Key facts and analysis on driving and charge patterns

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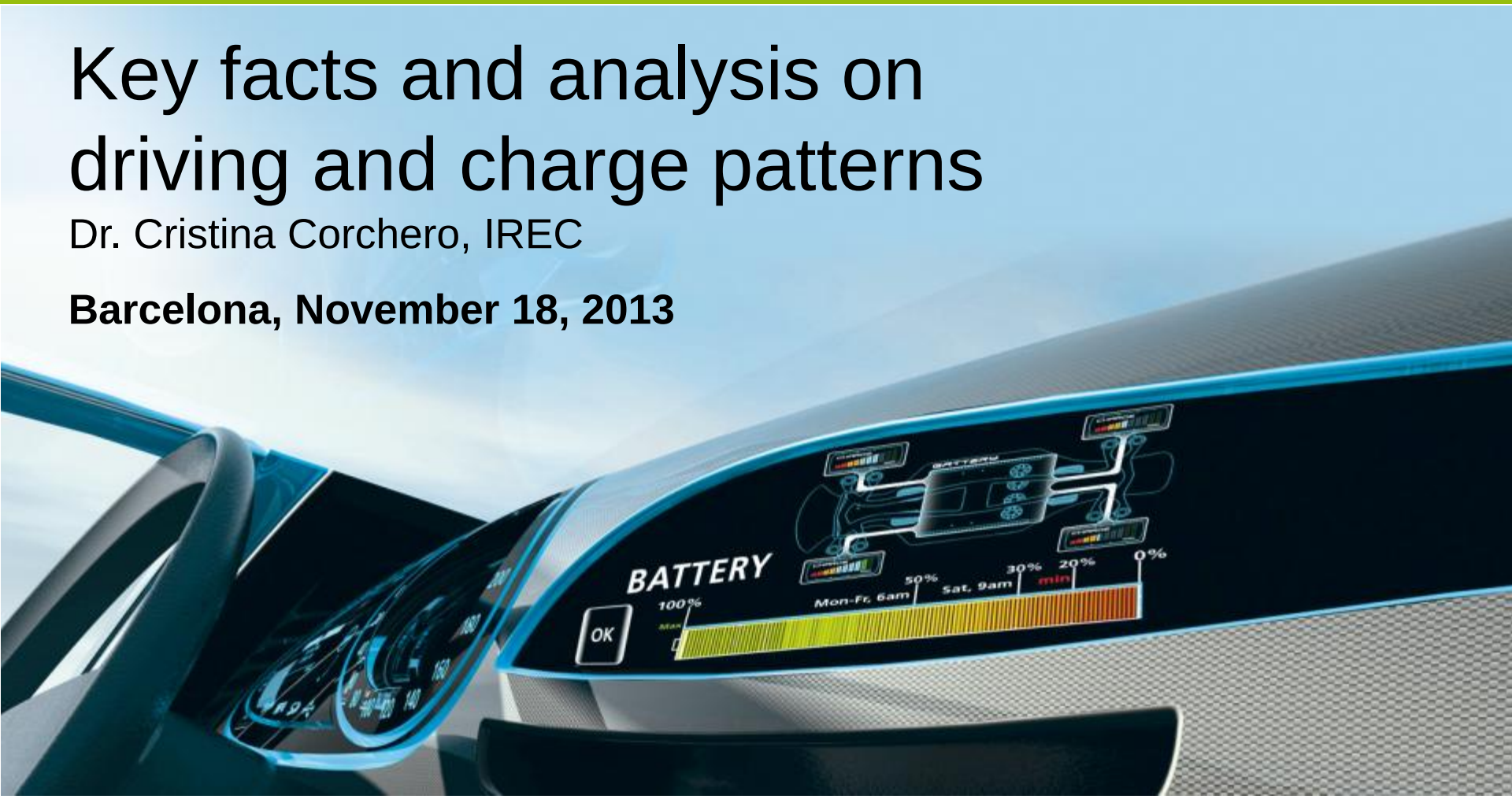
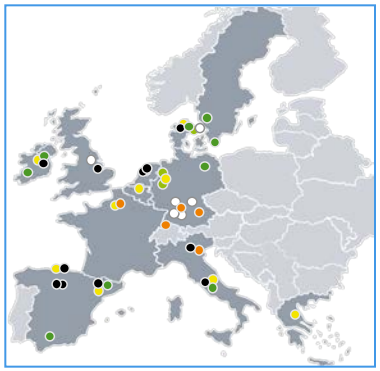
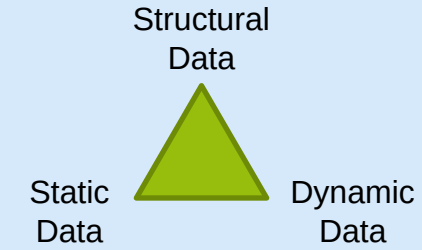


