

# They See Me Scooting

## A Long-Term Real-World Data Analysis of Shared Micro-Mobility Services and their Privacy Leakage

Karina Elzer, Eric Jedermann, Stefanie Roos, Jens Schmitt

### What & Why?

- Shared Micro Mobility
- Dockerless E-Scooters
- API with Available E-Scooters
- Standard: General Bikeshare Feed Specification (GBFS)<sup>a</sup>
  - Suggests Dynamic IDs
  - Sharing with cities and third parties



[https://images.noiz-mhn.de/img/45305142/crop/cbase\\_16\\_9-w748-h420/509236137/1037068722/e-roller.jpg](https://images.noiz-mhn.de/img/45305142/crop/cbase_16_9-w748-h420/509236137/1037068722/e-roller.jpg)

<sup>a</sup><https://github.com/MobilityData/gbfs>

→ What about privacy of the implementations and standard?

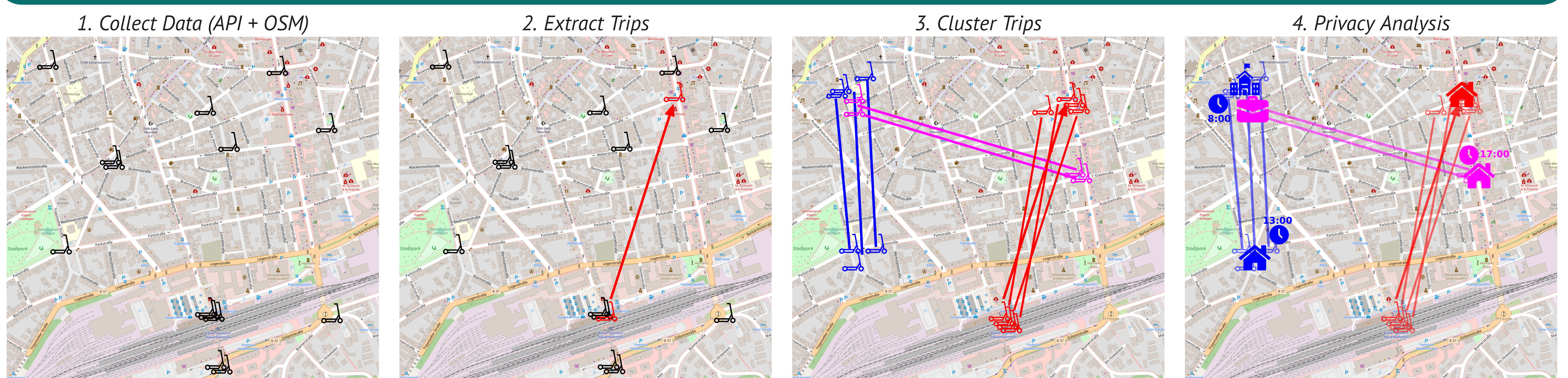
### Data & Facts

- Provider: Tier (Dott)
- City: Kaiserslautern
- Collection Period: 01.10.2023 - 31.03.2024 (6 month)  
Every 3min
- 80,980,942 Entries
- 116,728 Trips
- Averages:
  - 1670.28m
  - 10.22min
  - 637.86# per Day

#### Example Entry:

```
{
  "type": "vehicle",
  "id": "1b096d37-d444-49ba-bbaa-adf44dc967ee",
  "attributes": {
    "state": "ACTIVE",
    "lastLocationUpdate": "2023-09-25T20:15:43Z",
    "lastStateChange": "2023-09-14T20:55:36Z",
    "batteryLevel": 43,
    "currentRangeMeters": 16000,
    "lat": 49.454534,
    "lng": 7.765172,
    "maxSpeed": 20,
    "zoneId": KAISERLAUTERN,
    "code": 143134,
    "iotVendor": "okai",
    "licencePlate": "911WRX",
    "isRentable": true,
    "vehicleType": "escooter",
    "hasHelmetBox": false,
    "hasHelmet": false
  }
}
```

### Steps - (Example)



→ Static IDs are still implemented, allowing privacy leakage

Reconstructed trips allow the extraction of, for example: routines, residential addresses and work/school addresses.

### Results

#### Validation:

- 4 Known Individuals
- 57 Known Trips

→ 52/57 (91%) Identified

#### Limitations:

- Last Mile Problem
- Regular Users
- Population Density

#### Generalization:

Platform	Variable Parameters			Static IDs	
	Battery	Remaining Range	Location	License Plate	QR-code/ID
Tier	<b>%</b>	<b>km</b>	<b>meter</b>	<b>yes</b>	<b>yes</b>
Dott	3 levels	<b>km</b>	<b>meter</b>	<b>yes</b>	<b>no</b>
Zeus	3 levels	<b>km</b>	<b>meter</b>	no	<b>yes</b>
Lime	3 levels	<b>km</b>	<b>meter</b>	3 of 6 digits	no
Bolt	<b>%</b>	<b>km</b>	<b>meter</b>	no	no
Voi	3 levels	3 levels	<b>meter</b>	no	<b>yes</b>

Features Allowing Trip Reconstruction are in Bold

### What About Dynamic IDs?

→ Dynamic IDs, suggested by the current standard, are claimed to be more privacy protecting

- Collected dataset as ground truth
- 7 random days selected
- Trip Reconstruction possible if the following features are granular:
  - Battery Level or
  - Remaining Range

- Recall: 75.6%-81.6%
- Precision: 86.3%-91.2%

→ Dynamic IDs alone are not the solution for privacy protection

## Shared Micro Mobility Data Sharing Does Not Guarantee Privacy!

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Scooting GitHub:



Contact  
Karina Elzer:



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Eric Jedermann:

