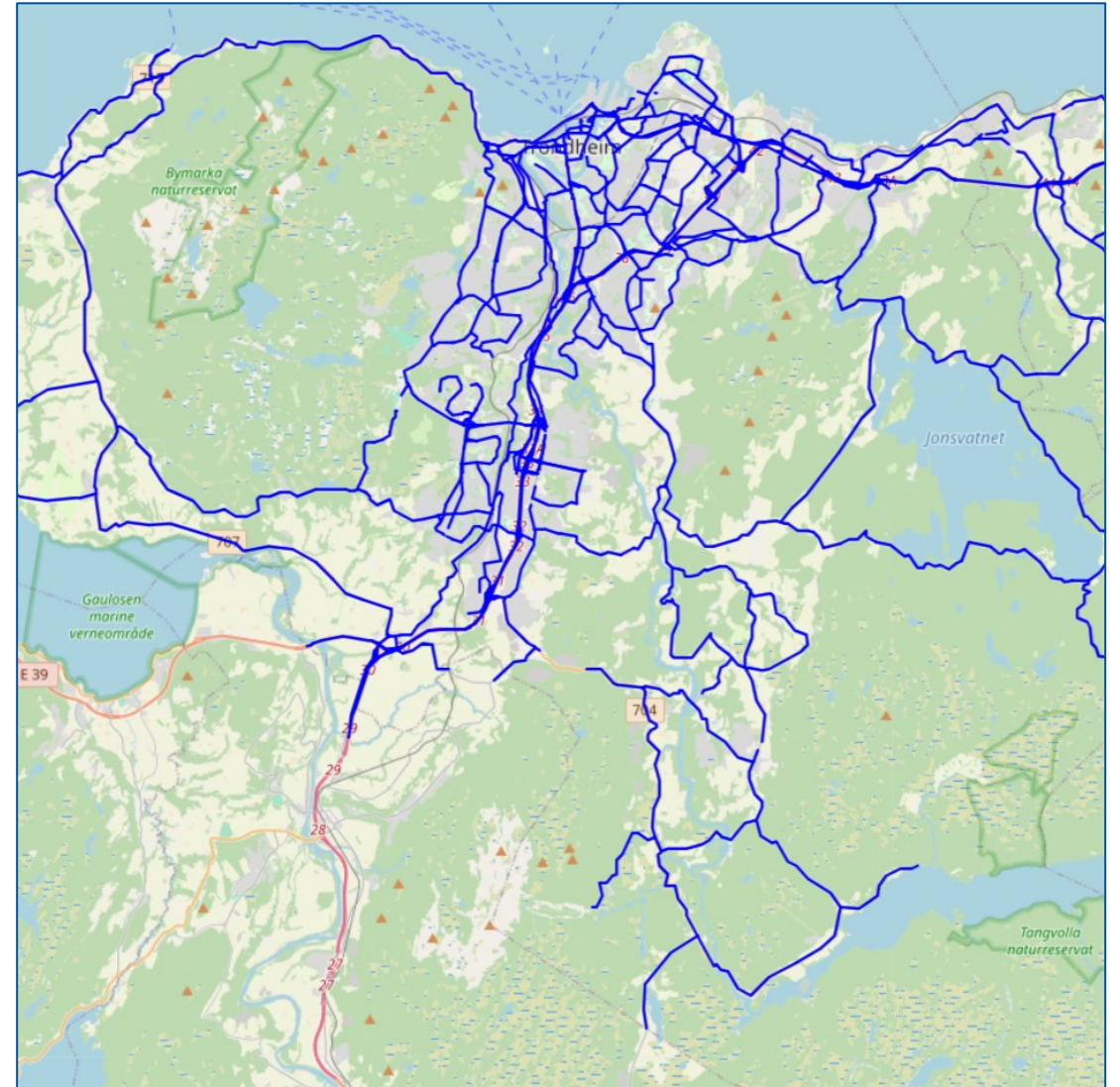
ROUTING REPORTS: TRONDHEIM, NORWAY

peopleFlow:

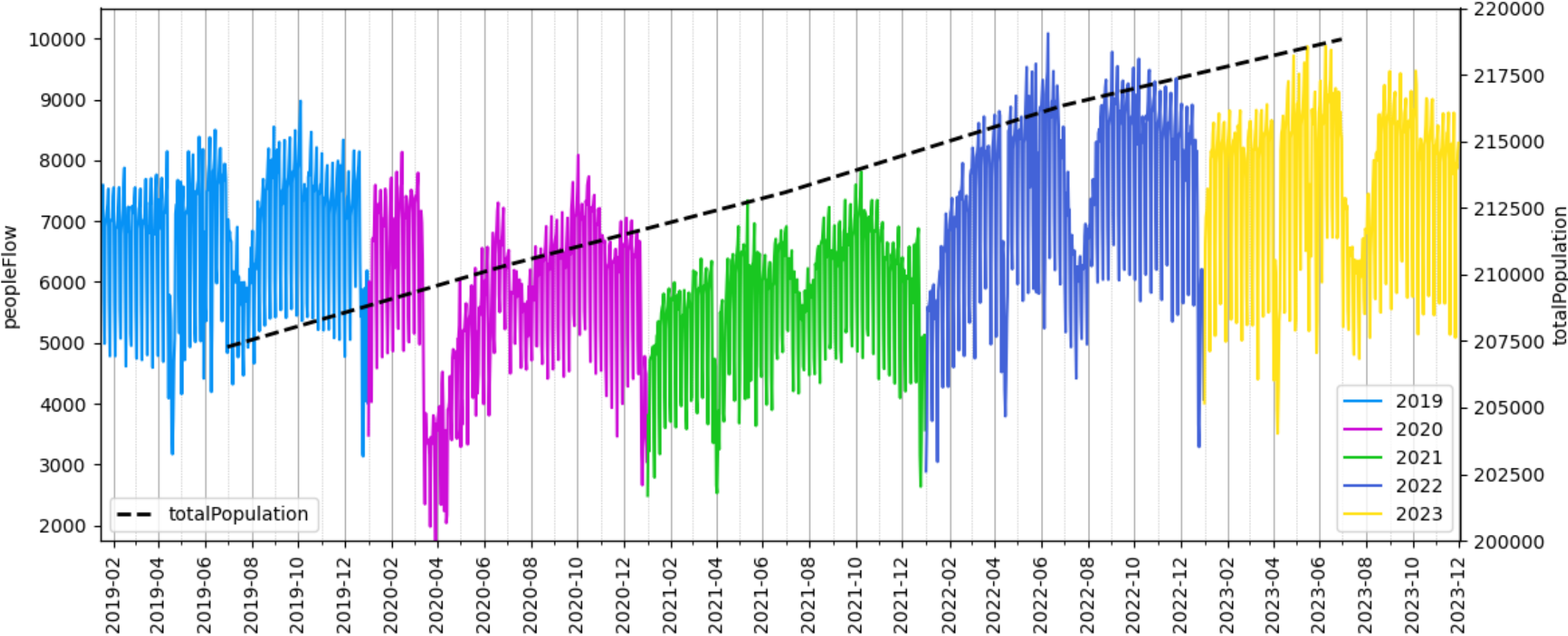
- Journey patterns of groups of people.
- Inferring the most probable travel routes.