Green eMotion - Data collection task



WORK PACKAGE 1

RAW DATA



Items:
- Charging points
- Electric vehicles
- Users

STATISTICAL ANALYSIS

DATA PREPROCESS
- Automatic data format check
- Data quality assessment
- Data cleaning and filtering
- Merge data into production database

DATA ANALYSIS
- Descriptive statistics
- Visual representation
- Summary tables
- Advanced Data mining

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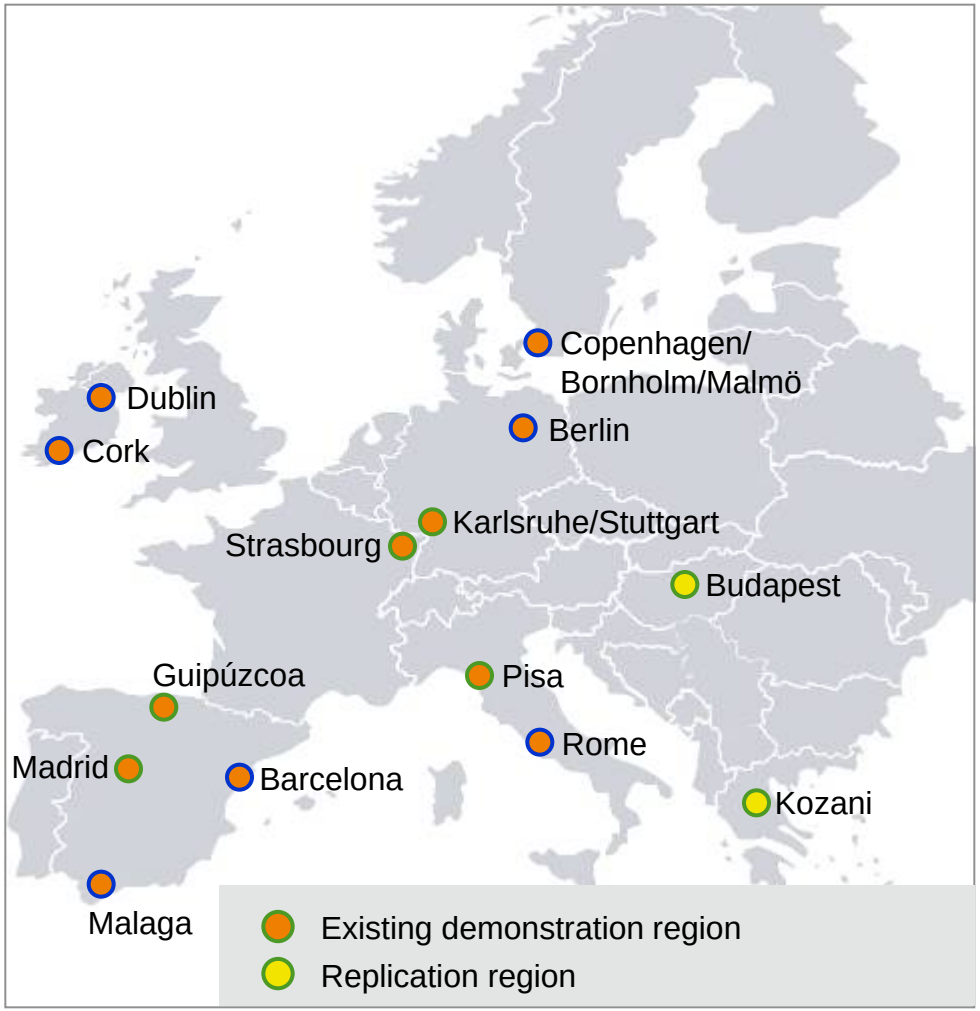
Green eMotion – Demonstration Regions



