The Best Place in Madrid

Installing Charging Station of Electrical Vehicle

Introduction/Business Problem

- Madrid is the capital of Spain and the most populous city in the country
- In recent years, sustainable mobility plans have been enhanced to facilitate the lives of its citizens and help prevent climate change.
- One of the key elements in this new mobility model is personal transport using electric vehicles, which enjoy great environmental and fiscal advantages.

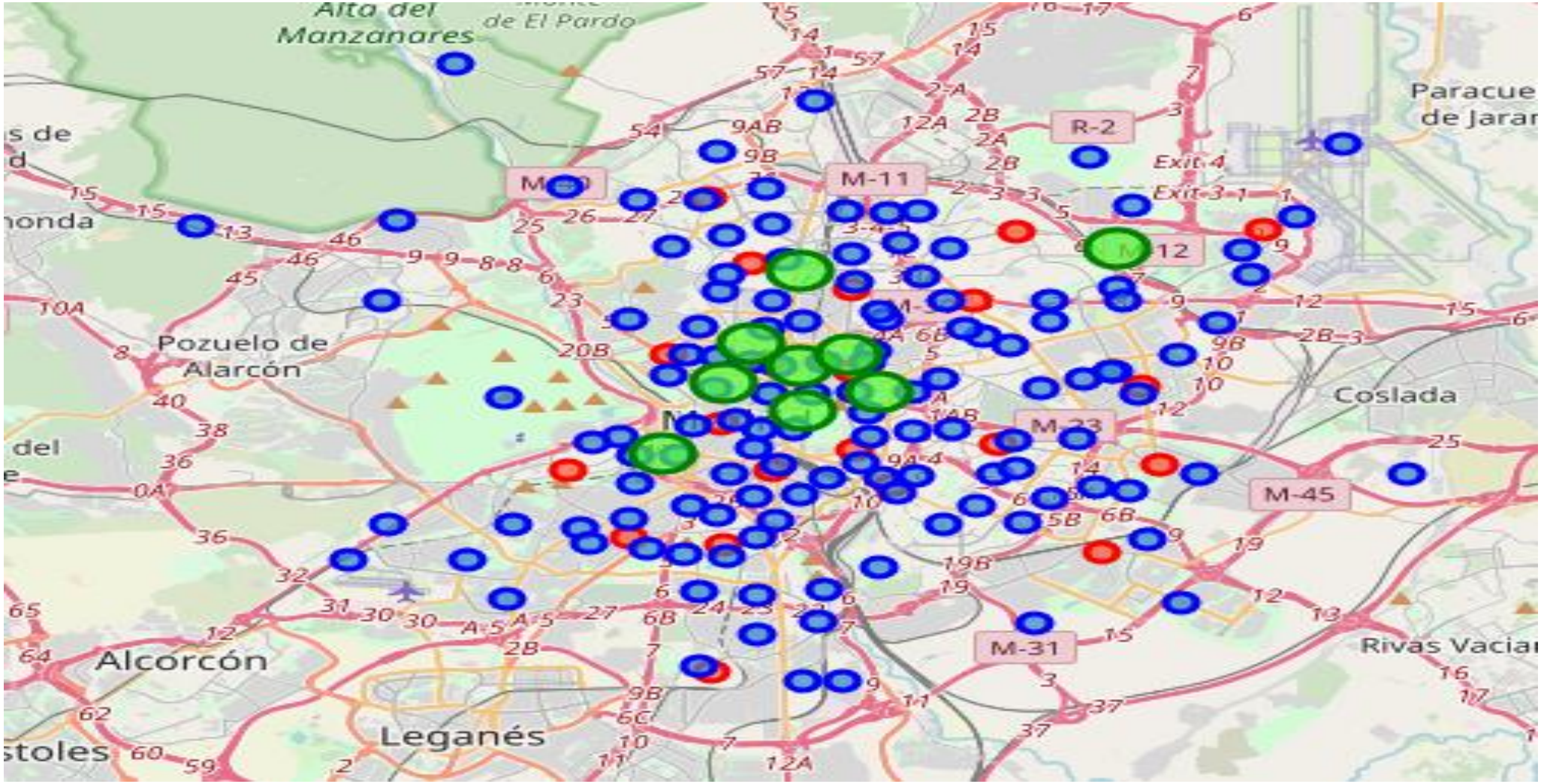
Objective

- The objective of this project is to analyze the charging points of electric vehicles available in the city of Madrid, to help an investor find the best location between the neighborhoods of Madrid to install a new charging point.

Approach

- Collect the Madrid city data from ttps://es.wikipedia.org/wiki/Madrid#Distritos
- Collect the Madrid station charge of electrical vehicles from Google Earth.
- Using FourSquare API we will find all venues for each station charging.
- Using FourSquare API we will find all venues for each neighborhood.
- Cluster the data to find the ideal location of a charging station.

