



Big Data Analytics for Passenger-Centric ATM

A Case Study of Door-to-Door Intermodal Passenger Journey Inferred from Mobile Phone Data

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Founding Members



The motivation of the BigData4ATM project is the lack of reliable and updated passenger-related information:

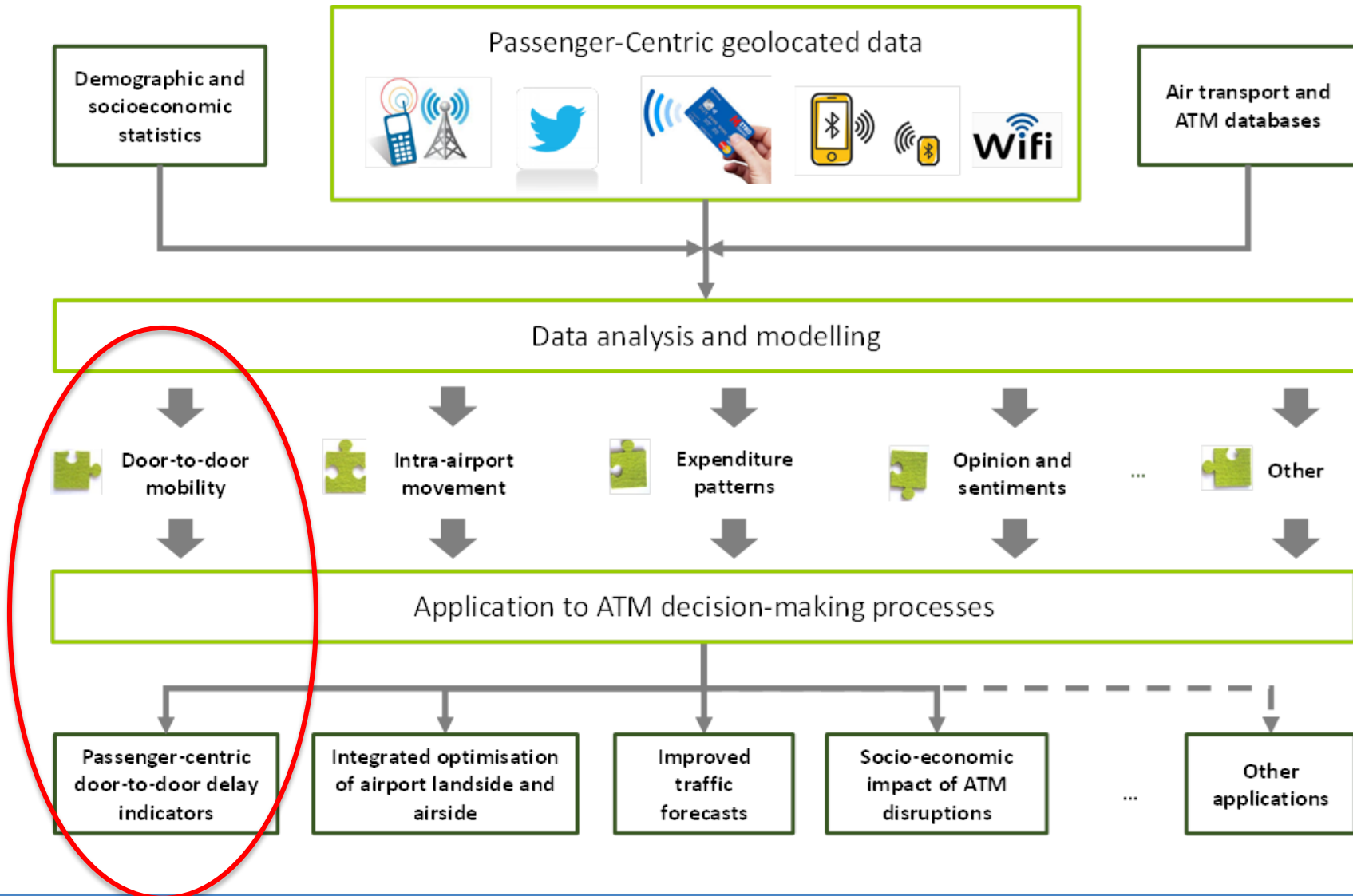
- **No information on the complete door-to-door itinerary**
 - Origin and destination beyond the airport
 - Transport modes to access/egress airport
- **Public data is highly aggregated**
 - Monthly aggregated, airport/country level
- **Typically, data is collected from surveys**
 - Several limitations: cost, declared information, does not capture unpredicted events