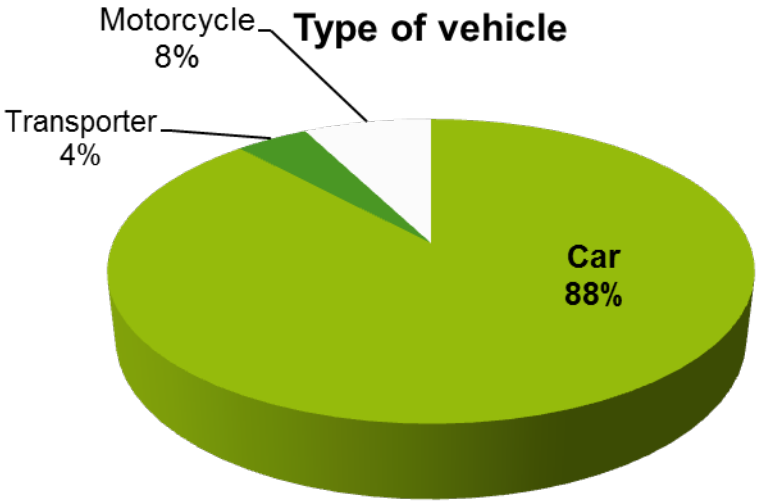
	2011	2012	Δ	Monitored %
Electric vehicles	235	536	128%	85%
Charging points	598	1728	188%	66%
Users	269	924	243%	60%

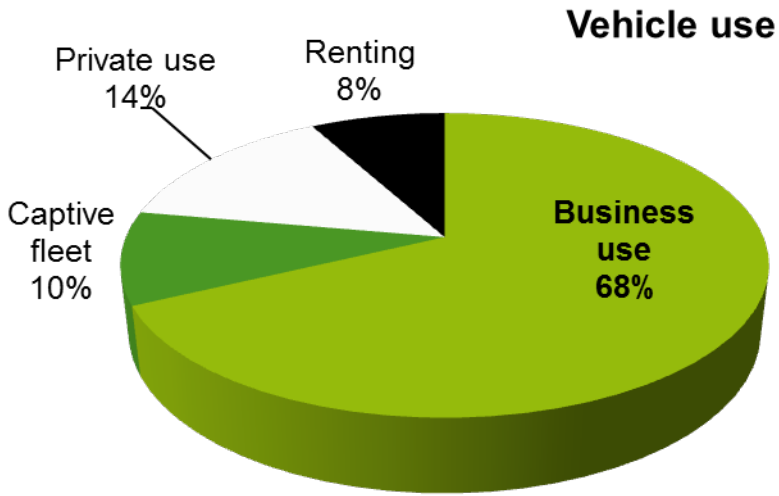
Each demo region is expanding the network of monitored assets through deploying larger EV fleets and the ongoing installation of smarter infrastructure. As the project matures, the amount and quality of the information improves.

This improvement in data integrity and availability will allow further, deeper analysis of vehicle and charge point usage patterns, both on an aggregated and regional level.

Vehicles, owners and use

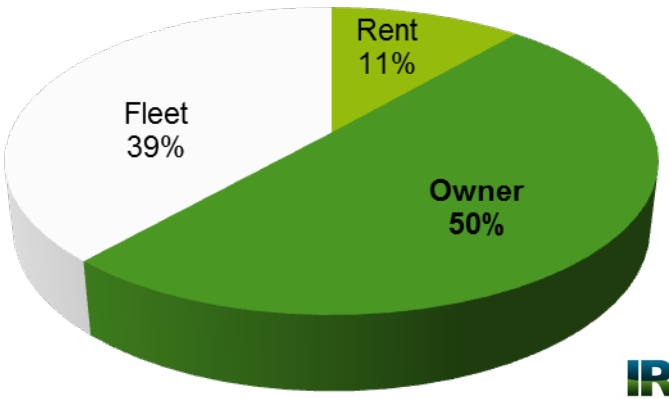
Static Data





VEHICLE MAKE AND MODEL COUNTS

Make	Model	Count	Percentage (%)
Renault	Fluence ZE	201	47.5
Daimler	Smart	85	20.1
Toyota	Prius	71	16.8
Peugeot	Ion	23	5.4
Mitsubishi	iMiev	22	5.2
Think	City	13	3.1
Nissan	Leaf	3	0.8