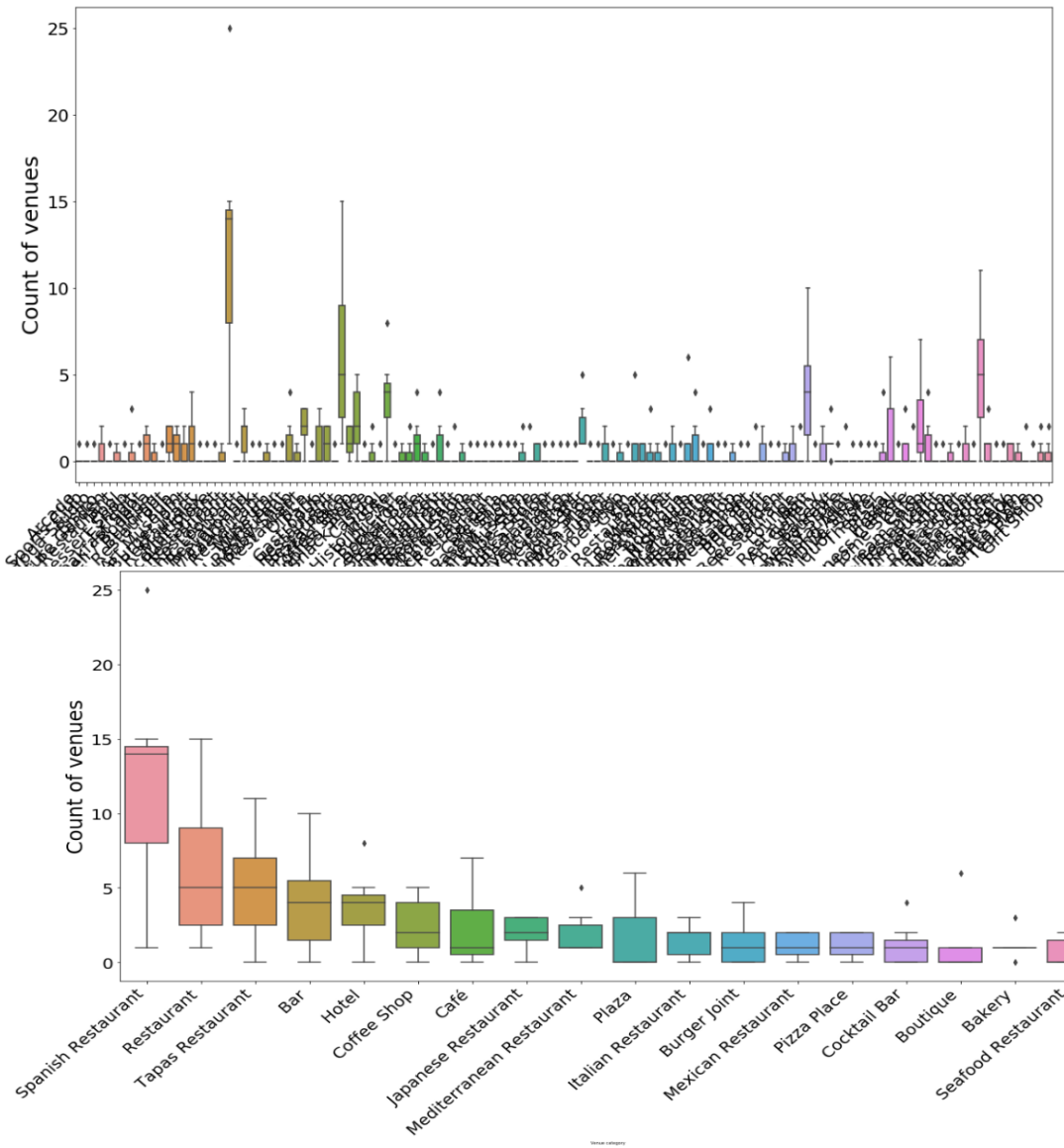
Getting the data

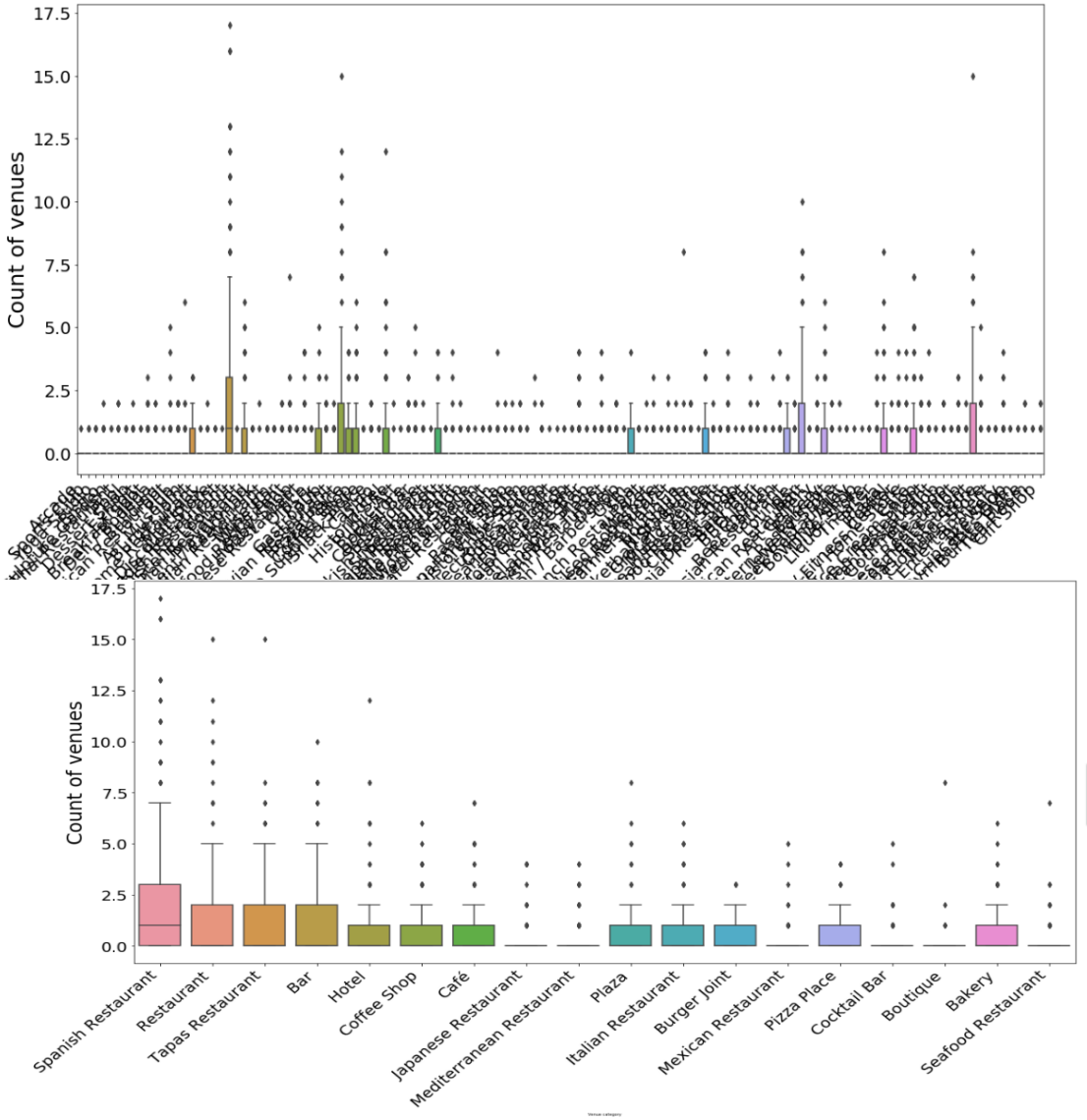


METHODOLOGY

- We want to find the best locations for a new electric vehicle charging station using as a reference the similarity