Determining The Main Mobility Flows in the City of Lisbon Based on Mobile Device Data

Challenge Provider: LxDataLab Lisbon

Through the Laboratório de Dados Urbanos de Lisboa (LxDataLab), the Lisbon City Council intends to help to solve concrete problems in municipal services, using the knowledge held by universities and the innovative ecosystem.

Thanks to the efforts of the LxDataLab, 14 protocols have already been established between the City Council and partner entities (mostly universities).

Since 2019, 31 challenges have been published in 6 domains: mobility, environment and energy, governance, citizen, economy, and way of life. Among them:

- Patterns of shared bicycle use in Lisbon
- Rebalancing Routes Optimization of Shared Bikes in Lisbon
- Discovery of patterns of traffic congestion
- Impact of the COVID-19 pandemic on mobility and the environment
- Traffic indicators for the main entry roads into the city
- Identification of Lisbon city green roofs by automatic detection from aerial photography
- Commuting movements in the main access routes to the city
- Movement of people in nightlife areas

So far, 160 students and teams have participated, contributing to increased efficiency, and providing better services to citizens.

Context

In the last decades we have observed a loss of inhabitants from the city of Lisbon to its metropolitan area. From the early 1980s until 2017, the number of inhabitants of the city decreased from 800.000 to 500.000. Simultaneously, an intensification of car use in daily commuting between the city and the metropolitan area has been observed.

This has resulted in an overload of the road network and parking spaces in the city, as well as a decrease in safety and quality of life for the city's inhabitants and users. In 2017 use of public

transport decreased from about 46% of journeys that start and end in the city, compared to only 22% (although, pedestrian and bicycle trips within the city have been increasing in the late years).

Reversing the current modal split to free up public space for citizens and ensure convergence with the goals of the Paris Agreement, namely carbon neutrality by 2050, is the biggest challenge of the mobility policies for the city of Lisbon. It is thus necessary to change the paradigm. We aim to promote solutions that will reduce dependence on the private vehicle, therefore improving the quality of life and health of Lisbon citizens.

As stated in the Document "GRANDES OPÇÕES DO PLANO 2023 / 2027 DA CIDADE DE LISBOA" (in Portuguese), the City Council's objectives for the 2023- 2027 period include:

- boost soft mobility modes
- make it easier and more affordable use of public transportation
- promote the development of an integrated, connected, accessible, multimodal ecosystem, integrating active, public, and shared transportation, with the involvement of companies, municipal entities and integrated in the Lisbon Metropolitan Area

To meet the objectives set by the city council and implement the measures foreseen in the 23/27 objectives, it is important to know the main flows in the inner city, especially in the morning and afternoon rush hours (7:00 to 10:00 AM and 05:00 to 08:00 PM).

The City Council has acquired data regarding the number of mobile devices entering and leaving the main axes (roads) that connect the city to its metropolitan area. Similarly, data is available on the mobile devices grouped in a 200x200m grid, applied to the territory of the city of Lisbon.

The intention of this challenge is to acquire a deeper and more realistic knowledge of the flows that are generated between squares and with the access axes to the city, especially during periods of higher traffic intensity.

Further Background Information

There is already some work on improving public transport with mobility data that can help to brainstorm for solutions and work as a good basis. For instance:

Previous Challenges of WDL:
https://gitlab.com/worlddataleague/wdl-solutions/-/tree/main/WDL_2021/Stage_1_Public_Transportation

Using Location Data:
[Using Data Analytics to Optimize Public Transportation on a College Campus](#)

Using Schedule and Validation Data:
[Data-Driven Optimization of Public Transit Schedule](#)

Câmara Municipal de Lisboa/Mobility (Portuguese)
https://www.lisboa.pt/cidade/mobilidade/entrada

Lisbon Mobility Strategic Vision MOVE 2030 (English)
https://www.lisboa.pt/fileadmin/cidade_temas/mobilidade/documentos/Lisbon_Mobility_Strategic_Vision_MOVE_2030_EN.pdf

GRANDES OPÇÕES DO PLANO 2023 / 2027 DA CIDADE DE LISBOA (Portuguese)
https://www.lisboa.pt/fileadmin/download_center/orcamento/2023/gop/GOP_2023_2027.pdf

Goal

The goal is to extract the inputs that will allow planning and carrying out the necessary actions to improve mobility in the city, the quality of life of its citizens and meet sustainability goals.

Sustainable Development Goal

GOAL 11: Sustainable Cities and Communities
Target 11.2.1: Provide access to safe, affordable, accessible, and sustainable transport systems for all.

Outcome

The intended outcome of this challenge is a better understanding and visualization of how people move between grids during rush hours (7:00AM-10:00AM and 5:00PM-8:00PM), a model that can predict those movements and identification of potential interventions to improve the commuting experience of people in Lisbon and favor sustainable modes of mobility.

The datasets are provided by the city of Lisbon under the conditions listed in the license agreement you will sign when accessing the data.

All the data resources can be found on the challenge platform.

The data provided consists of 7 datasets:

- Set1 - Number of mobile phones entering, remaining and exiting per 200m/200m square in a period of 15 minutes - Lisbon City Grid (september to november 2022)
- Set2 - Number of mobile phones entering and exiting the city every 15 minutes on the 11 main axes of entry into the city of Lisbon - Axes of the city of Lisbon (september to november 2022)
- Set3 - Mapping squares
- Set4 - Identification of the 11 points of entry and exit of Lisbon
- Set5 - Data on the road network of the city of Lisbon
- Set6 - Traffic level data (WAZE platform)
- Set7 - Traffic Conditions

The description of the datasets can be found in the [data dictionary](#).

As a reminder, you can also use any data that is open, free and legally available.

List of suggested resources to use:
- [Google GTFS reference](#). Explains how to interpret and work with a GTFS standardized dataset.
- [Datasets on the Lisbon Open Data portal](#) (Portuguese website). An overview can be found [here](#) (Portuguese website). A selection of potentially relevant datasets:
  - Lines, schedules, stops and routes of public transit (by operating company, GTFS):
    - [Transportes Sul do Tejo (TST) (bus)](#)
    - [Transtejo (boat)](#)
    - [Carris (bus)](#)
    - [Sul-Fertagus (train)](#)
    - [Fertagus (train)](#)
    - [Soflusa (boat)](#)
    - [CP - Comboios de Portugal (train)](#)
    - [Metropolitano de Lisboa](#) (subway)

- ○ [Location of Lisbon's main river transport stations](#)
- ○ [Dataset of Subway stations in Lisbon](#)
- ○ [Dataset of Railway stations in Lisbon](#)
- ○ [Map of location of cycling routes in Lisbon](#)
- ○ [Location of speed limit 30km/h zones in Lisbon](#)

Tips

- Start by defining what will be the end product and what is it going to answer;
- Don't forget to explore the data in visual and geographical terms;
- Consider first defining a metric to measure the quantity of an aspect you are exploring and then addressing the quality of the aspect in a second step.

Submissions

Deadline: TBD 23h59 AoE (Anywhere on Earth)

Don't forget that you will need to submit the solution report (notebook template with the link below) and executive summary (markdown template below). You also need to submit a **3-minute** video summary of your solution.

Solution report template: https://bit.ly/wdl2023-notebook
Executive summary template: https://bit.ly/wdl2023-summary