Hogeschool van Amsterdam

Amsterdam elektrisch | MRA elektrisch | Utrecht elektrisch | Rotterdam elektrisch | Den Haag

APPLYING DATA SCIENCE ON CHARGING INFRASTRUCTURE

BENCHMARKING 5 REGIONS IN THE NETHERLANDS

AVERE E-mobility conference
April 13th 2016
Session: *Interoperability of charging infrastructure*

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CREATING TOMORROW

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AMSTERDAM

Start	*febr 2012*
Charge Stations	*824*
Charge Sessions	*901.390*
Monthly	*42.643*

UTRECHT

Start	*dec 2013*
Charge Stations	*263*
Charge Sessions	*169.166*
Monthly	*11.601*

THE HAGUE

Start	*juni 2013*
Charge stations	*429*
Charge Sessions	*217.872*
Monthly	*15.664*

METROPOLE REGION

Start	*feb 2014*
Charge Stations	*722*
Charge Sessions	*390.423*
Monthly	*51.121*

ROTTERDAM

Start	*dec 2012*
Charge Stations	*~500*
Charge Sessions	*288.924*
Monthly	*19.079*

GRAND TOTAL

Charge Stations	***2855***
Charge Sessions	***1.967.775***
Monthly	***140.108***

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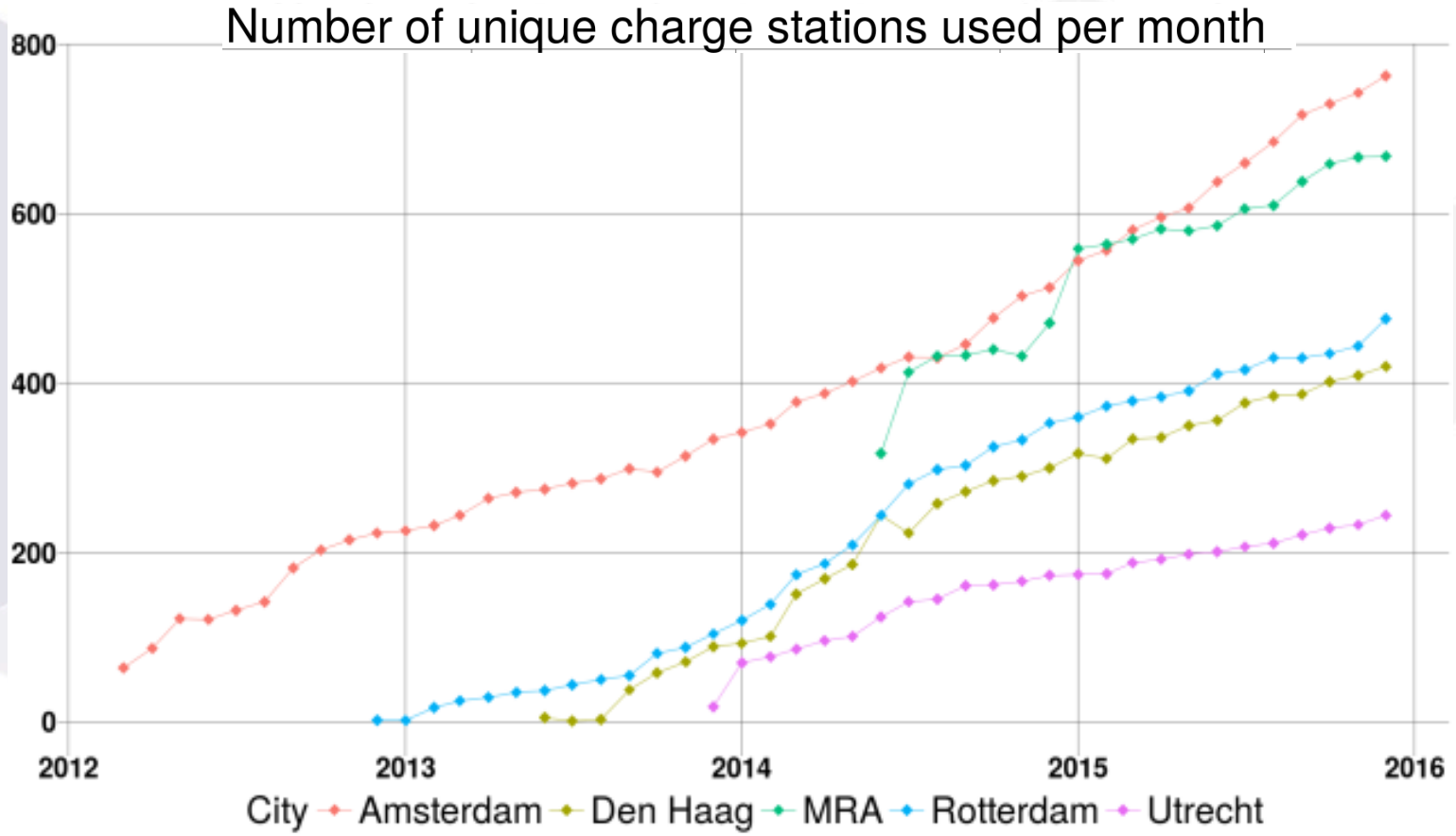
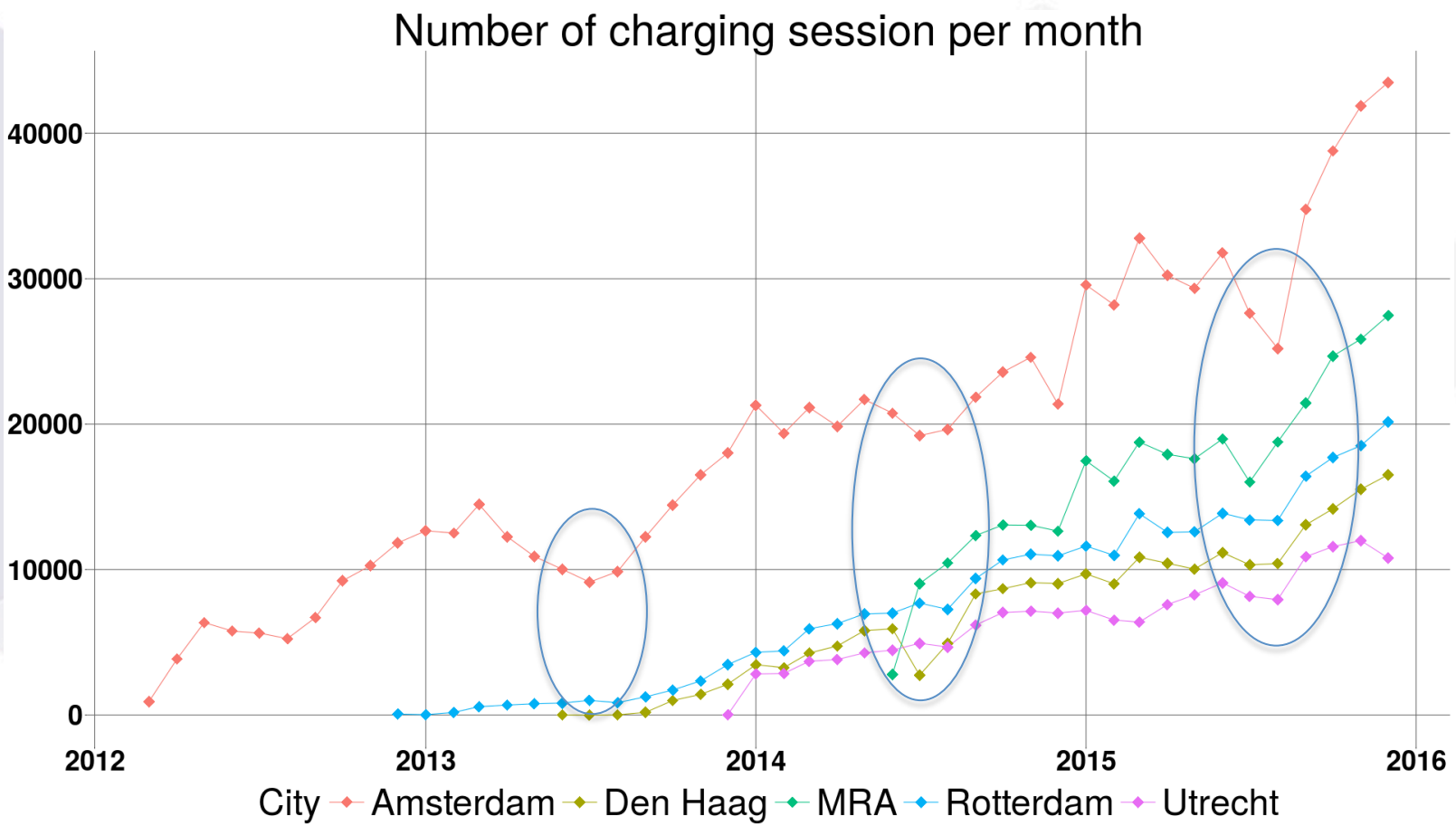
#CHARGING STATIONS USED MONTHLY: STEADY INCREASE