Green eMotion sample characterization

13 Demo Regions from 7 European countries

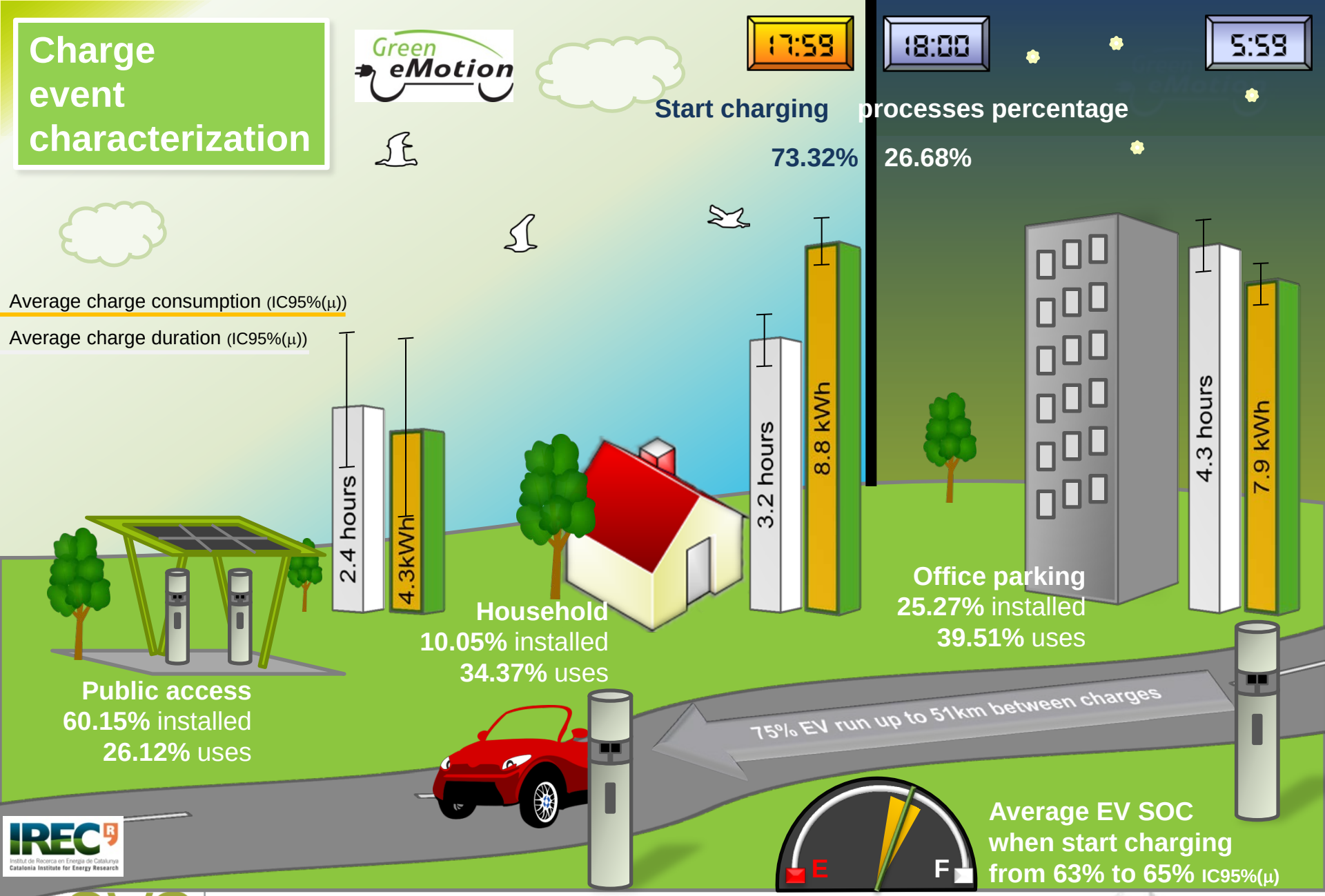
		Total uses
Charging points		124 306
Electric vehicles	Trips	78 438
	Charging events	51 077
Users		23 974

Total driven distance during the first two years: **640.817 km*.**

CO_2 savings: 60.4 tones* of $C0_2$.