The goal of BigData4ATM is to investigate how different **passenger-centric geolocated data** coming from smart personal devices can be analysed and combined with more traditional demographic, economic and air transport databases to extract relevant information about **passengers' behaviour**, and to study how this information can be used to inform air transport and ATM decision making processes

- H2020 project - SESAR Exploratory Research
- Coordinator: Nommon
- Partners: IFISC, Fraunhofer, Hebrew University of Jerusalem, ISDEFE
- Start date: May 2016, duration: 24 months

<http://www.bigdata4atm-sesar.eu/>





Case Study

Introduction

Scope and Objectives

Characterise the Madrid-Catalonia corridor through obtaining:

- Modal split
- Airport and HST catchment area
- Door-to-door travel times

Temporal scope: one working day of March 2016

Dataset

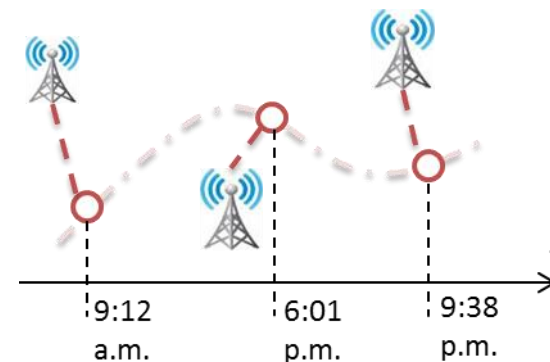
- Anonymised call detail records (CDRs) provided by Orange Spain
- Data from Google Maps Directions API



Case Study

Dataset

- Anonymised call detail records (CDRs)
 - Spatio-temporal data: time and cell tower to which the user is connected every time an event occurs
 - Sociodemographic data for each user (age and gender)
- Orange's clients + roamers that connect to Orange's network
- Sample of around 20% of the total population



Case Study

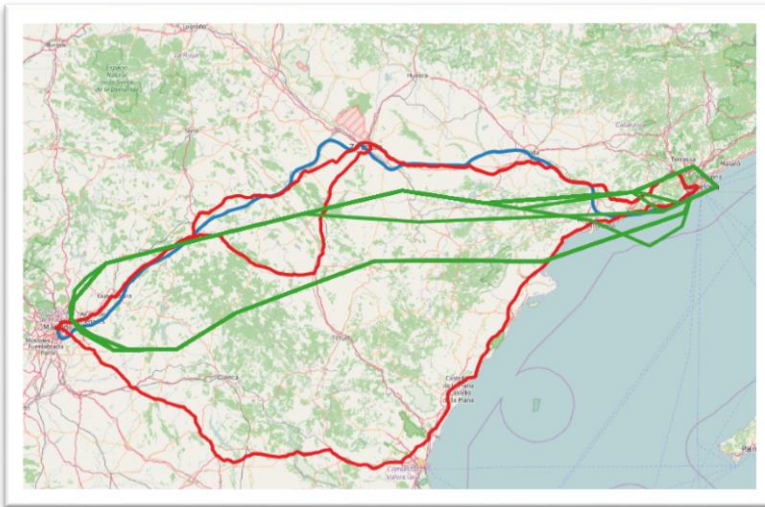
Methodology

- Sample construction 
- Identification of users' home areas
- Generation of activity-travel diaries
- Expansion of the sample to the total population
- Determination of corridor users
- Determination of transport mode