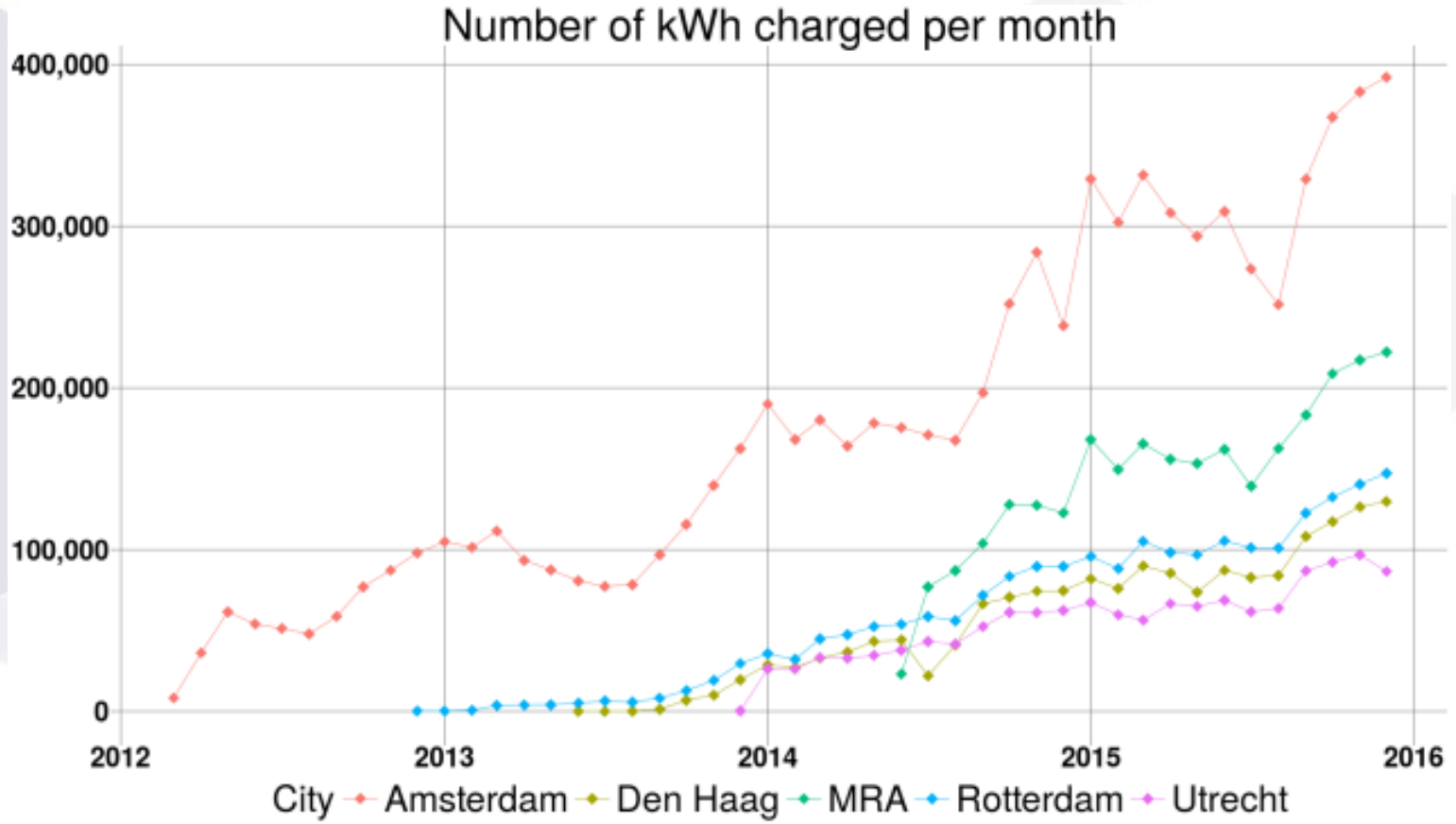
- Amsterdam and MRA leading
- Den Haag and Rotterdam close followed by Utrecht