(*) Estimated using registered electric vehicles with trip and consumption data.

Charge event characterization



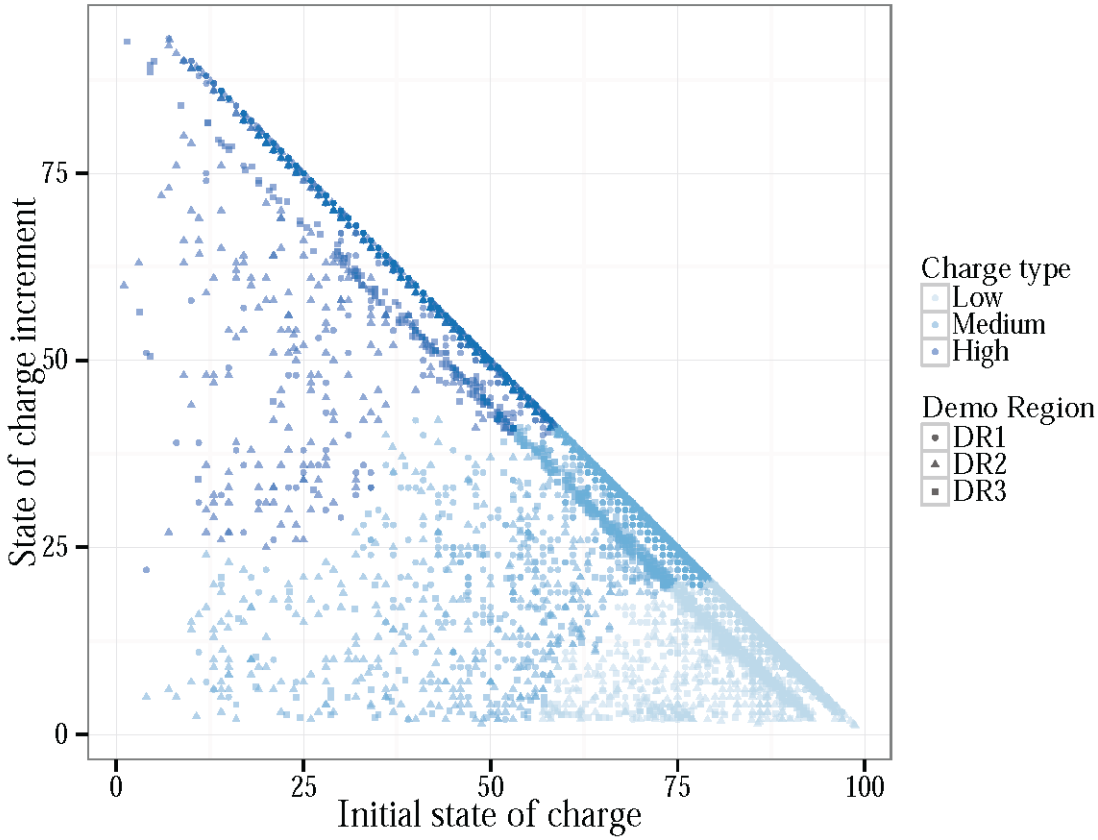
Pattern sequence analysis

Represent *car life trajectories* as sequences of charging, trip and parking events.

EV CODE	Initial Timestamp	Final Timestamp	Type	
...				
DR1_EV0001	2012-05-12 07:08:49	2012-05-12 07:22:09	trip	
DR1_EV0001	2012-05-12 07:22:09	2012-05-12 12:45:58	parking	
DR1_EV0001	2012-05-12 12:45:58	2012-05-12 13:18:36	trip	
DR1_EV0001	2012-05-12 13:18:36	2012-05-12 13:18:43	parking	
DR1_EV0001	2012-05-12 13:18:43	2012-05-12 14:00:27	charge	
...				