Details:

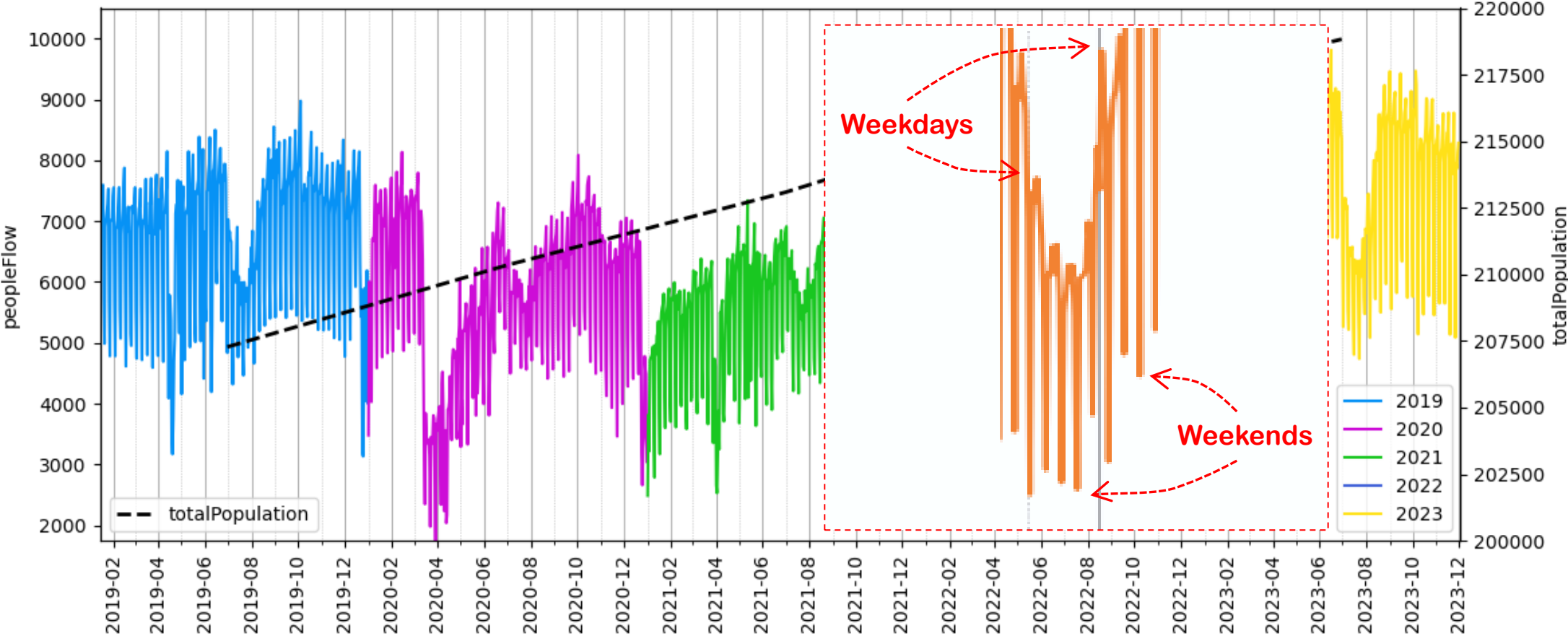
- January 2019 – November 2023
- 2210 (H) & 2212 (D) wayIDs
- 3 Transportation Modes



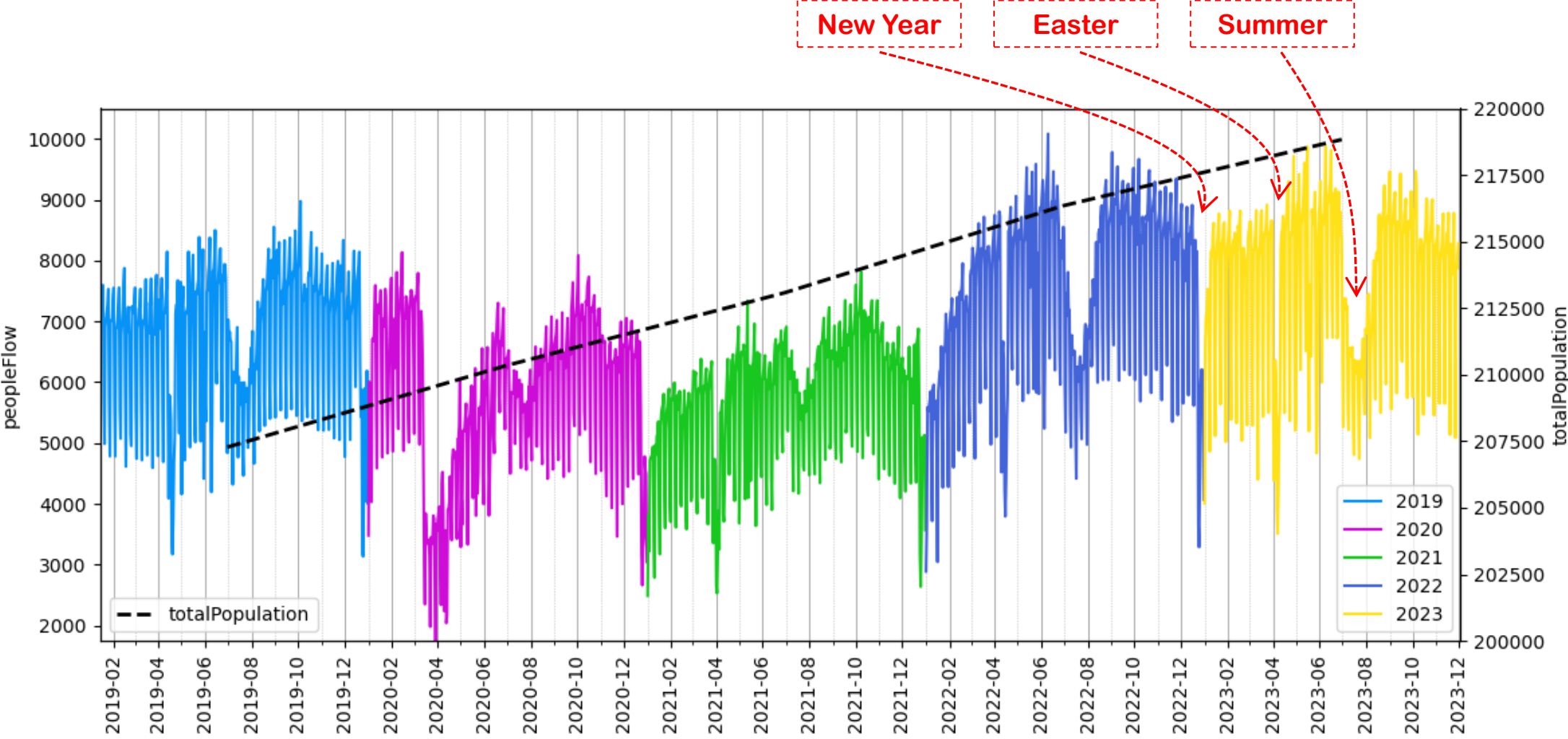
ANALYSIS: DAILY PEOPLEFLOW VOLUMES



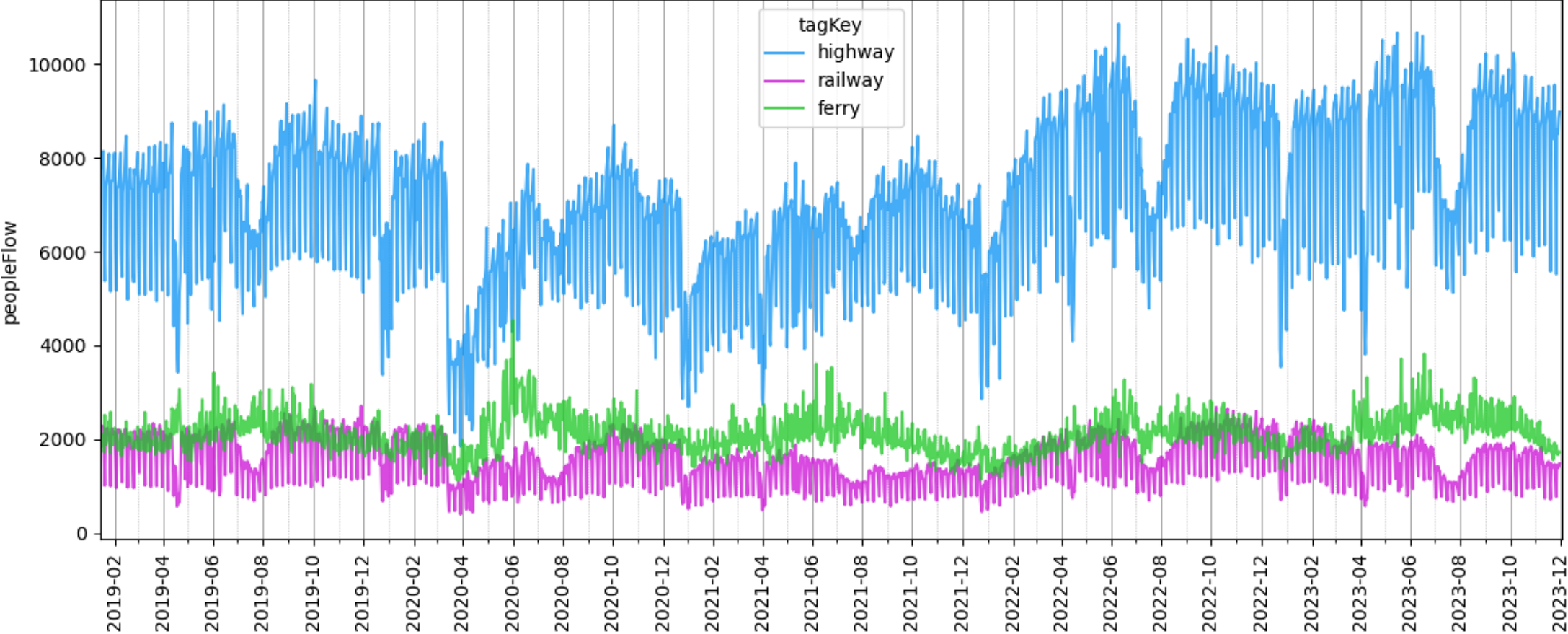
ANALYSIS: DAILY PEOPLEFLOW VOLUMES