#CHARGING SESSIONS MONTHLY



- Variance from 12.000-20.000 (Utrecht, Den Haag, Rotterdam) to 40.000 (Amsterdam) sessions per month
- Seasonal influences

ELECTRICITY CHARGED (KWH)



- Monthly between 100 MWh (Utrecht, Den Haag, Rotterdam) to 400MWh (Amsterdam) charged

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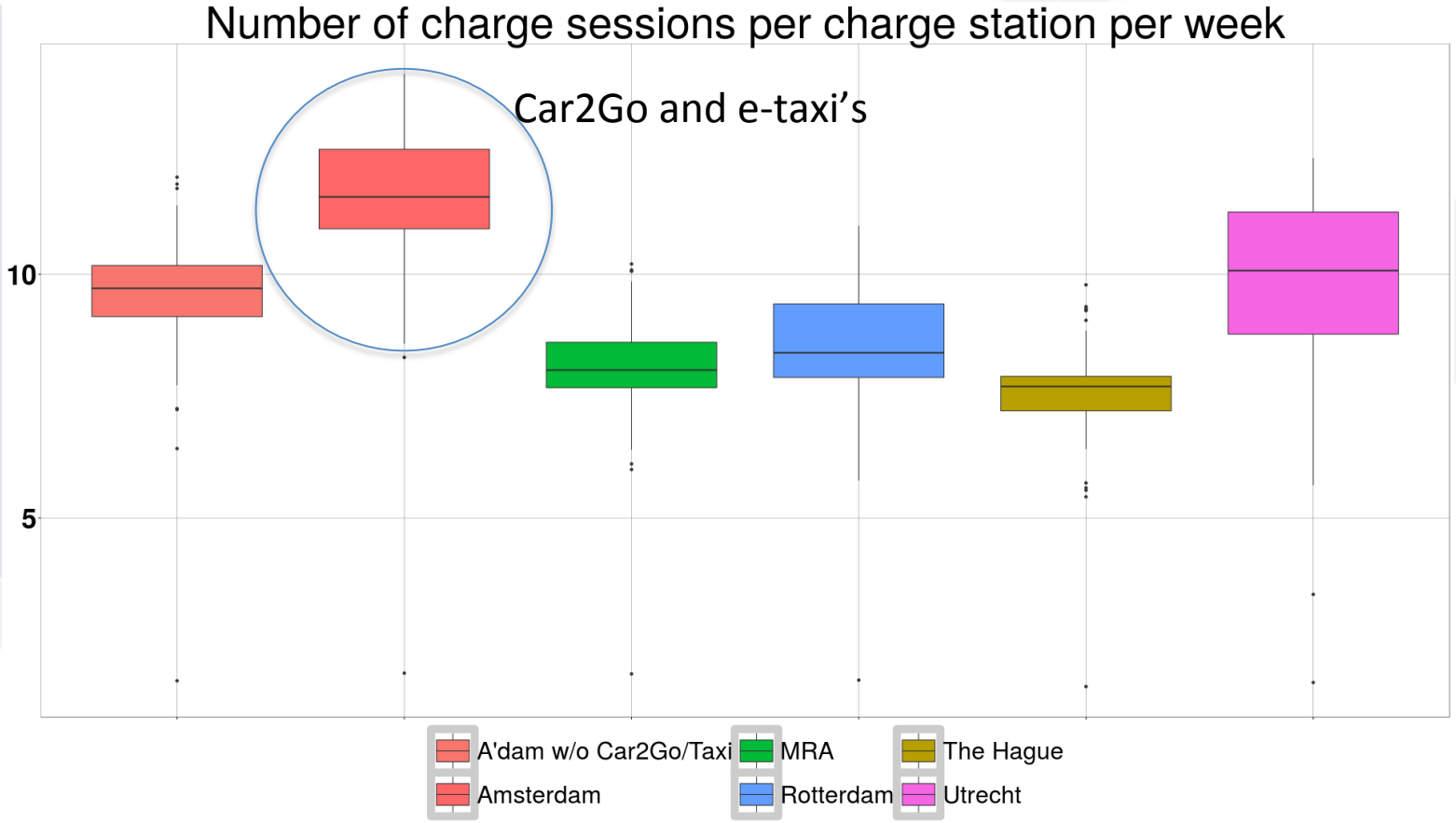
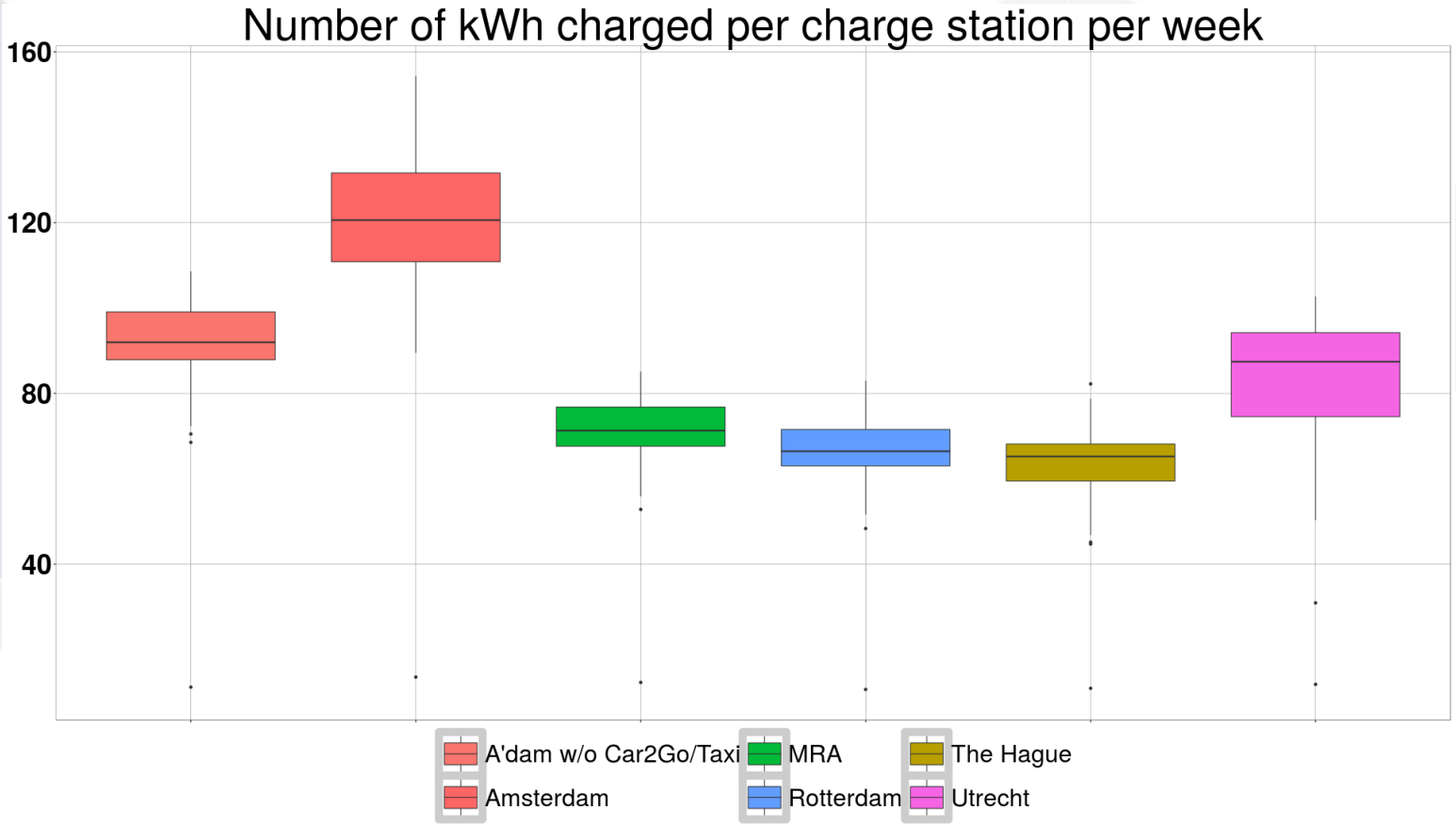
CHARGE SESSIONS PER CHARGE STATION