Charge typology

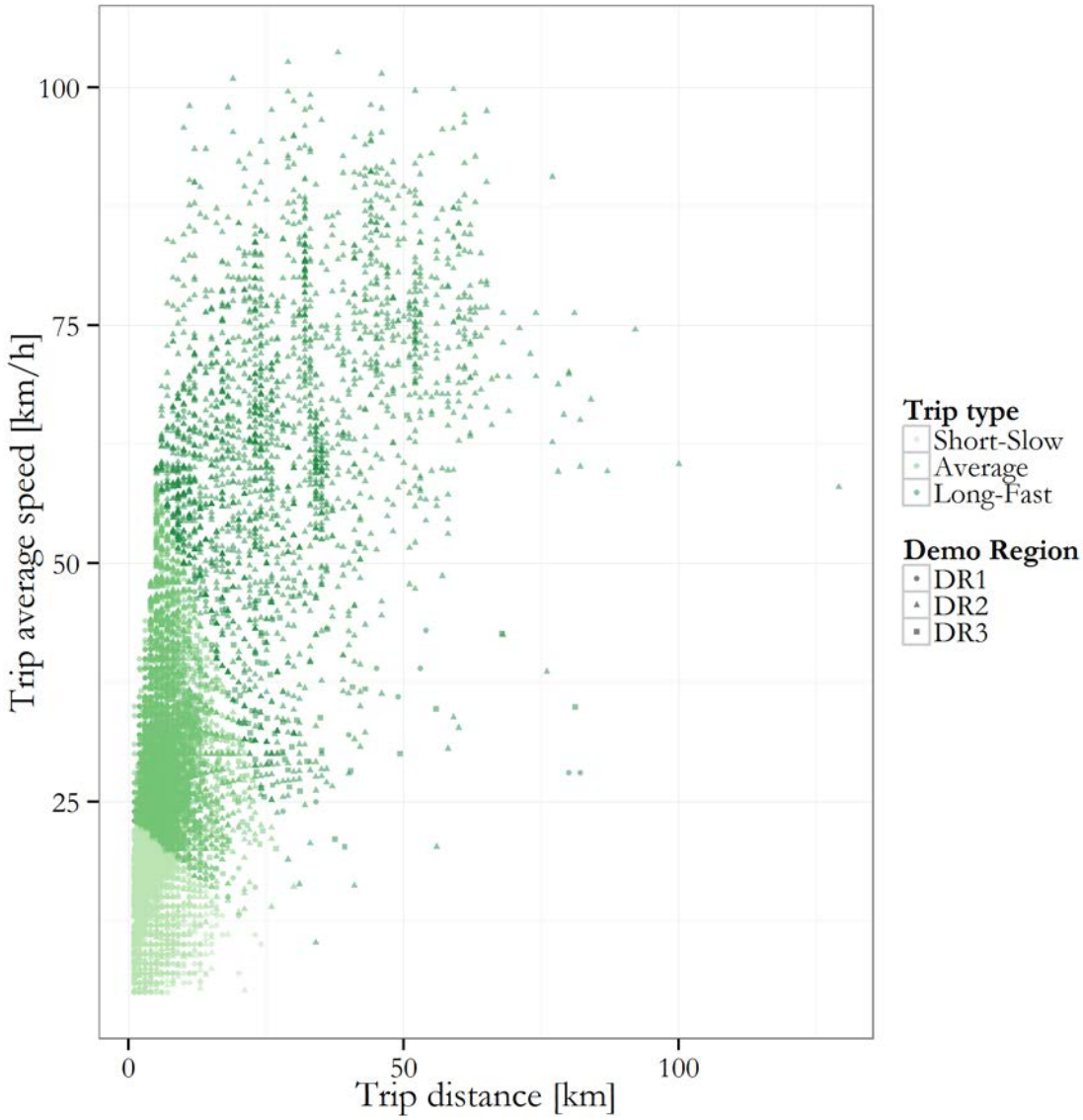
* **Low Charge** (N, initial SOC, SOC increment)
  2326 obs, 83.6%, 11.1%
* **Medium Charge**
  2375 obs, 62.2%, 26.5%
* **High Charge**
  1597 obs, 39.5%, 55.7%



