Optimization of public transport routes during road interruptions

Challenge Provider: Cascais

Cascais Municipality is a local authority body that coordinates the life in the territory for those who live there, but also for those who visit, work or study in the municipality. With a proactive attitude and constant search for solutions that boost the quality of local life, it has been able to unite with the right partners, encourage public participation, and gather knowledge from talented human resources that it has been attracting.

Cascais Municipality bets on the power of synergies derived from innovation hubs, co-creation projects, and innovation for sustainability to increase its pioneering spirit in structuring smart and resilient cities, in order to bring the future of local cities into the present. We combine tradition and history with innovation: collecting knowledge, analyzing data and foreseeing possibilities. We bet on a jointly built dynamism that attracts more value and turns the county into a centre of investment and business.

Context

Cities are constantly being redesigned and maintained. Sometimes it is necessary to perform interventions on the public road and resort to traffic cuts/drifts. These disruptions on the public road not only cause inconvenience to the residents of the affected streets but to the city's entire mobility system, including public road transport.

If these cut-offs/drifts are constant, this can create situations of distrust in the reliability of the public transport network (which, even if it continues to operate, will not always run on the previously determined lines).

We want to discover intervention trends on public roads (geographical, temporal and frequency) that indicate locations more prone to these interventions, which may require differentiated communication strategies targeted at local users.

Goal

The goal is to model, from the point of view of trends, which routes of the transport road network suffer the most cuts/disturbance due to interventions on public roads. We intend to evaluate the effort needed to adapt our services to match the network's needs in the presence of disruptions due to physical obstacles preventing circulation along usual routes. Additionally, we would like to evaluate and quantify levels of the perception of "inconvenience" by network users caused by different disruptions.

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 outcome should focus on two main aspects:

- A data analysis of the most interrupted routes, trends in interruptions and locations with the highest amount of interruptions.
- A route optimization model/approach which minimizes the disturbances for passengers (e.g. travel time and location of new stops). The model should be tested with several interruptions.

Finally, don't forget to propose the application (product) for the model and study its impact.

Available Resources

All the data resources can be found here: https://dadosabertos.cascais.pt/. The link to specifica datasets can be found below.

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

The following list of resources is available for you to use:

- GTFS Public Transport Network of Cascais
- Bus Routes
- Road Network
- Interventions in public roads

The description of the datasets can be found in the dictionary.

Tips

- For measuring inconvenience of interruptions to the passengers: Feel free to use your own assumptions (for example, by looking at possible POI nearby or concentrations of certain POIs).
- For measuring inconvenience of interruptions to the mobility company: Feel free to consider extra distance needed to be travelled or any other relevant metric.
- When looking to identify the trends, good starting points are localities/parishes, most intervened streets, average intervention times, and periods (months, weekdays, and semesters).
- Google has helpful documentation on the general GTFS dataset format and structure.

Submissions

Deadline: Wed, 22 April 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/wdl_2022_jupyter_template
Executive summary template: https://bit.ly/wdl_2022_exec_sum