- Relative high scores for Amsterdam and Utrecht
- Car2Go increase # of sessions by ~25%

70-120KWH CHARGED PER WEEK PER CHARGE STATION



- Again: high averages in Amsterdam and Utrecht

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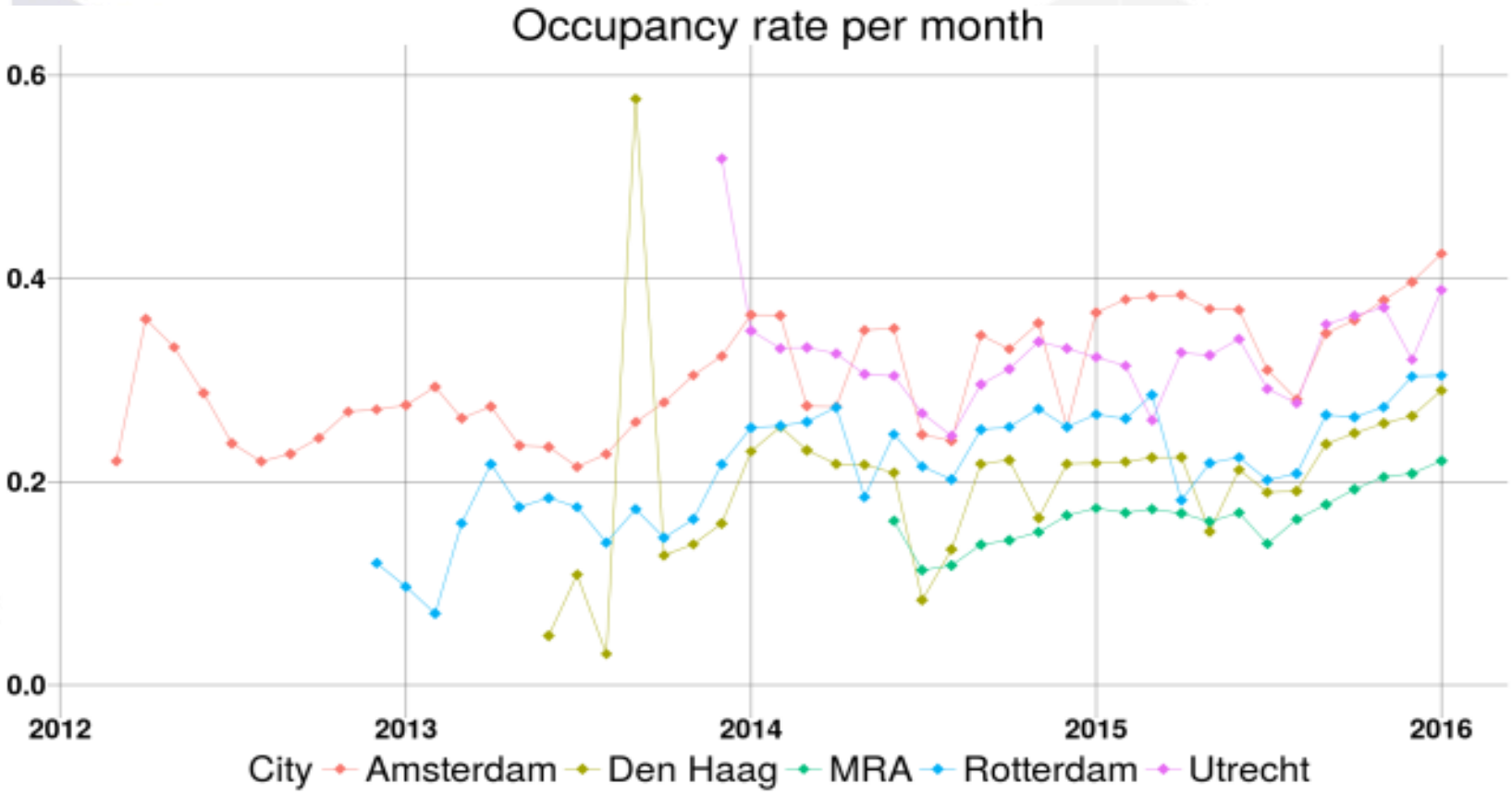
TO WHAT EXTENT ARE CHARGING POINTS OCCUPIED?