Based on over 7000 observations

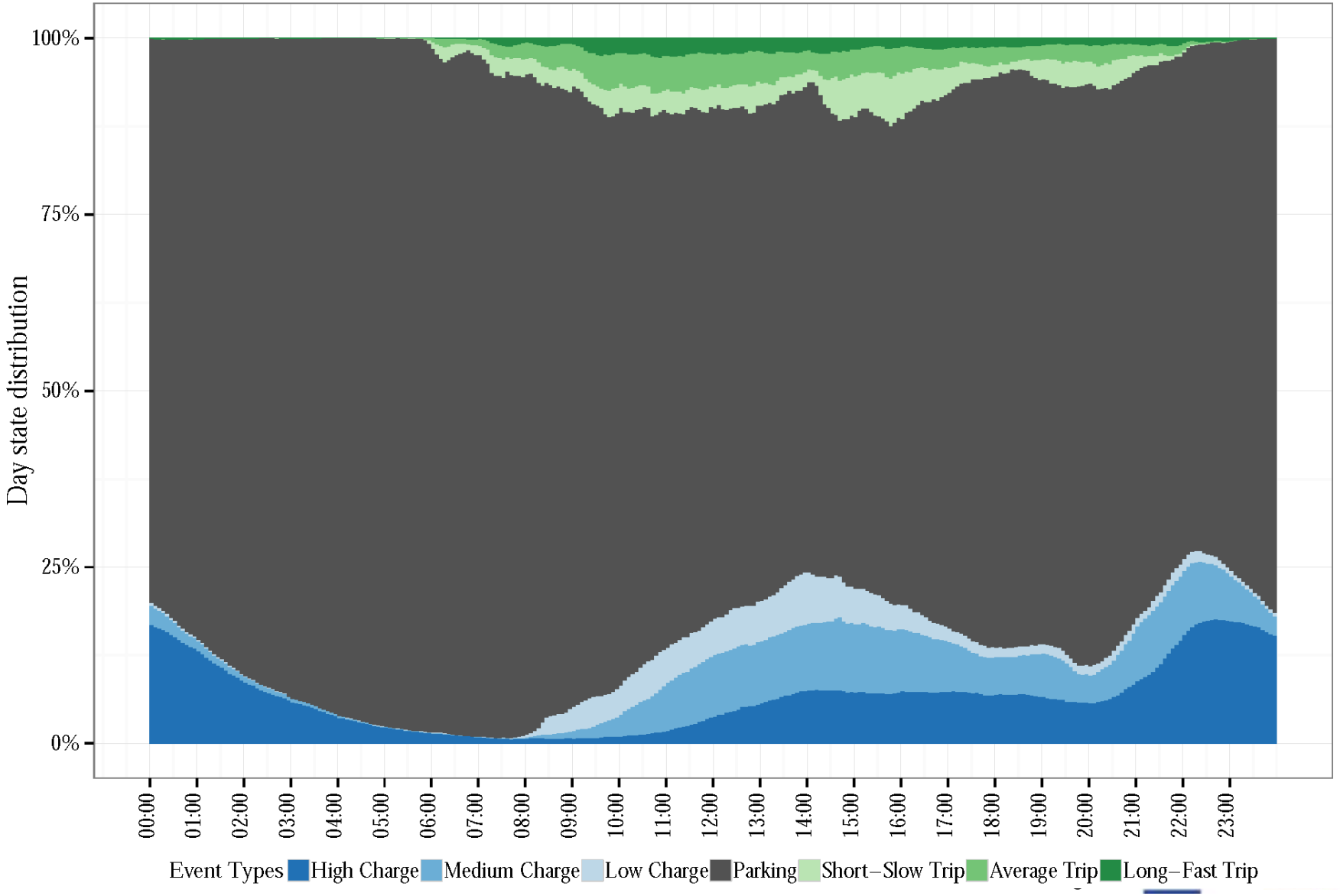
Charge typology

* **Short-Slow Trip** (N, distance, average speed)
  10311 obs, 3.1km, 15.3km/h
* **Average Trip**
  11618 obs, 5.4km, 29.3km/h
* **Long-Fast Trip**
  2423 obs, 28.2km, 62.2km/h

