From road traffic volumes to individual vehicle representations

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Conventional visualisation method: strategic noise maps

Strategic noise map of the island of Södermalm (Stockholm, Sweden)

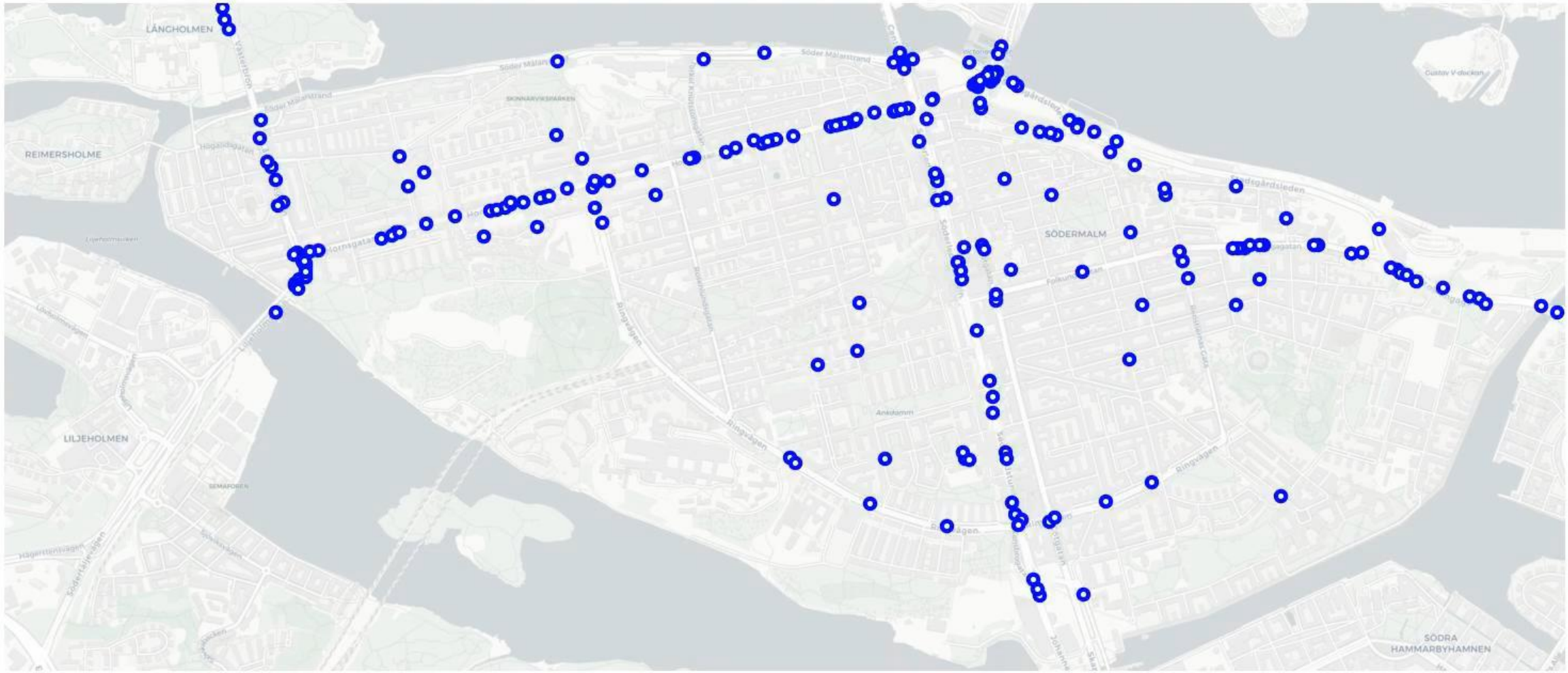
Limitations:

- **Source-centric**
- **Static**
- **Limited indicators (e.g. L_{den})**

→ Solution: microscopic traffic

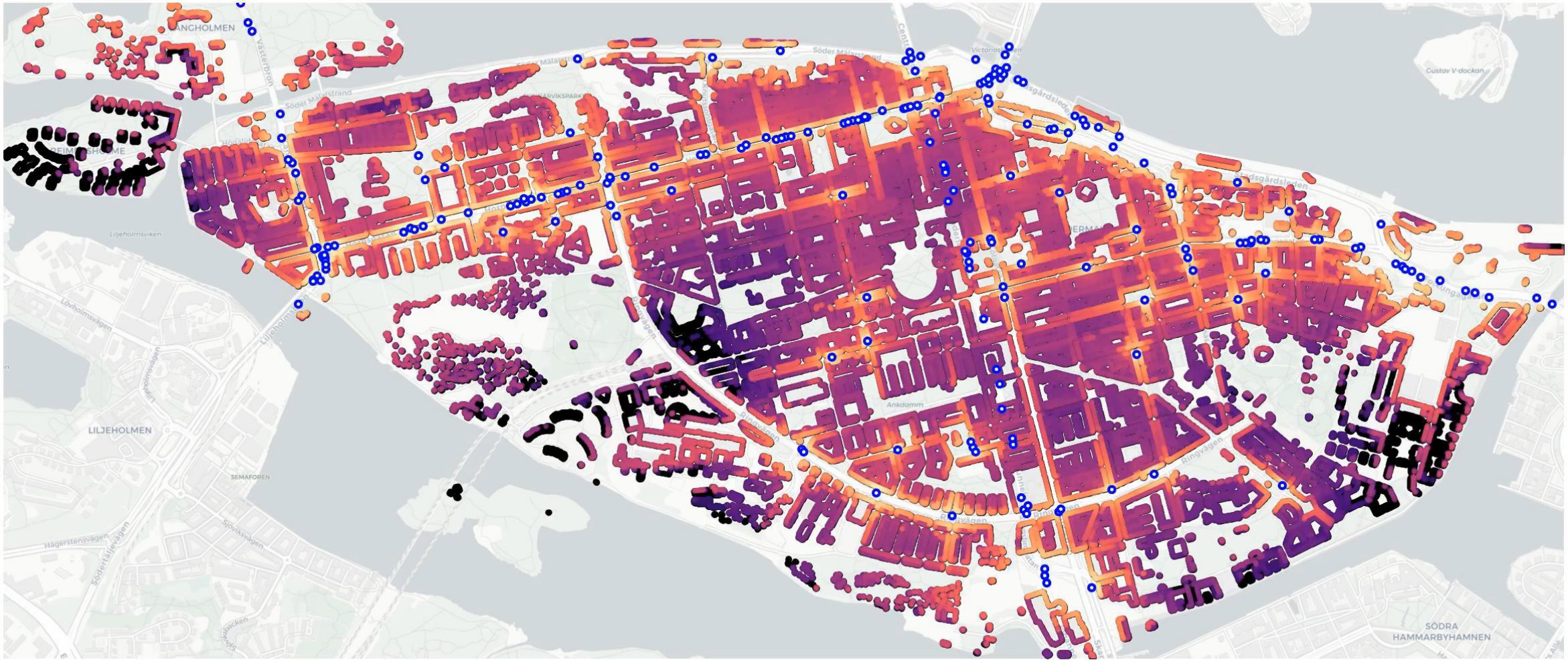
NoiseModelling

Microscopic traffic (SUMO)



NoiseModelling

Dynamic noise level ($L_{Aeq,1s}$)



NoiseModelling

Average noise level ($L_{Aeq,1h}$)

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Number of noise events

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Microscopic traffic simulation

Problem: calibrating the microscopic traffic simulation

- **requires extensive data**
  - Traffic sensors in many locations, providing **little to non-aggregated** traffic data
  - Average traffic flows in the area (baseline)
- **is complex and intensive**
  - Optimisation problem with well-chosen objective functions
  - Many iterations
- **may result in inaccurate results** in locations with no sensor