between each neighborhood and the environment of the points where a charging station already exists.
- Analyzing the dataframe **madrid_station_venues** we will try to locate the parameters that define a good location.
- Then, we will apply those parameters to the set of neighborhoods in Madrid (*madrid_venues*) to obtain its classification.

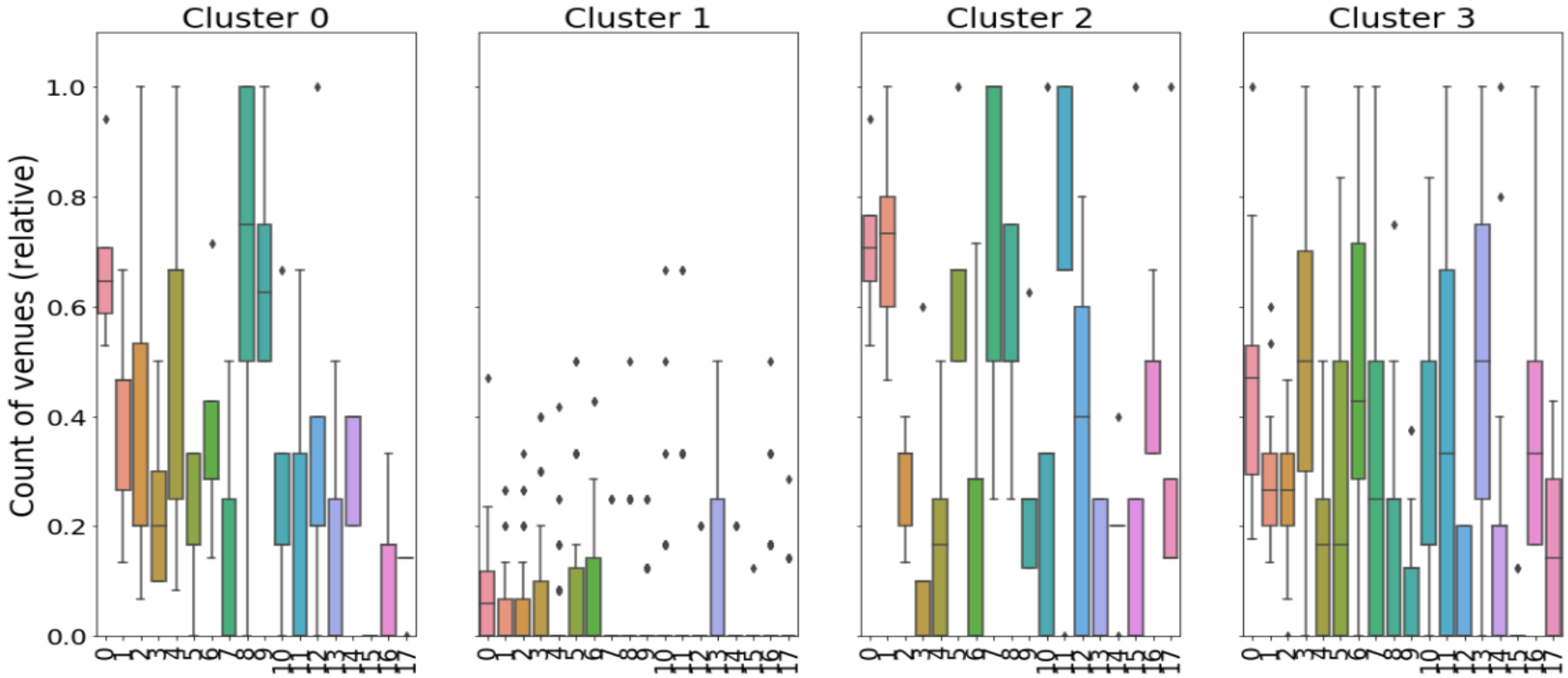
Comparing reference with the raw data of each neighborhood.