OCCUPANCY RATE BETWEEN 20% AND 40%



- Occupancy rate at peak times can be very high.
- Note that *charging rate* is (significantly) lower than occupancy rate

CONCLUDING BENCHMARK

Success factors:

- Car2Go (Amsterdam)
- Electric taxis (Amsterdam)
- Dense/urban areas (Amsterdam)
- High level of active users / ~income? (Utrecht, Amsterdam)
- Relative scarcity of charging points (relative to # of users) (Utrecht)
- On-demand placement (versus strategic placement) (most cases)

Importance of deeper analysis of charging patterns.

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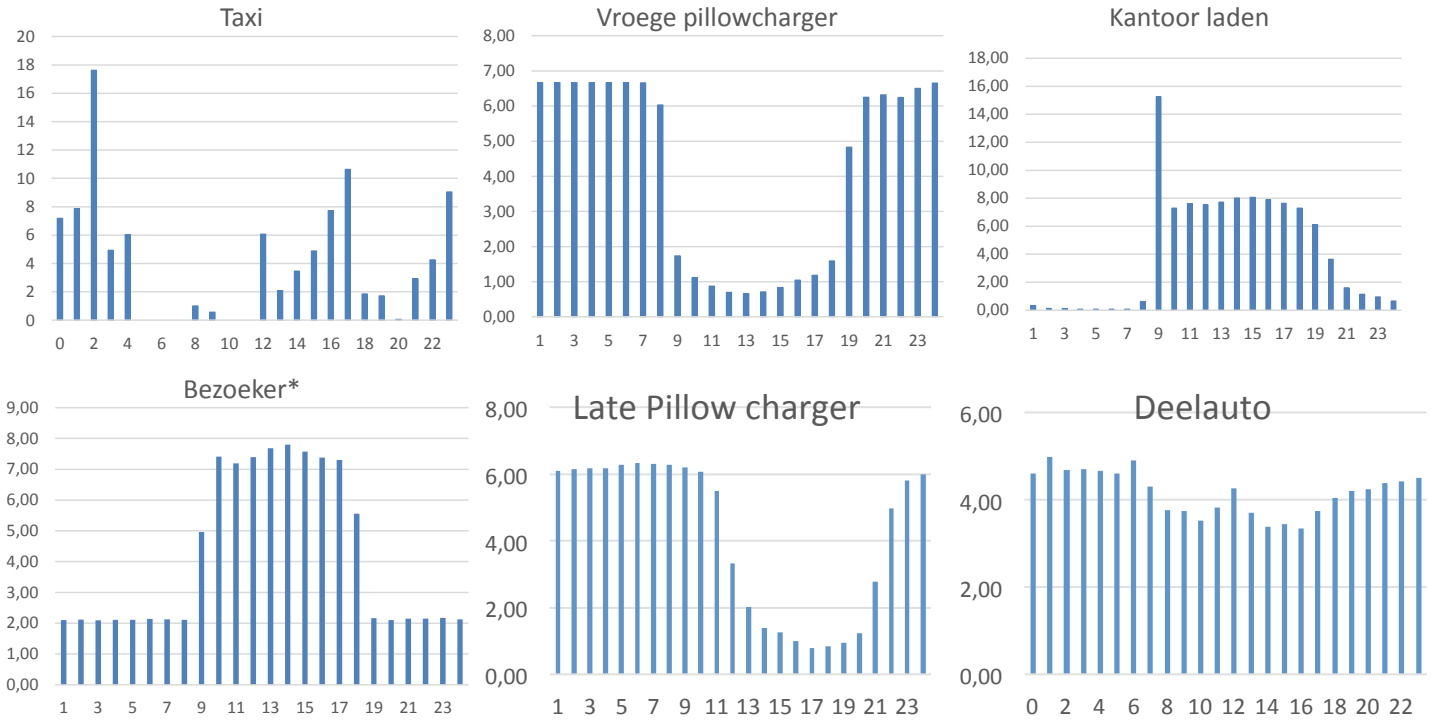
CHARGING PROFILES OF USERS: DISTINCT DIFFERENCES CAN BE SEEN IN HOW PEOPLE CHARGE



- Major part of EV user population is highly predictable.
- Can support in optimizing charging infrastructure