→ **Potential solution: De-aggregating traffic flows**

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Individualising traffic flows

Two approaches under investigation:

- **Density-based stochastic method**

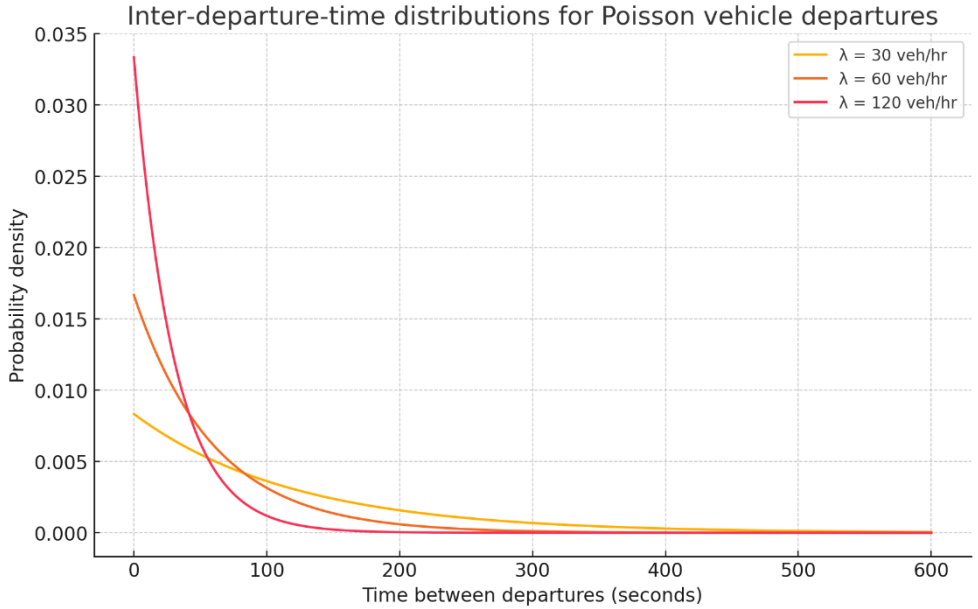
Vehicles appear randomly at points on the road network, each second.

Example: 360 vehicles/h driving at 10 m/s

→ Each second, there is a 360/(3600*10) = 1% probability that a vehicle appears per 1 meter section of road

- **Poisson process**

Vehicles randomly appear at the start of the road segment following a Poisson distribution, and drive until the end of the road segment.