Case Study

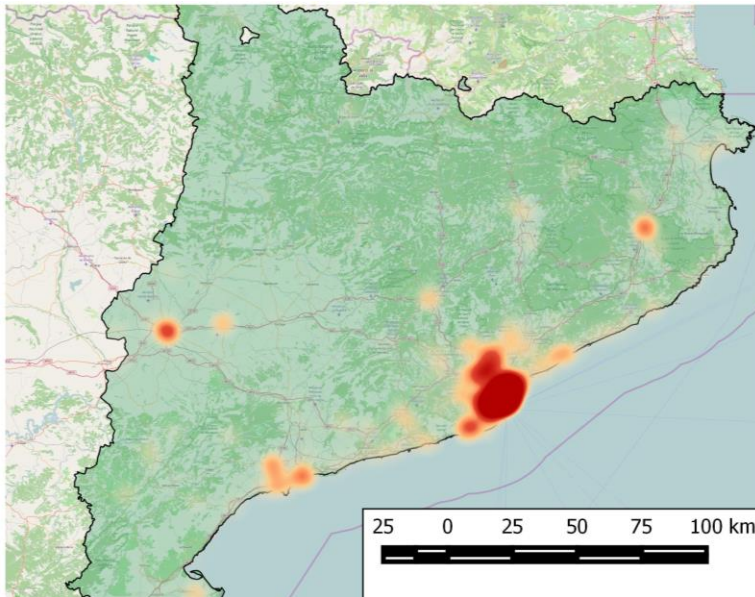
Determination of transport mode

Mainly through intermediate registers:

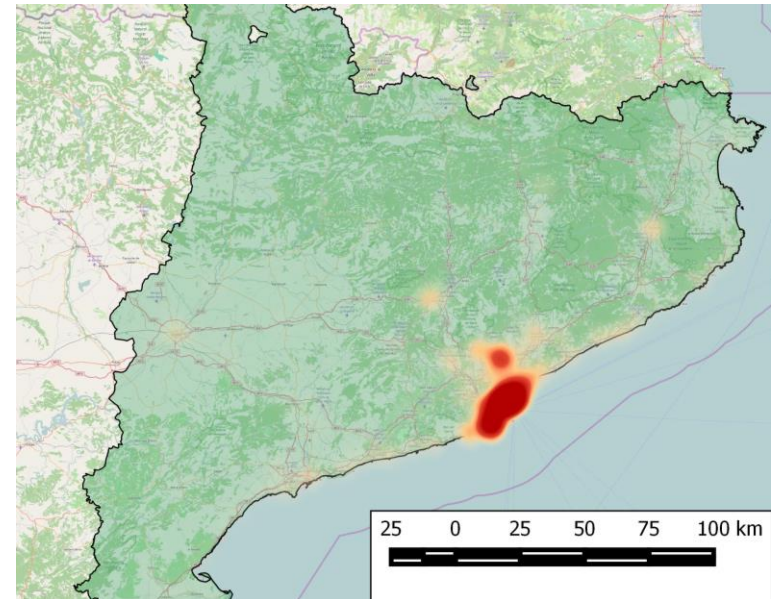


Case Study

Results – Catchment areas



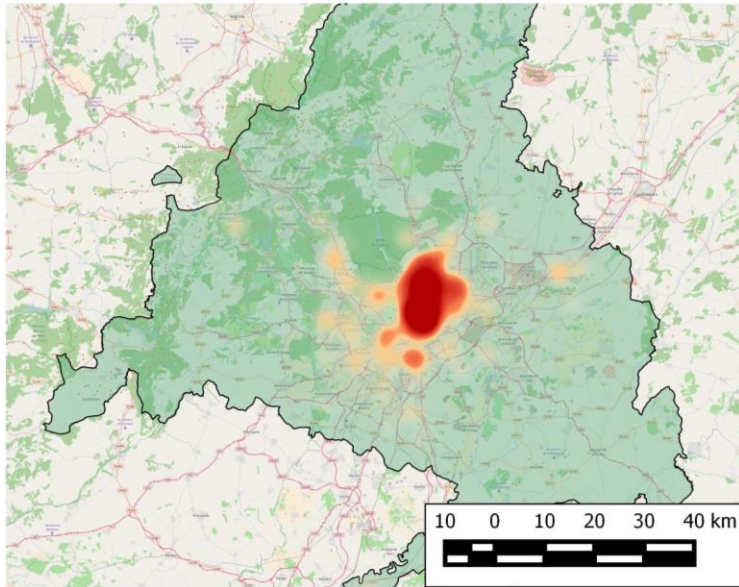
High Speed Train



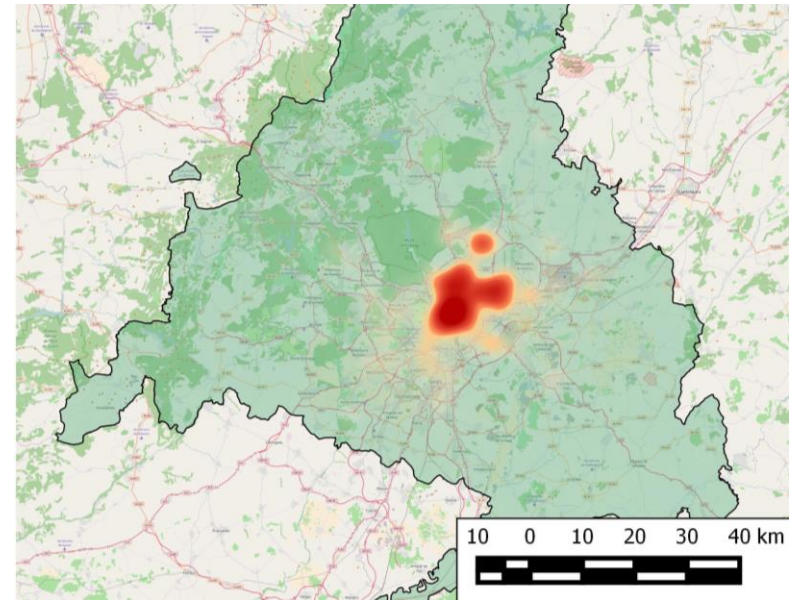
Plane

Case Study

Results – Catchment areas



High Speed Train

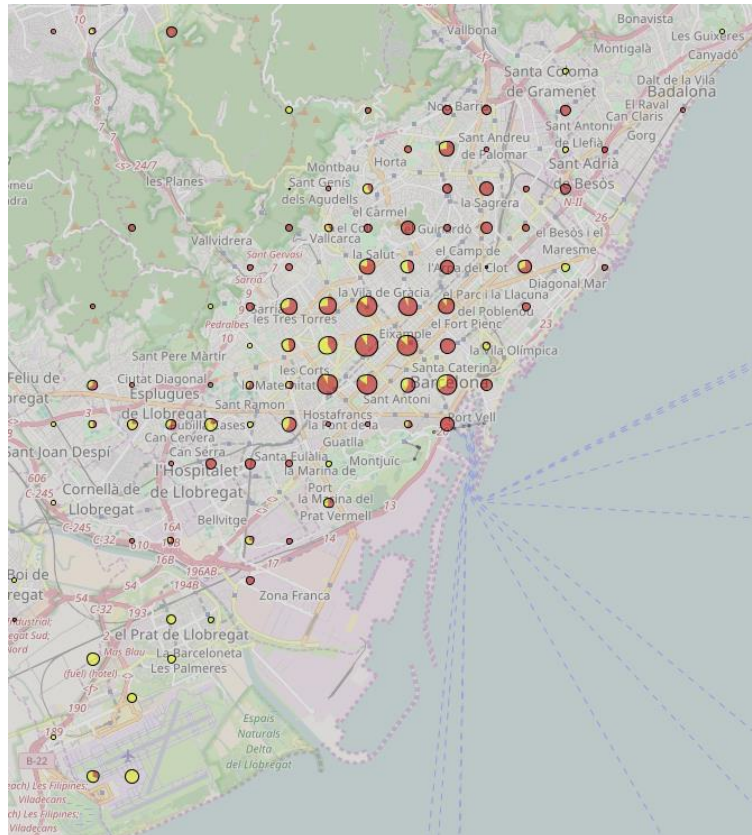


Plane

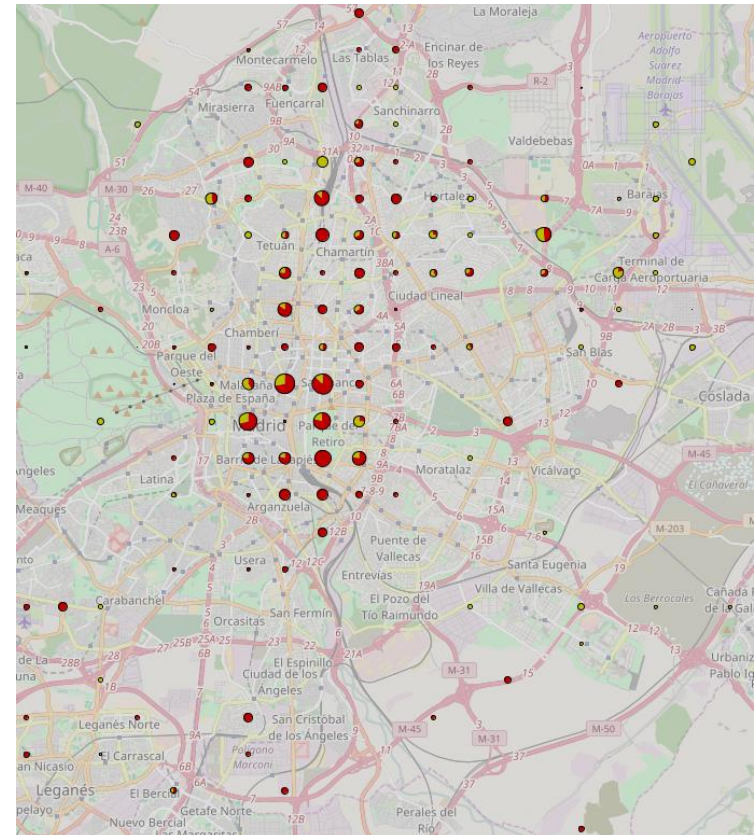
Case Study

Results – Catchment areas

Barcelona metropolitan area

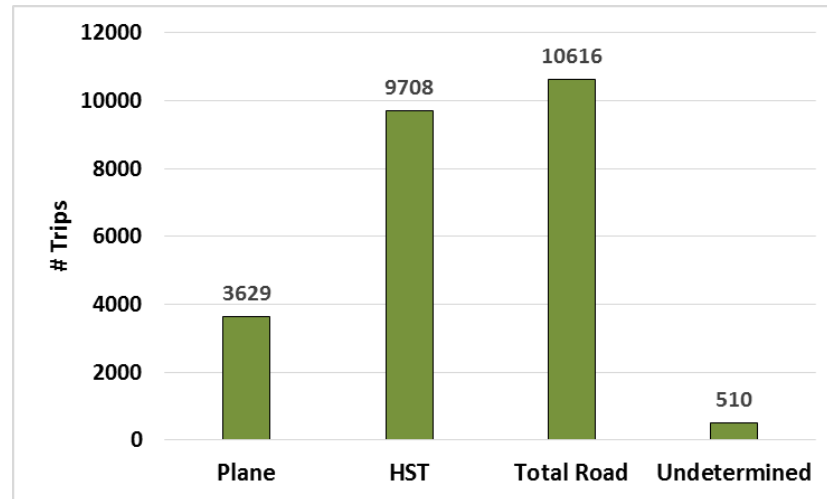


Madrid metropolitan area



Case Study

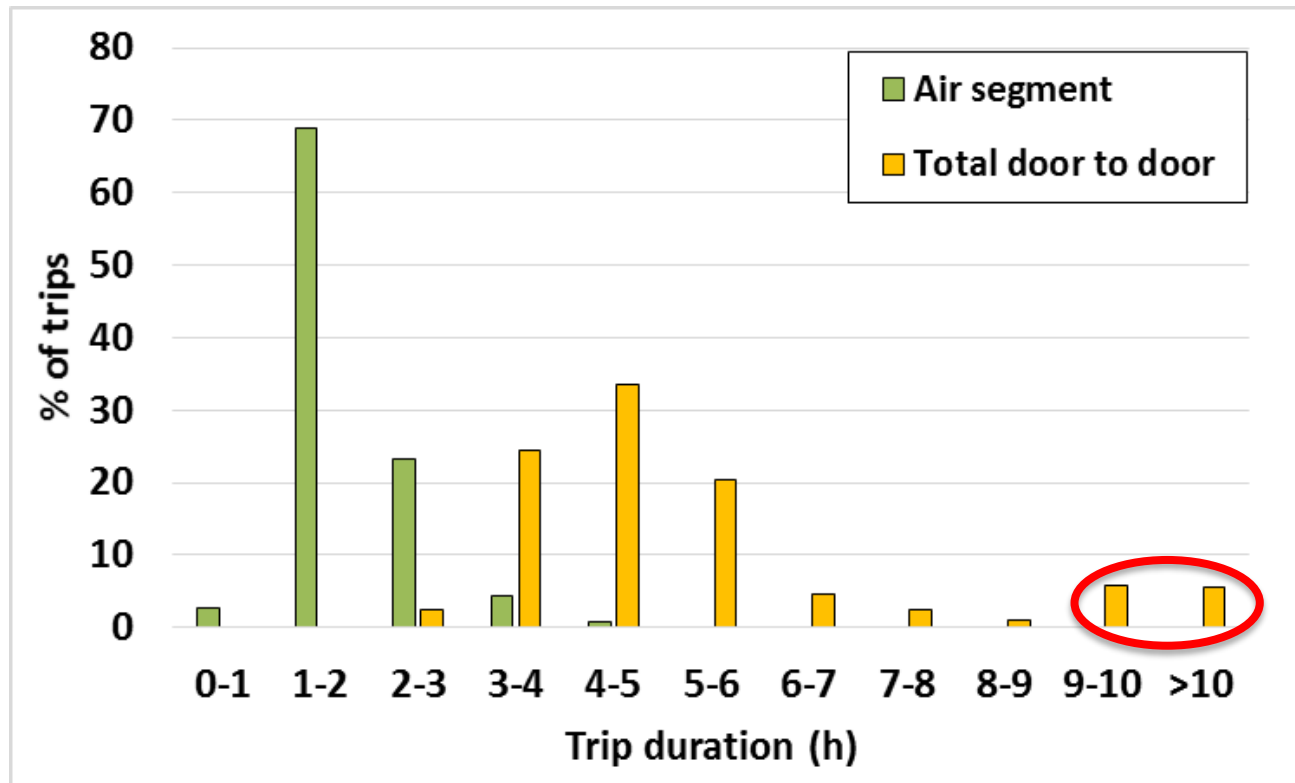
Results – Modal share



These results are coherent with the official data, both HST-plane market share and traffic counts across the main roads

Case Study

Results – Door to Door travel times



Conclusions

- Results show that mobile phone data is able to replicate official aggregated data and can be used as a source of information useful for ATM
- Mobile phone data is also able to produce new, more disaggregated data that is not available from traditional data
- With mobile phone data, the full door to door trip can be characterised – something that is not available from traditional sources

Future directions

- Perform a more comprehensive validation of the results
- Improve the activity detection algorithm to filter out outliers detected
- Explore other city pairs and replicate the analysis for more days
- Characterise purpose of the trips
- Identification of short distance modes used to access airport by blending mobile phone data with other sources
- Refine the expansion methodology to build a synthetic population that replicates more accurately the sociodemographic characteristics of the real population

Research questions

- Can we use mobile phone data to develop better airport accessibility indicators and passenger door-to-door travel time indicators?
- What is the impact of flight delays on passenger total travel time?
- Is it possible to improve air traffic forecasting models by introducing airport accessibility indicators and passenger-centric information (sociodemographic characteristics, trip purpose, etc.) obtained from mobile phone data?
- ...?



Big Data Analytics for a Passenger-Centric Air Traffic Management System

Thank you very much for your attention!



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