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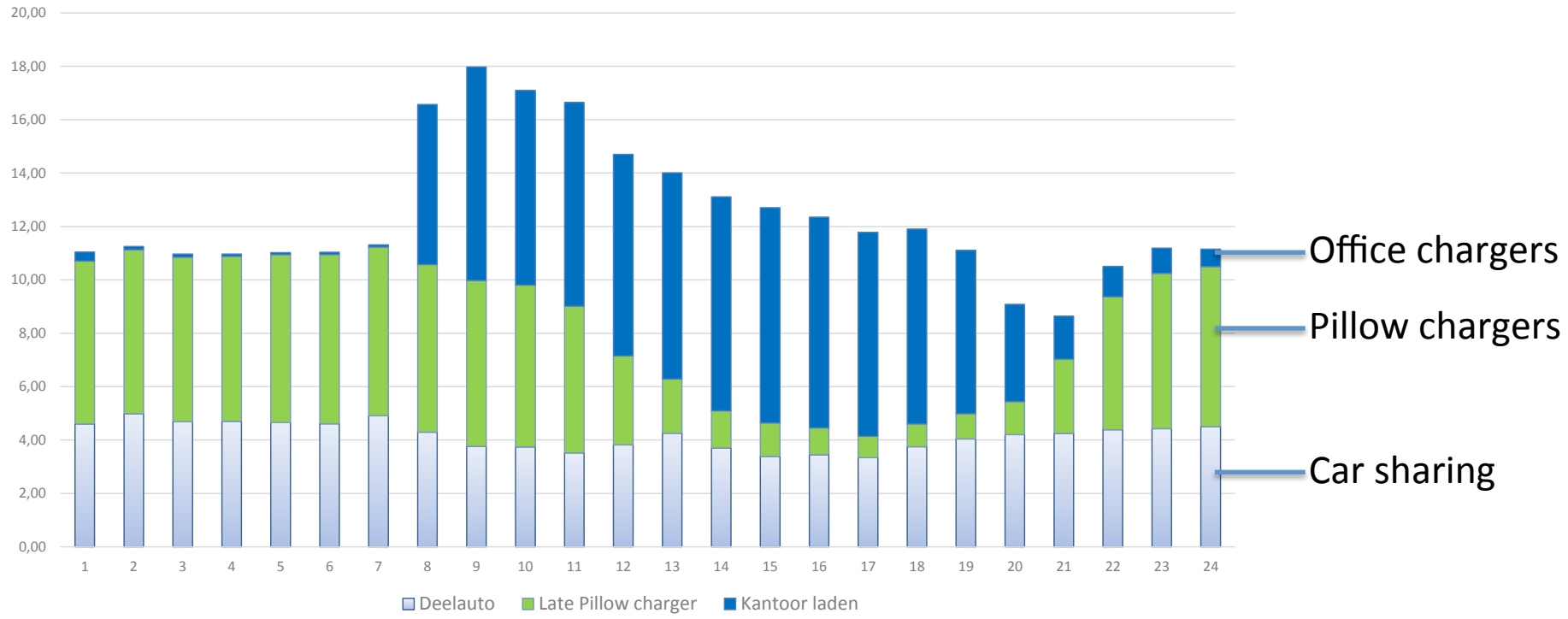
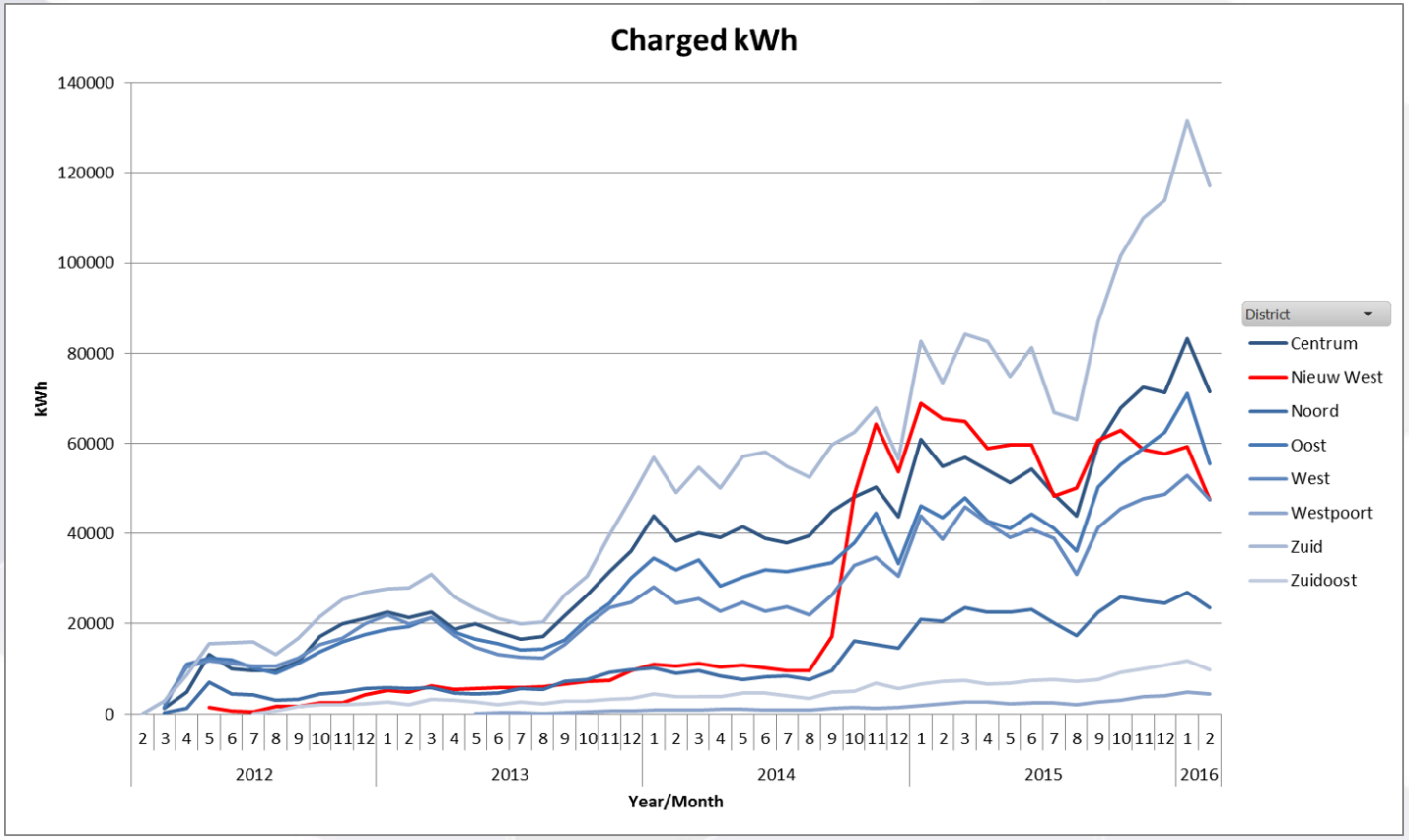
SMART ROLL-OUT STRATEGIES: OPTIMIZING LOCATIONS SELECTION