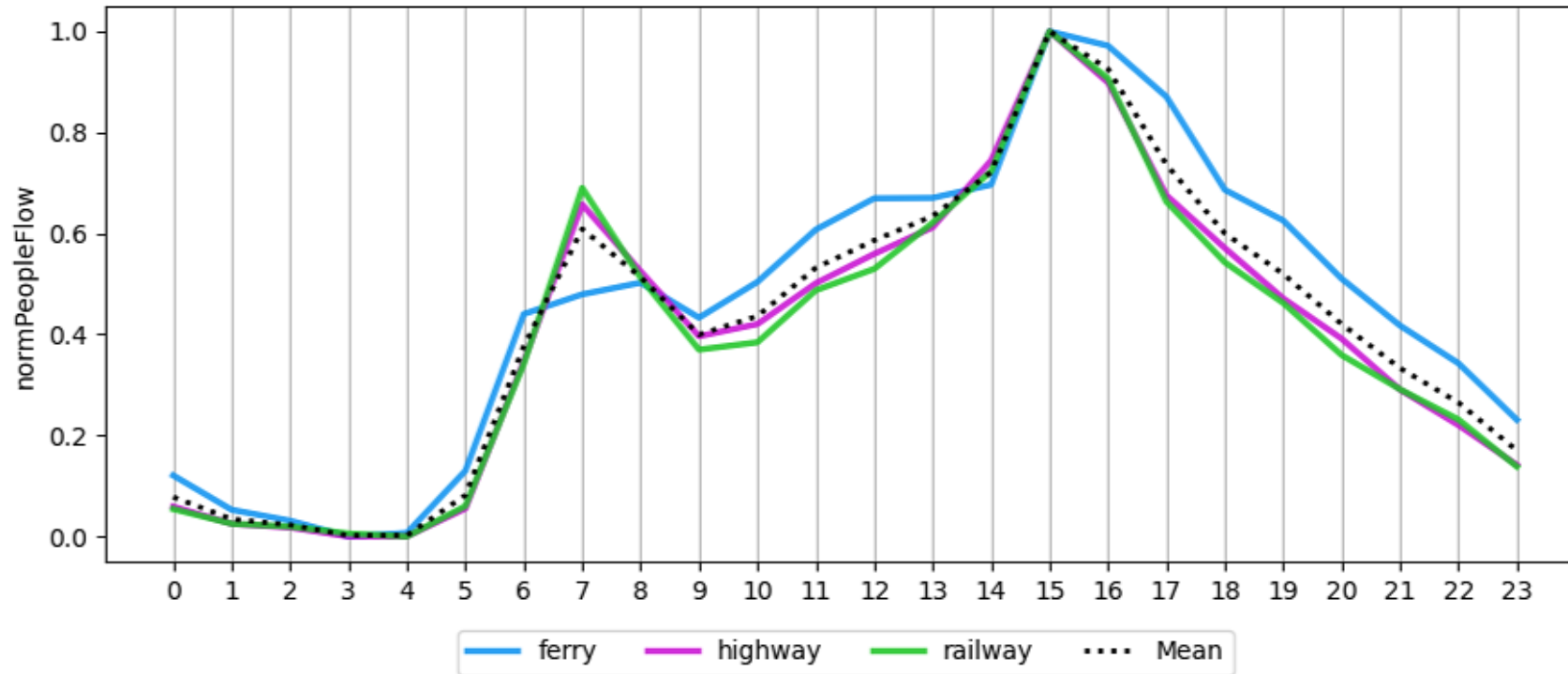
ANALYSIS: DAILY PEOPLEFLOW VOLUMES



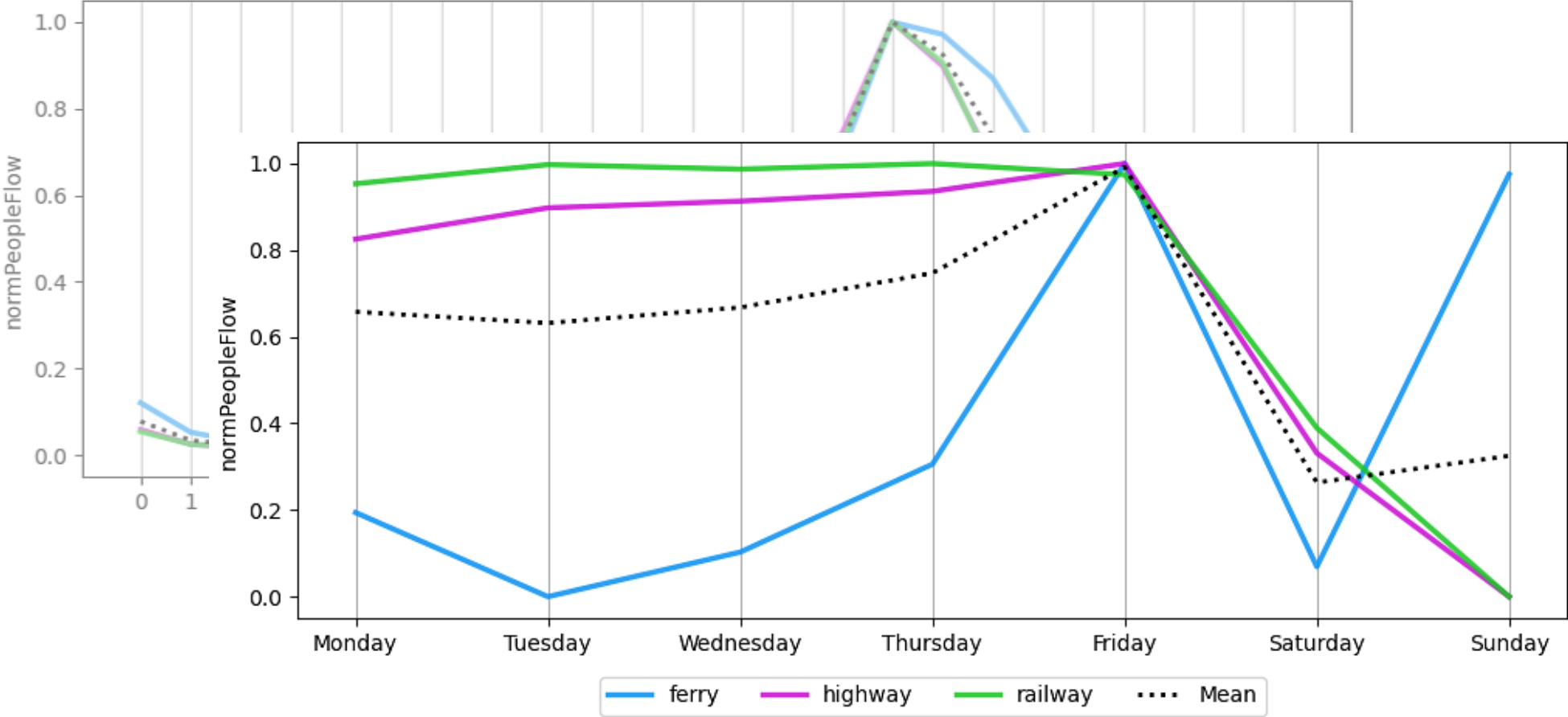
ANALYSIS: DAILY VOLUMES / MODE



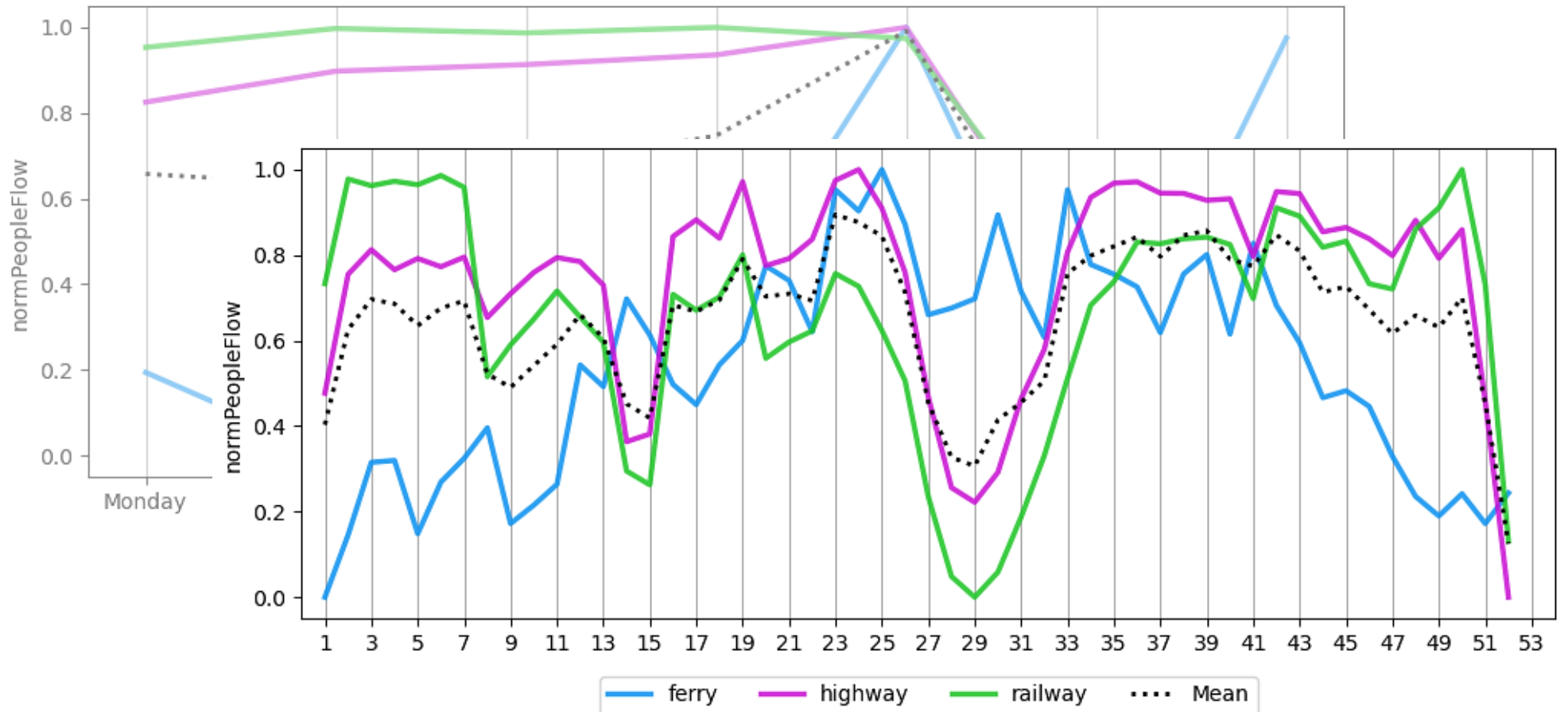
ANALYSIS: HOURLY, DAILY & WEEKLY



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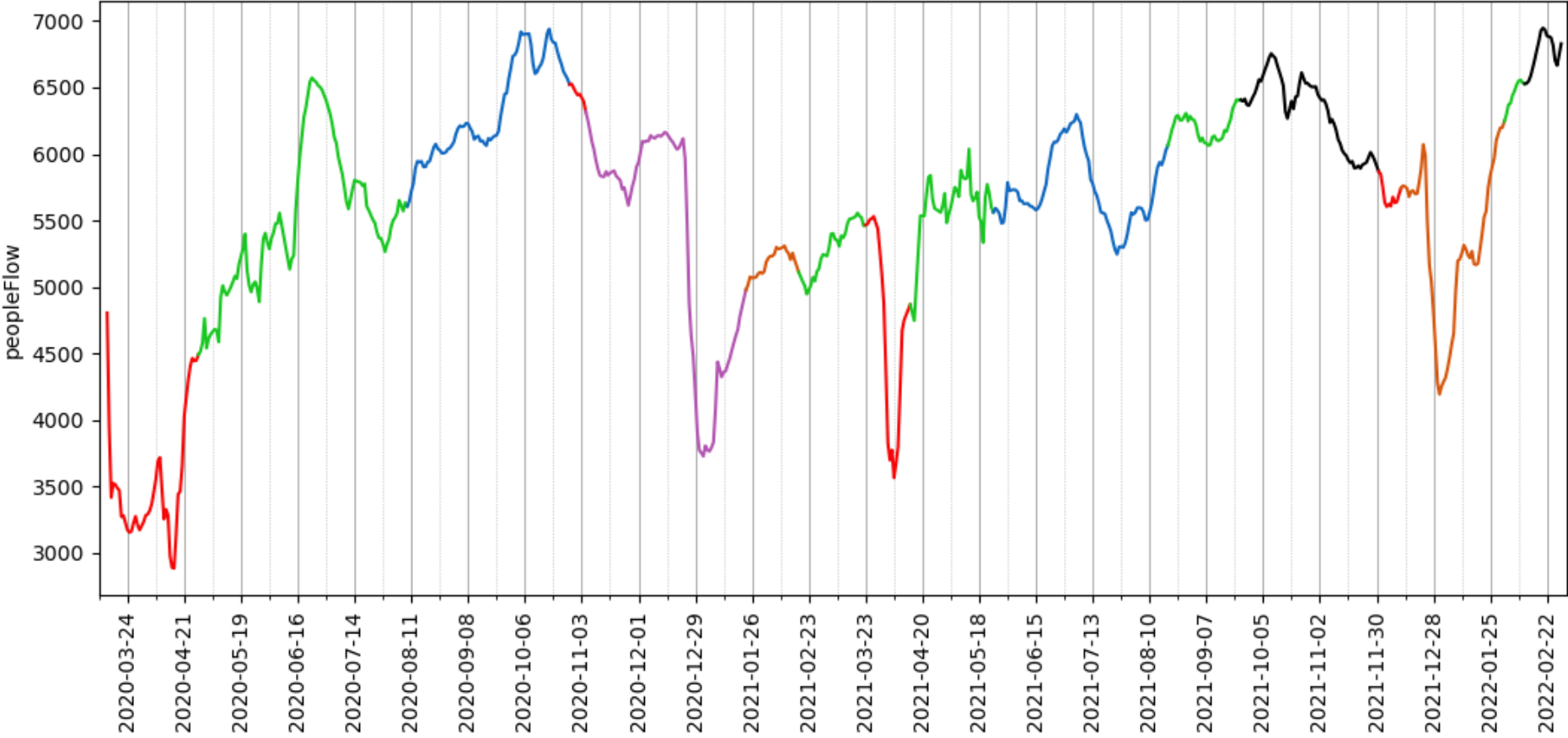


ANALYSIS: HOURLY, DAILY & WEEKLY



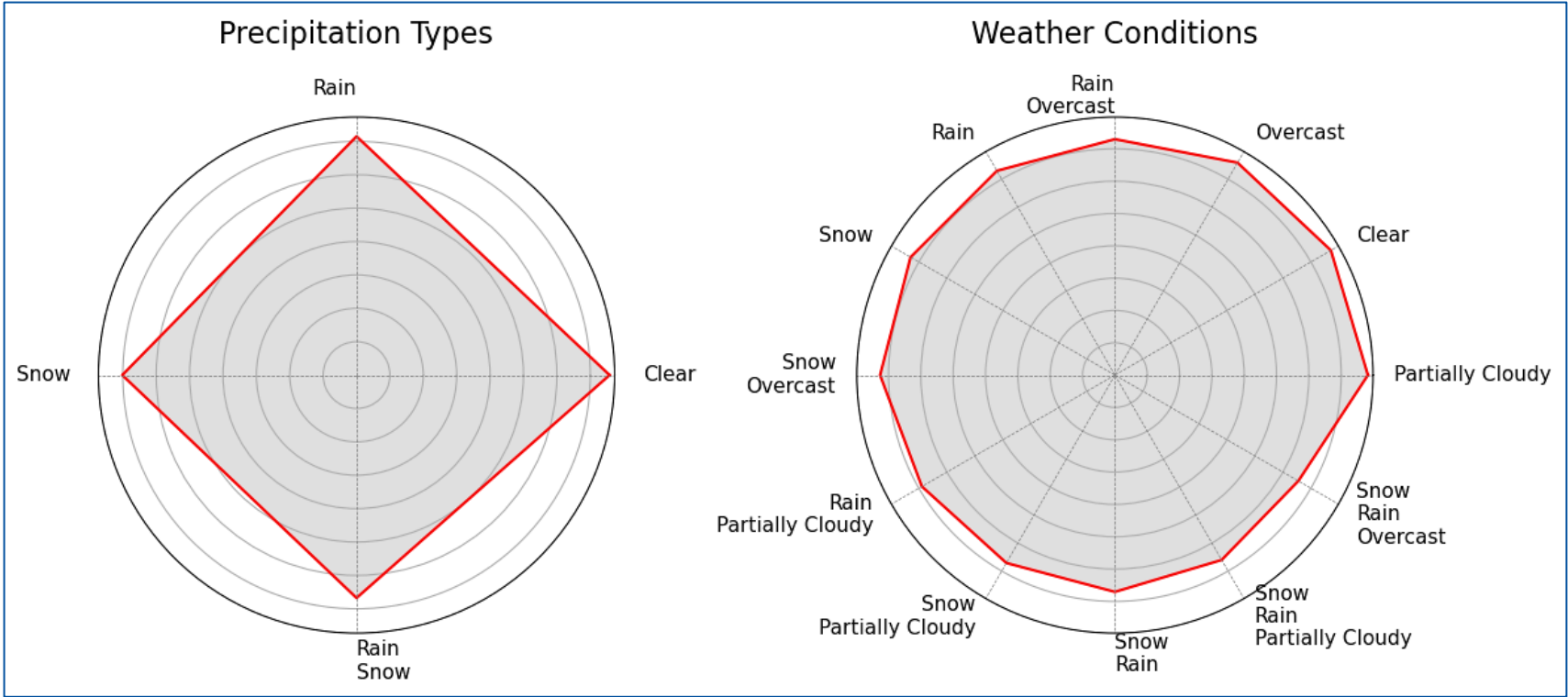


ANALYSIS: COVID-19 POLICIES

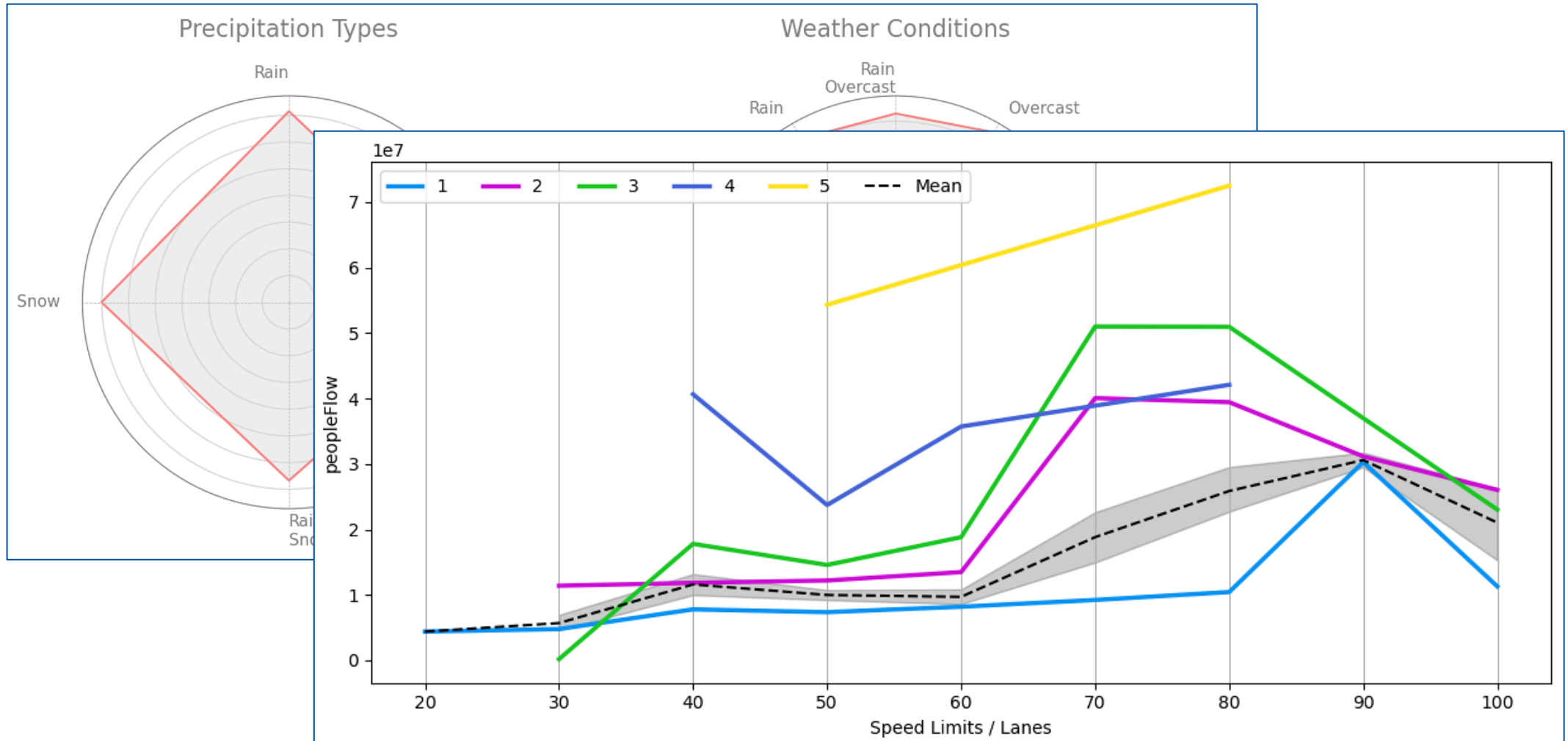


- | | | |
|--|---------------------------------|----------------------------------|
| — Campus Closure | — Campus Reopening | — All National Measures Repealed |
| — Gradual Campus Reopening | — Campus Closure | — Full National Lockdown |
| — Hybrid-Education Semester Start | — Gradual Reopening | — Mandatory Digital Education |
| — Full National Lockdown | — Part-Time In-Person Education | — Gradual Reopening |
| — Stay-At-Home Policy | — Near-Normal Semester Start | — All National Measures Repealed |
| — Strict Regional Measures, 1/3 Students | | |