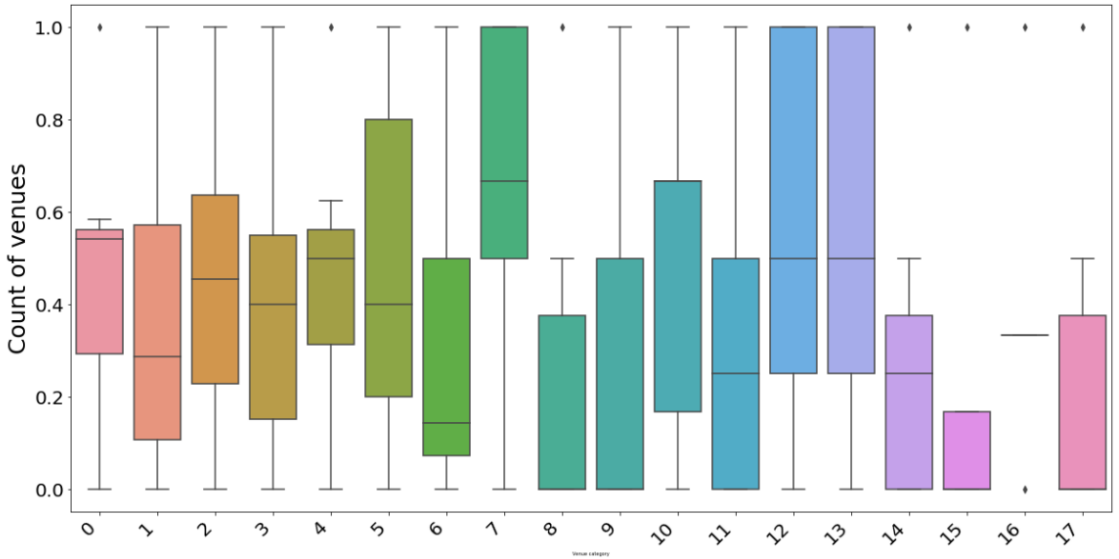


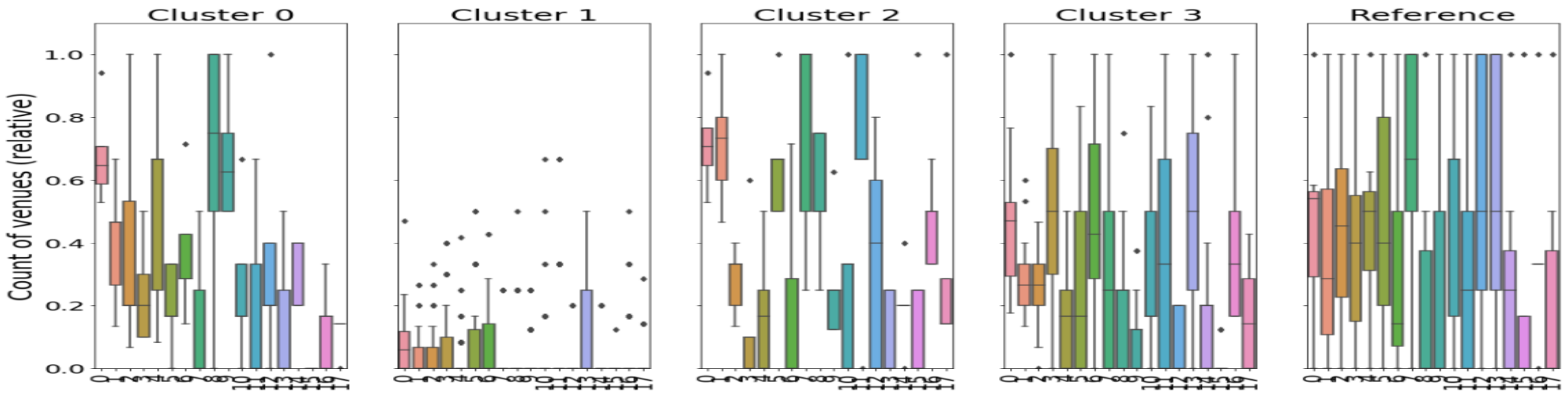
Clustering

We'll be using k-means clustering. We want to classify each neighborhood on a scale that goes