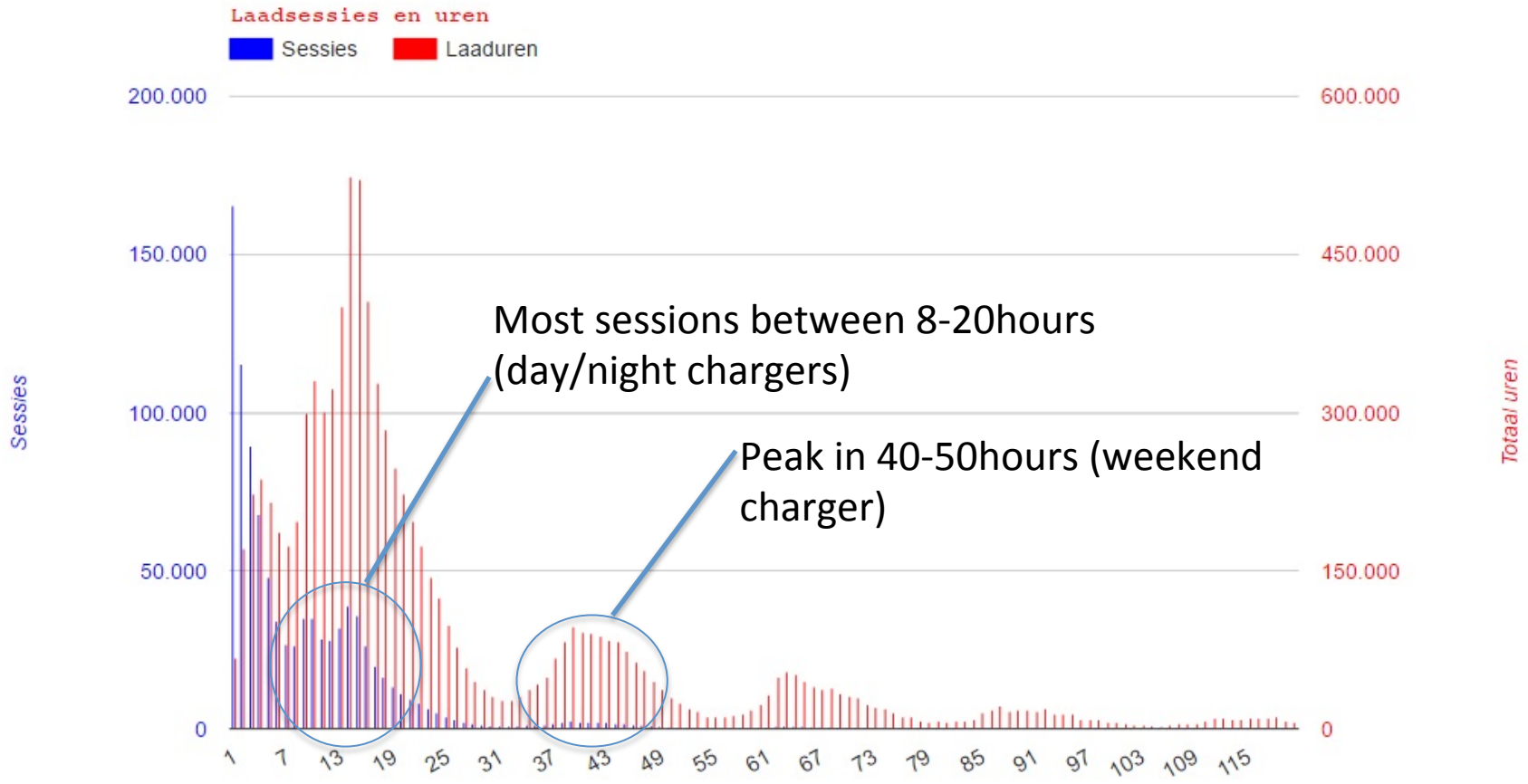
- Selecting locations with multiple user profiles
- Understanding utilization of charging infra, requires insight in user profiles

USER SEGMENTS: ILLUSTRATION



- 80 commissioned electric taxi's responsible for 4-fold increase in kWh charged in an Amsterdam district (new west)

THE ISSUE OF LONG-CHARGERS



- <3% of all charge sessions responsible for 20% of occupation
- Incentives or social charging initiatives can improve effectiveness

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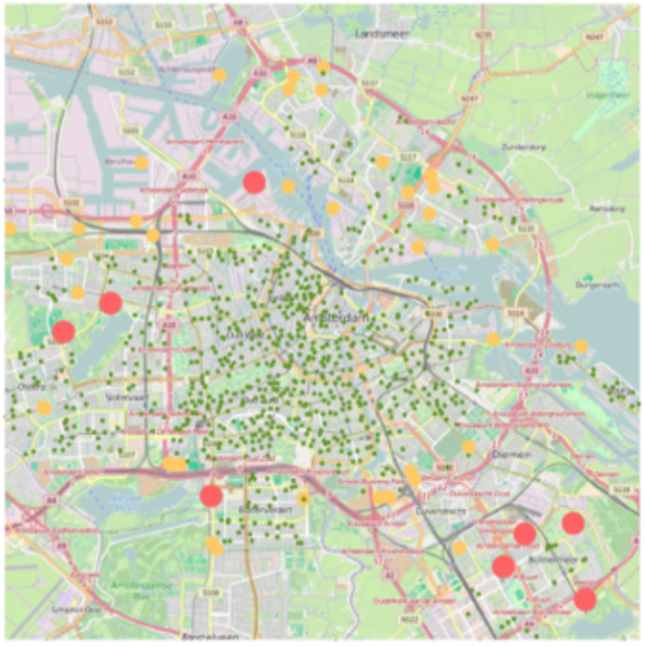
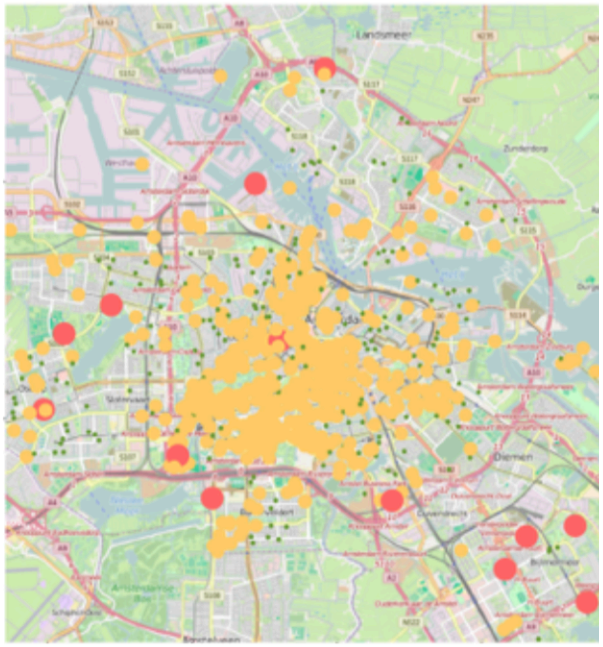
VULNERABILITY OF CHARGE INFRASTRUCTURE:

CAN I CHARGE MY CAR IF MY PREFERRED CHARGING POINT IS NOT AVAILABLE?