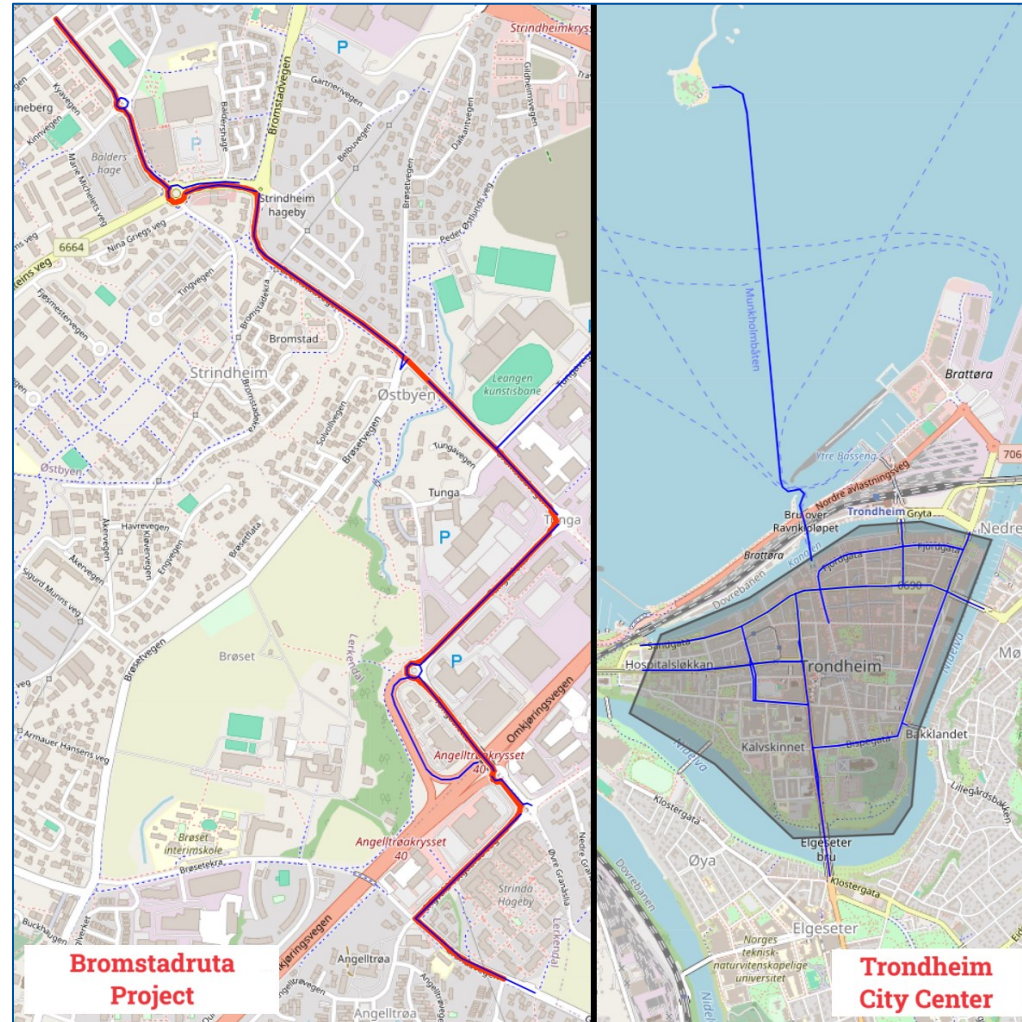
ANALYSIS: EXTERNAL INFLUENCES



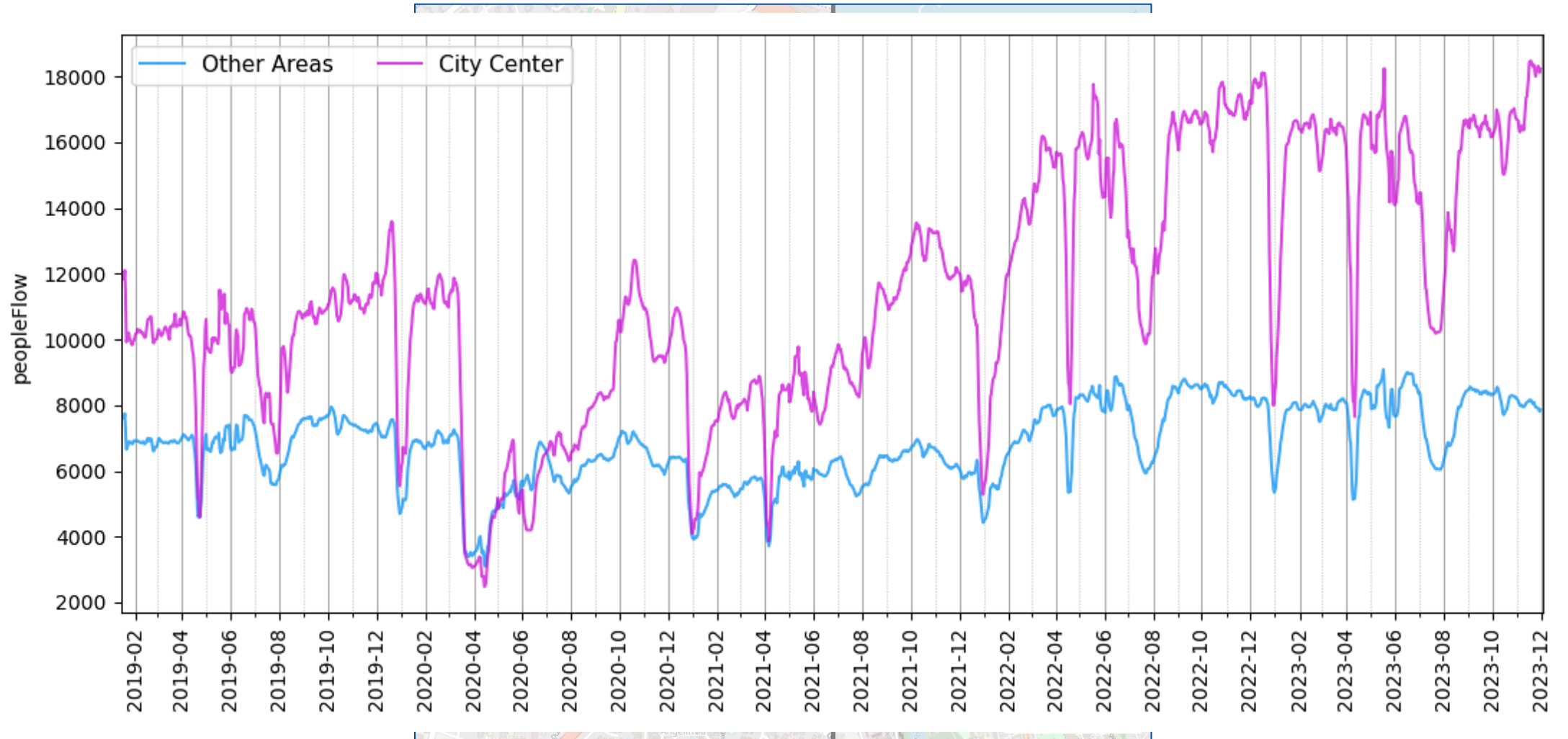
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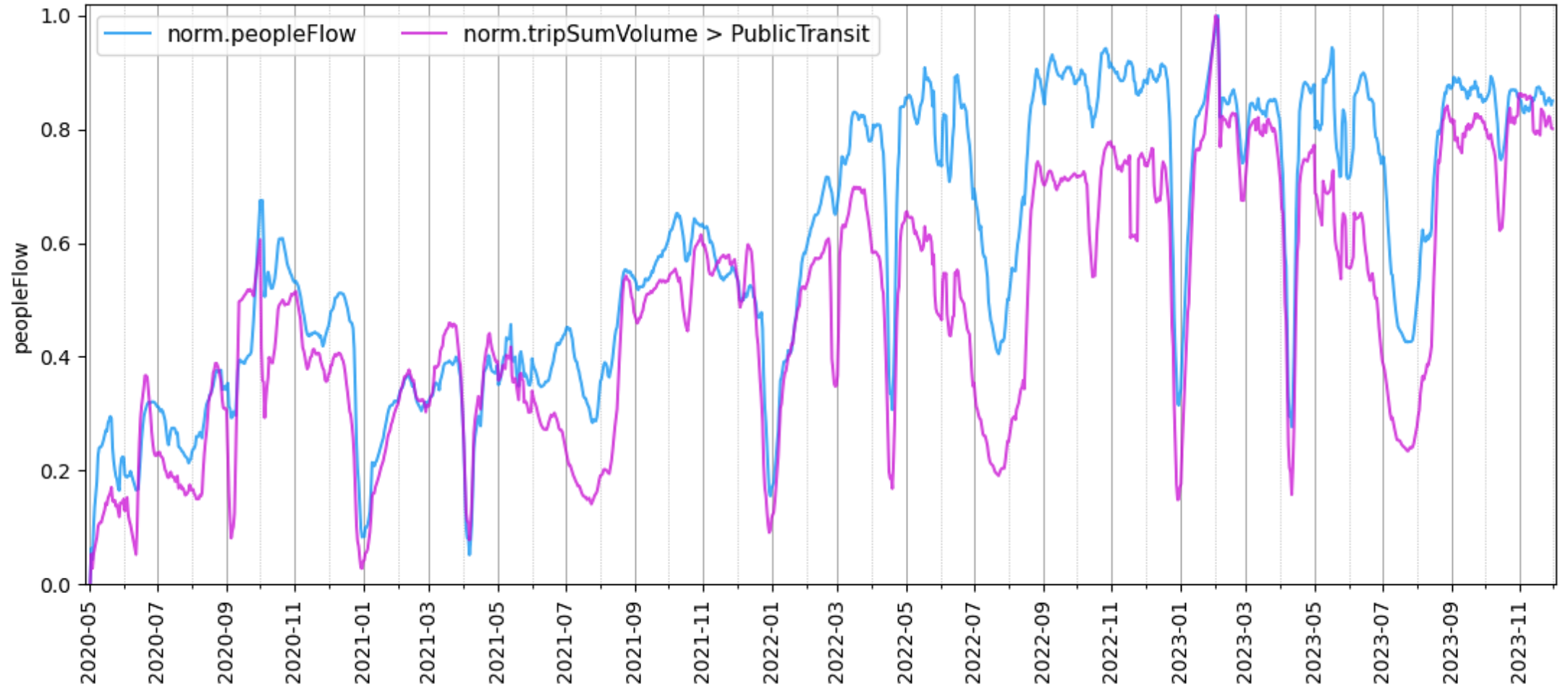
COMPARISON: AREAS OF INTEREST



