Predicting the demand for shared bicycles

Challenge Provider: Valle de Aburrá

The Metropolitan Area of the Aburrá Valley is an administrative entity of public law that associates the 10 municipalities that make up the Aburrá Valley: Medellín is the core city, around which is a conurbation of the municipalities of Barbosa, Girardota, Copacabana, Bello, Itaguí, Sabaneta, Envigado, La Estrella and Caldas; linked to each other by territorial, environmental, economic, social, demographic, cultural and technological dynamics and interrelationships that require a coordinating body for the programming and coordination of their sustainable development, human development, territorial order and rational delivery of public services.

Context

The Metropolitan Area of the Aburrá Valley acts as a metropolitan public transport authority and urban environmental authority. Hence, almost ten years ago, it implemented the Public Bicycle System of the Aburrá Valley – EnCicla to offer a free alternative of sustainable mobility through the loan of bicycles for up to an hour to users registered in the system.

It currently has more than 1,600 bicycles in 101 stations, from which an average daily of 7,600 loans are made during the pandemic. On figure 1 you can visualise the distribution of the stations in the metropolitan territory.

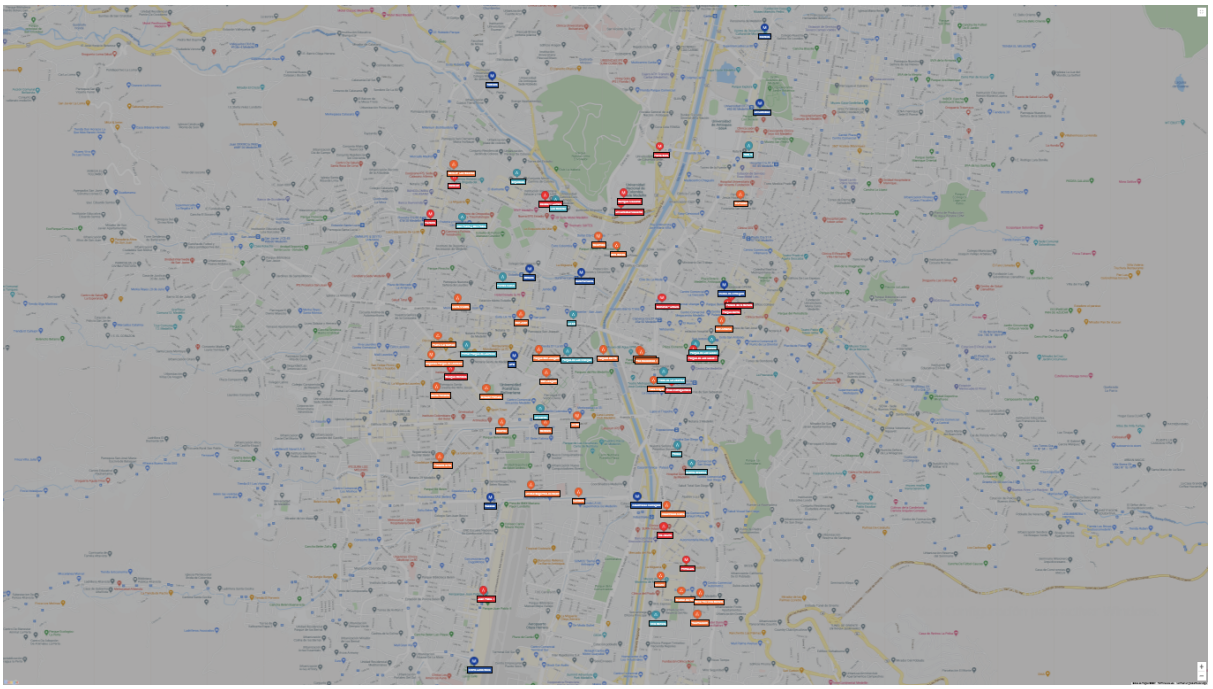

Figure 1. You can visualize the distribution of the stations in the metropolitan territory.