Amsterdam – December 2015 45.000 charging sessions



First Order Vulnerability: available alternative for start time of charge session



Second Order Vulnerability: available alternative for full charge session

< 5 failures

5 < 40 failures

> 40 failures

failure: No relevant charge station within a radius of 500m is available

- Vulnerability analysis can support in deciding logical new charging station locations

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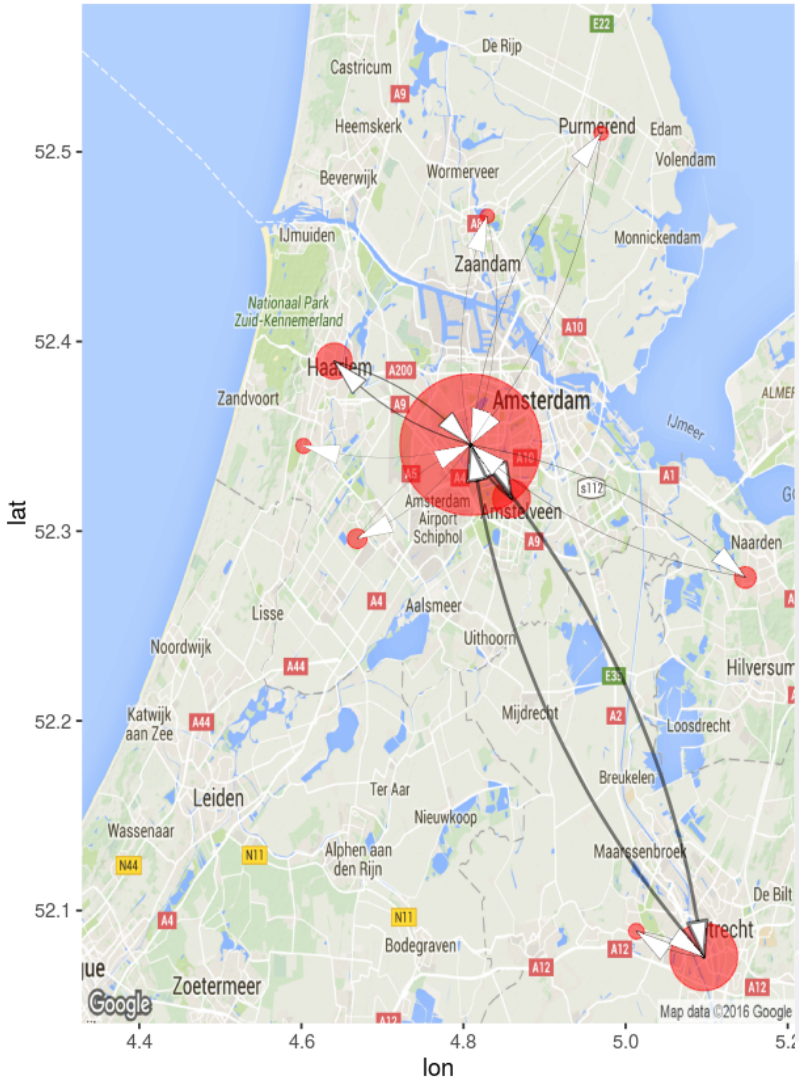
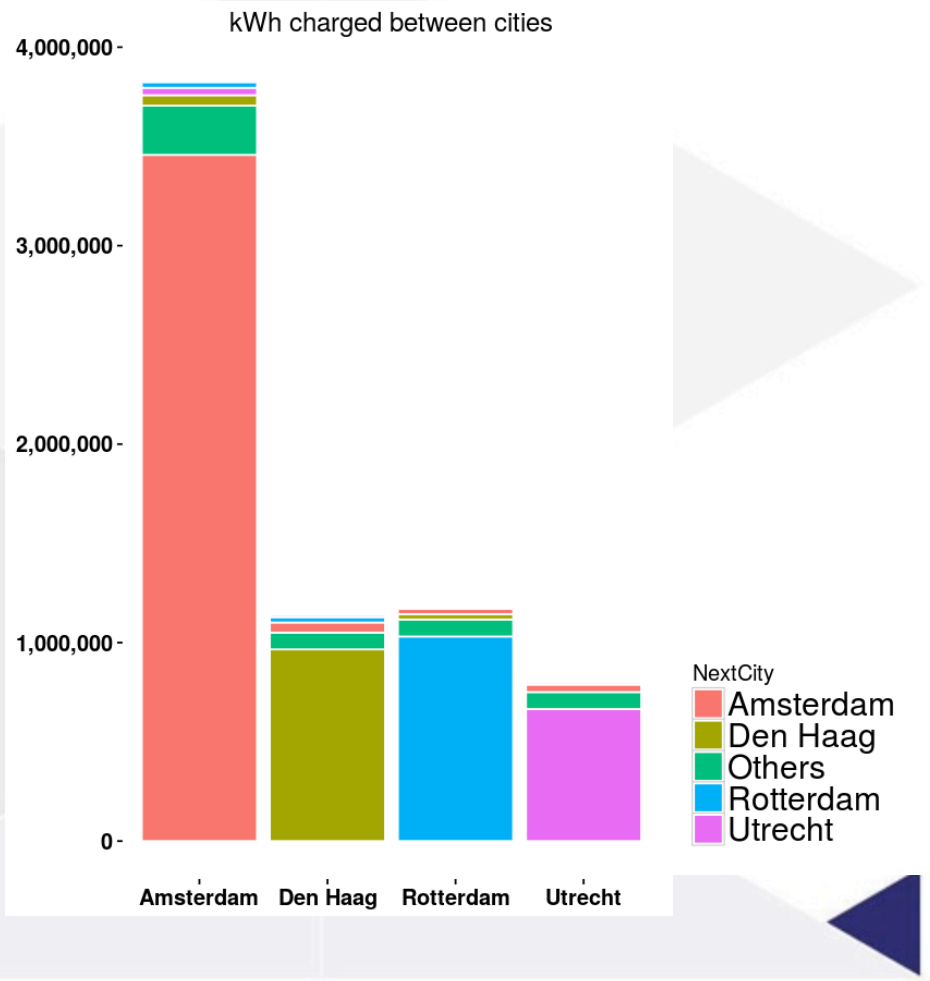
INTERCITY TRAFFIC: LARGE CITIES HAVE SUPPORTING ROLE FOR SUBURBS





CONCLUDING

- Instrumental role of data science in roll out of charging infrastructure:
  - Monitoring
  - Benchmarking
  - Pattern recognition
  - Anomaly detection
  - Forecasting
  - Simulation
  - Policy evaluation
- For more information: **www.idolaad.nl**