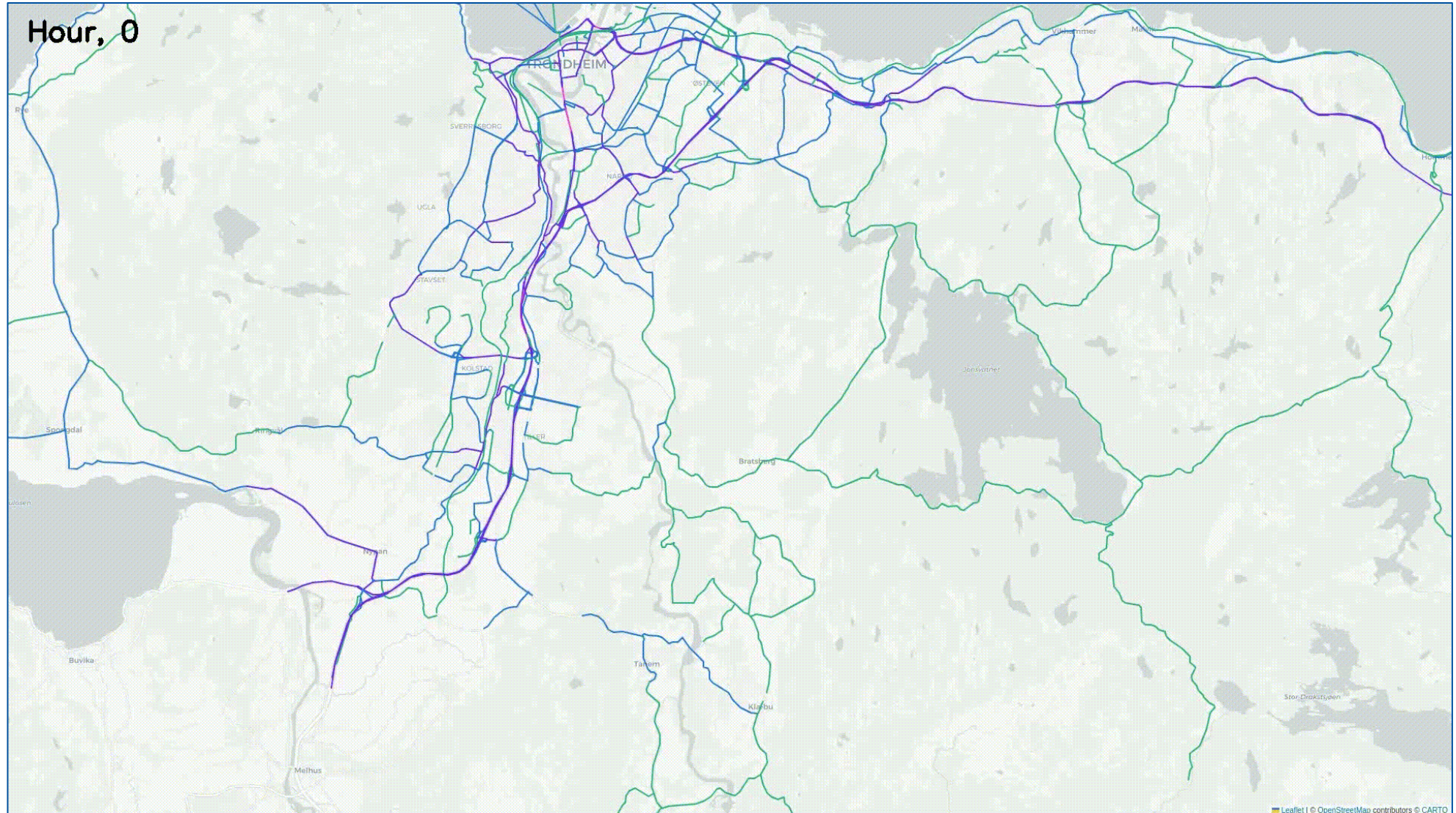
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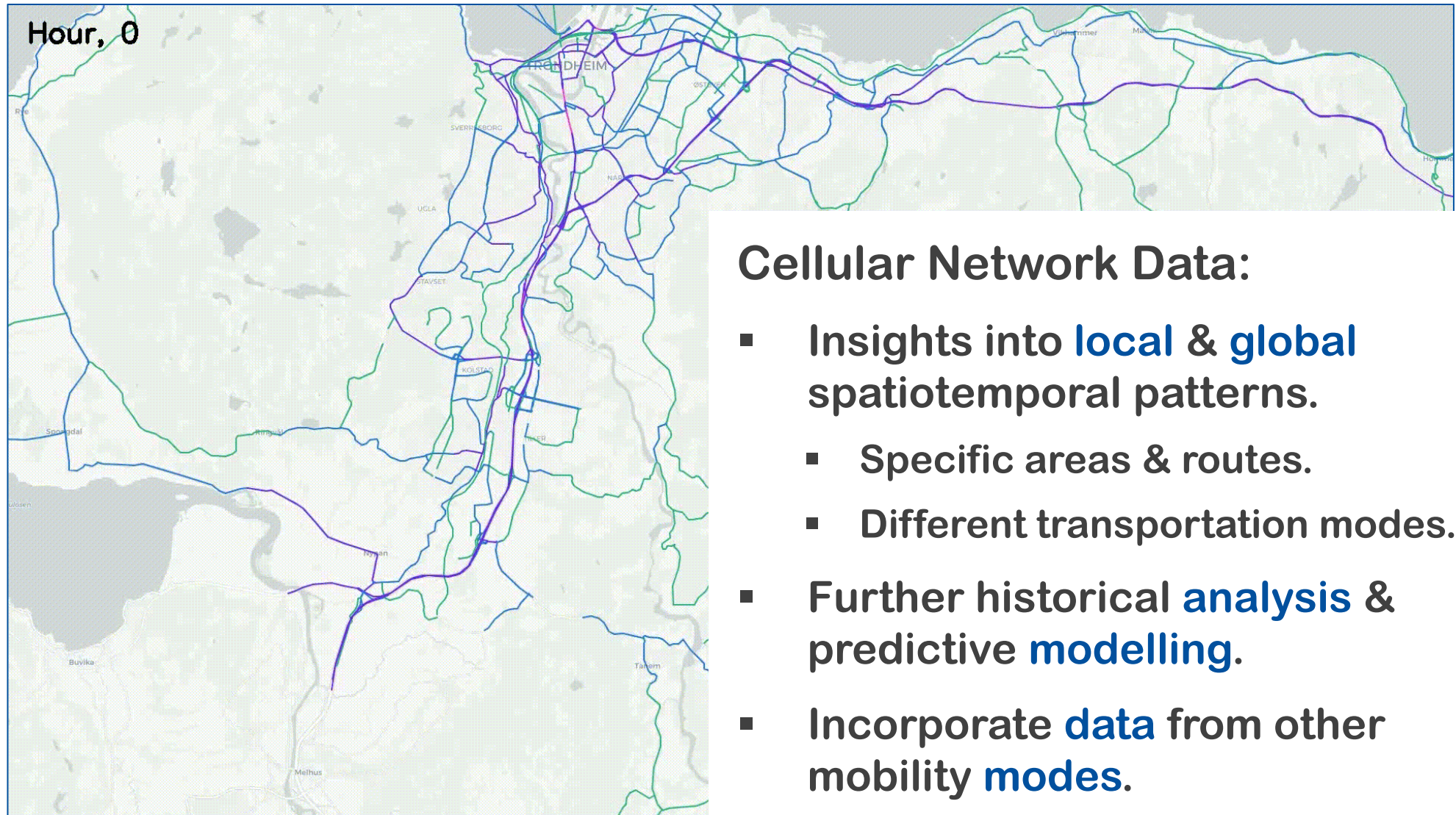
COMPARISON: PUBLIC TRANSIT DATA



CONCLUSION



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THANK YOU!

QUESTIONS??

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