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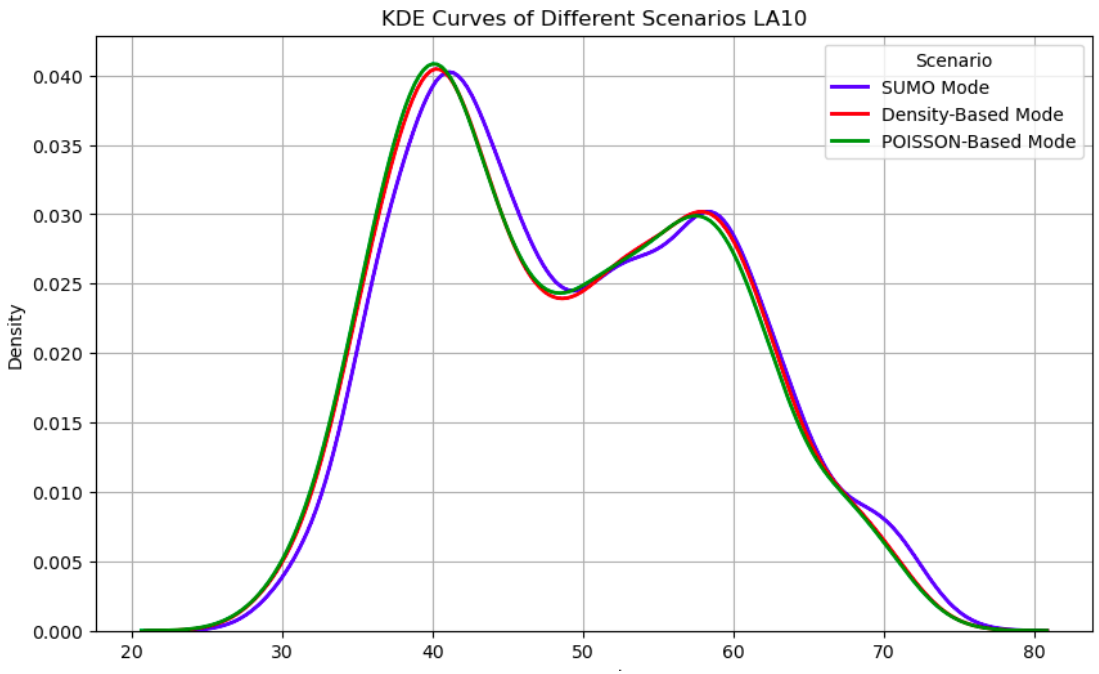
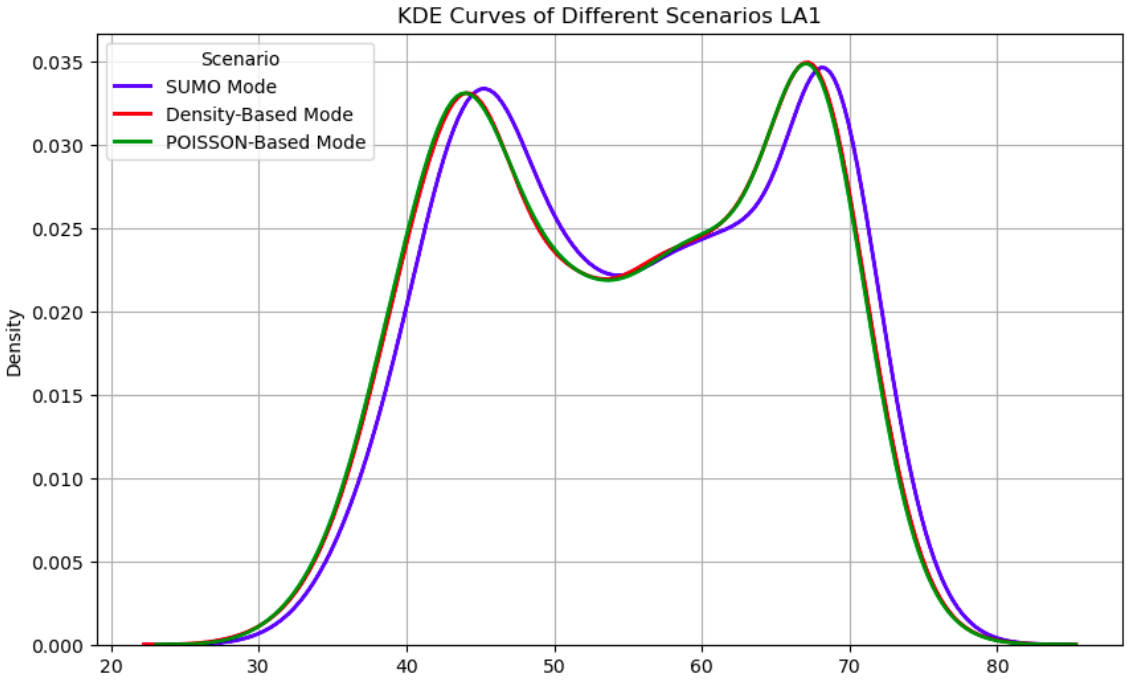
Results





Conclusions

→ Traffic flow-based models underestimate noise compared to trajectory-based models and lack dynamic indicators.

→Hybrid traffic representation methods enhance peak noise indicators, aligning distribution curves with trajectory-based models.

→However, hybrid methods cannot address underestimation due to unmodeled traffic variability and acceleration.

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Thank you!