System stations can be manual or automatic. In the manuals, a person is responsible for lending and receiving the bicycles to each user. In contrast, in the automatic ones, there are a limited number of anchor points from which the bikes can be loaned and to which you have to hook the bike that you want to return. If a user returns their bike and does not have empty anchor points, you will have to move to another station or wait for another user to release the anchor point.

One of the main challenges that the system has is to keep bicycles available by the time the user approaches the station to make a loan and have anchor points available for the moment the user wants to deliver the borrowed bike.

If it is considered that the flow of passengers is usually from the same origins to the same destinations, this completes the mentioned challenge. For example, in the mornings, university students often travel from subway stations to make the last mile to their institutions by bike.

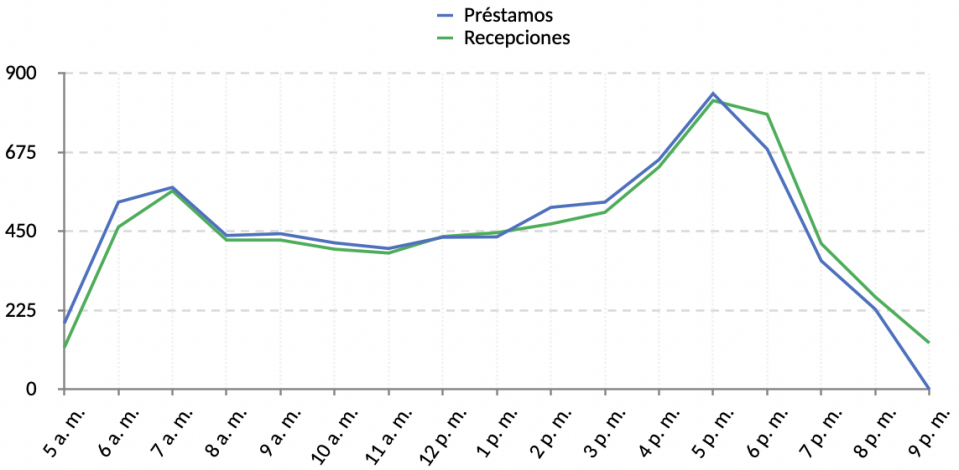

Figure 2: Behavior of loans during system operating hours (pre-pandemic)

Day of the week	2016	2017	2018	2019
Monday	7050	7188	9142	12089
Tuesday	7393	8817	10490	14133
Wednesday	7243	8726	10852	13689
Thursday	7157	8652	10953	13691
Friday	7128	8467	10552	13849
Saturday	2348	3405	3991	6814

Table 1. The average number of loans per day of the week 2016-2019

Goals

Have a model that allows us to make system load balancing decisions based on demand forecasting based on historical data. Load balancing means the planning of transporting bicycles from one station to another.

Outcome

A model that indicates the optimal movement of bicycles to be made between stations, and at what times or frequencies, to ensure that you perform the best system planning.

Available Resources

As a reminder, all the data resources can be found here: https://bit.ly/wdl-data. You can also use any open, free, and legally available data.

Loans: The bike loans from 2014 until 2021

Stations: Location of the station

Digital Terrain Model: Contains the elevation of the city

Public Transportation Stations: Location of each station

Metro Map: The metro map of the city

Submissions

Deadline: 15 - 05 - 2021 @ 14h00 GMT + 1

Don't forget that you will need to deliver the report **using the template provided** (see below) and a 1-minute summary.

Submission template: http://bit.ly/wdl-template

Tips

- Don't forget that OpenStreetMaps can be a source of data;
- You have access to pre and post-pandemic data. Don't overcomplicate. Analyse just one, and if you have time, add more details about the pandemic;
- Try to fill in the template from start to finish with a straightforward dummy solution first and iterate afterwards;
- You can use other data sources, such as weather, which can be very useful;
- We don't define which period of the day for you to predict on purpose. We want to tell us which is the most useful in this case;
- If possible, don't forget to explain the predictions of your model.