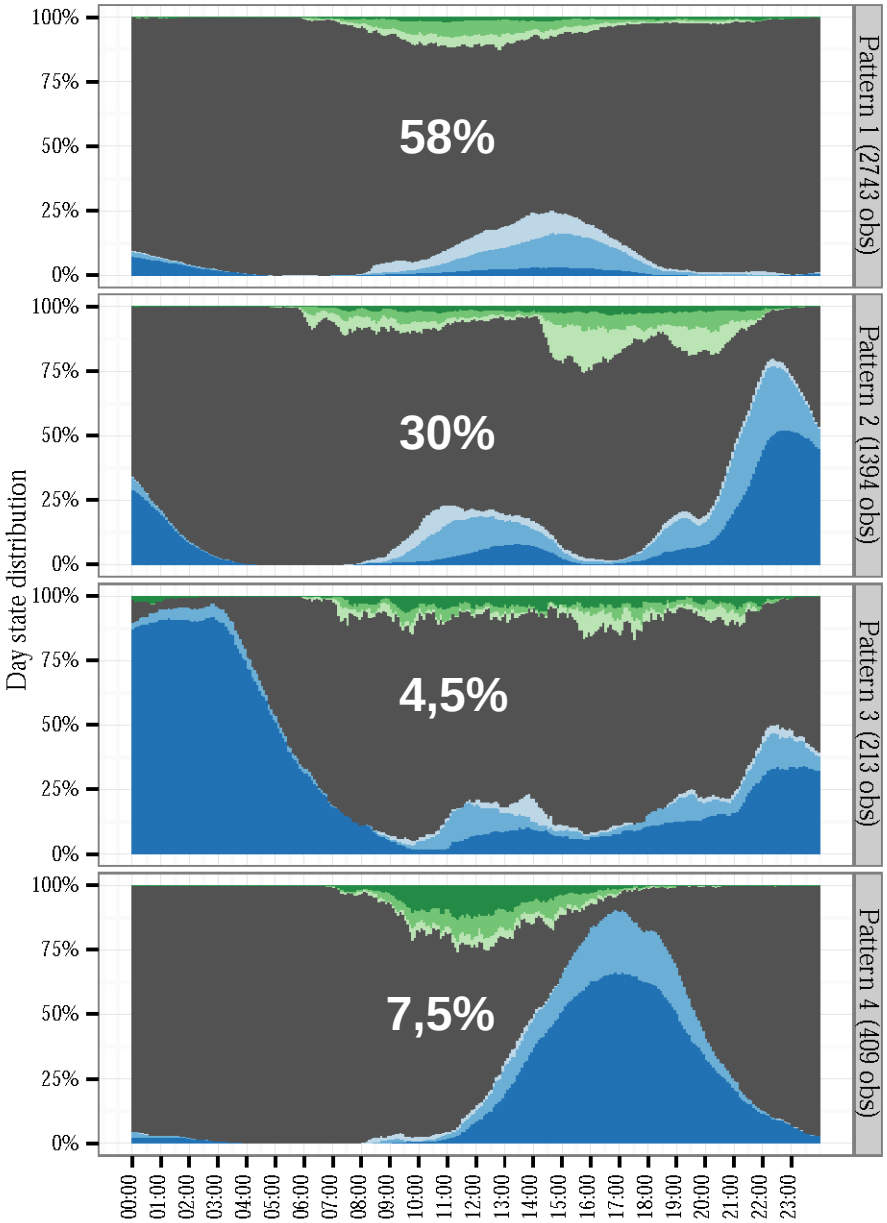


Based on over 25000 observations

Day state distribution



Day state clustering



* Low activity day, few charge and trip events
* Trips in the morning, charges in the afternoon
* Mainly cars destined to business use and owned by private company.

* Charge and trip alternation during daylight and long charges late in the evening.
* Trips tend to be short and slow, charges medium
* Mainly cars destined to captive fleet use and owned by municipality.

* High charge and trip activity. Charges concentrated at night and trips distributed all day long.
* Charges tend to be heavy, trips long and fast.
* Mainly cars destined to renting use and owned by municipalities.

* Trip in the morning, charges during the afternoon with almost no activity at night
* Charges tend to be heavy, trips long and fast
* Mainly cars destined to business use and owned by private company.

Conclusions and applications

The knowledge extracted can be applied:

- To simulate the user car behavior required in other algorithms such as microgrid optimization.
- To provide accurate information about the charge cycles in order to estimate the EV battery life span.
- To realise client segmentation for car manufacturers and electric generation and distribution companies.
- To help policy makers to regulate and promote the use of EV with objective data.


BATTERY
OK
100%
50%
30%
20%
0%
Mon-Fr, 6am
Sat, 9am
min