from "The best" to "Bad", going through "Good" and "Regular". Therefore, we select 4 for the number of clusters.



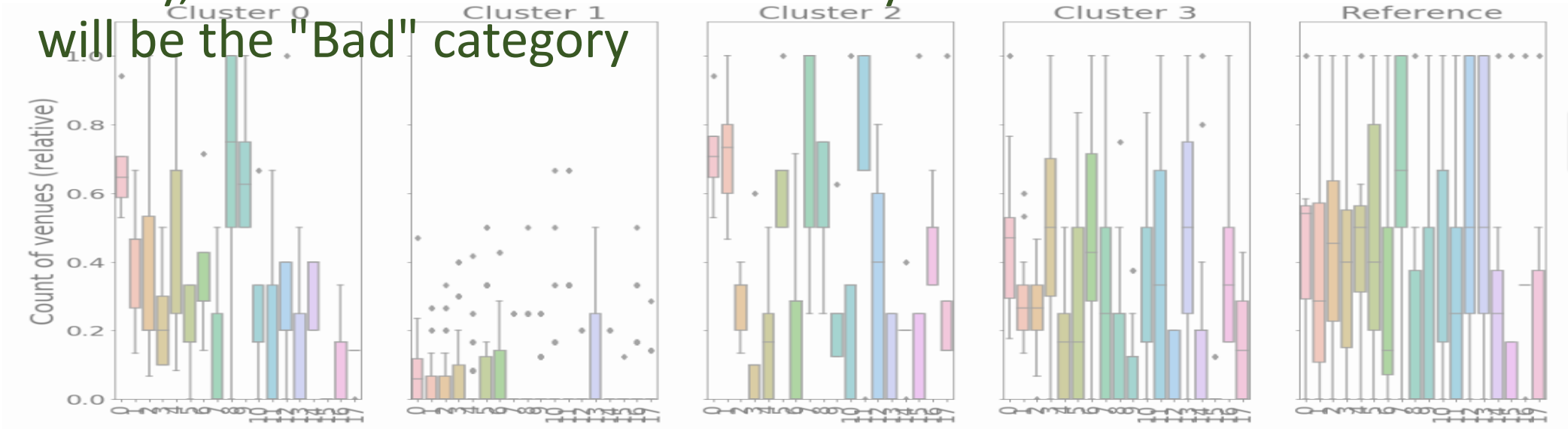
Comparing with the reference:



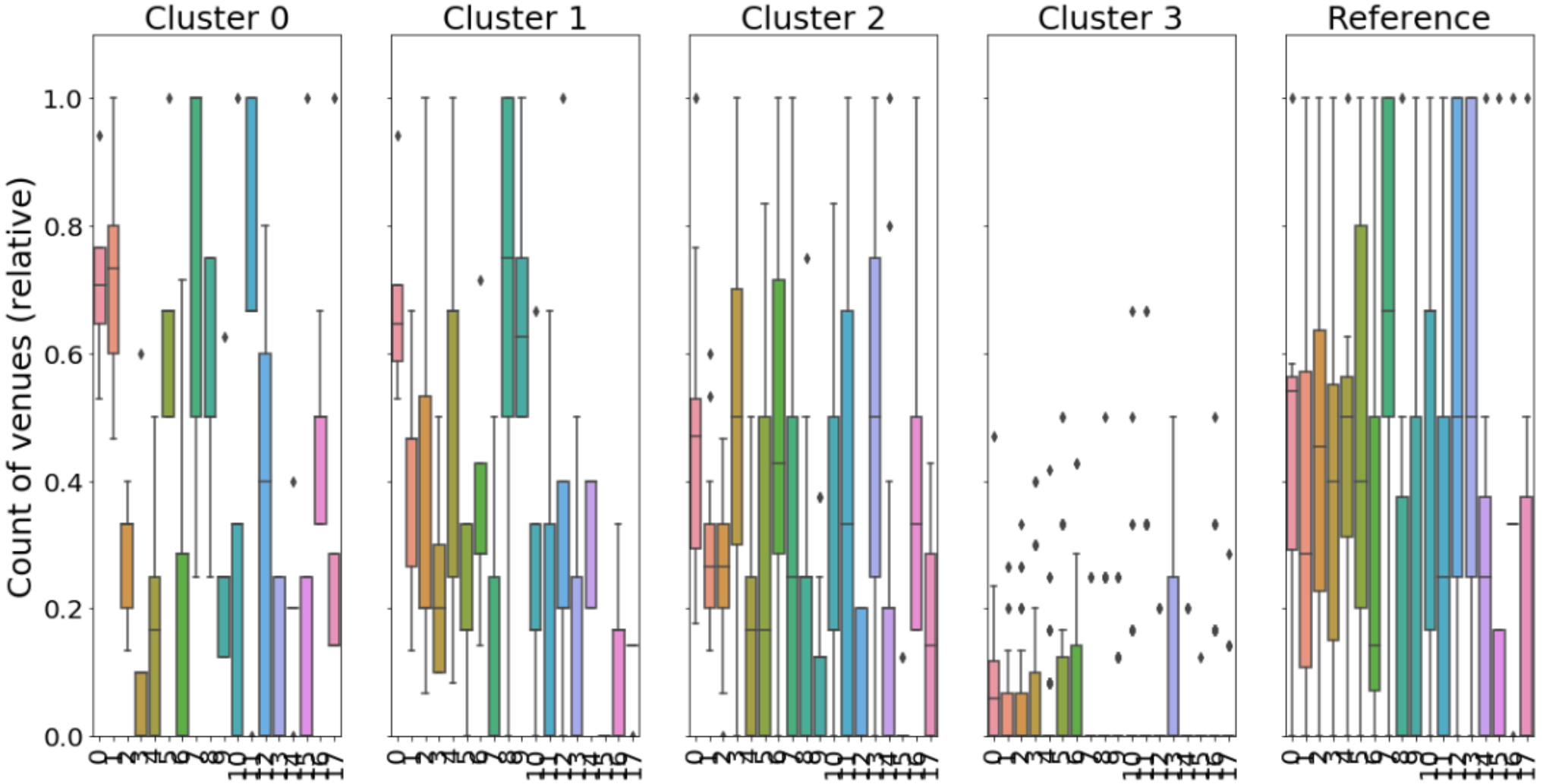


Comparing with the reference:

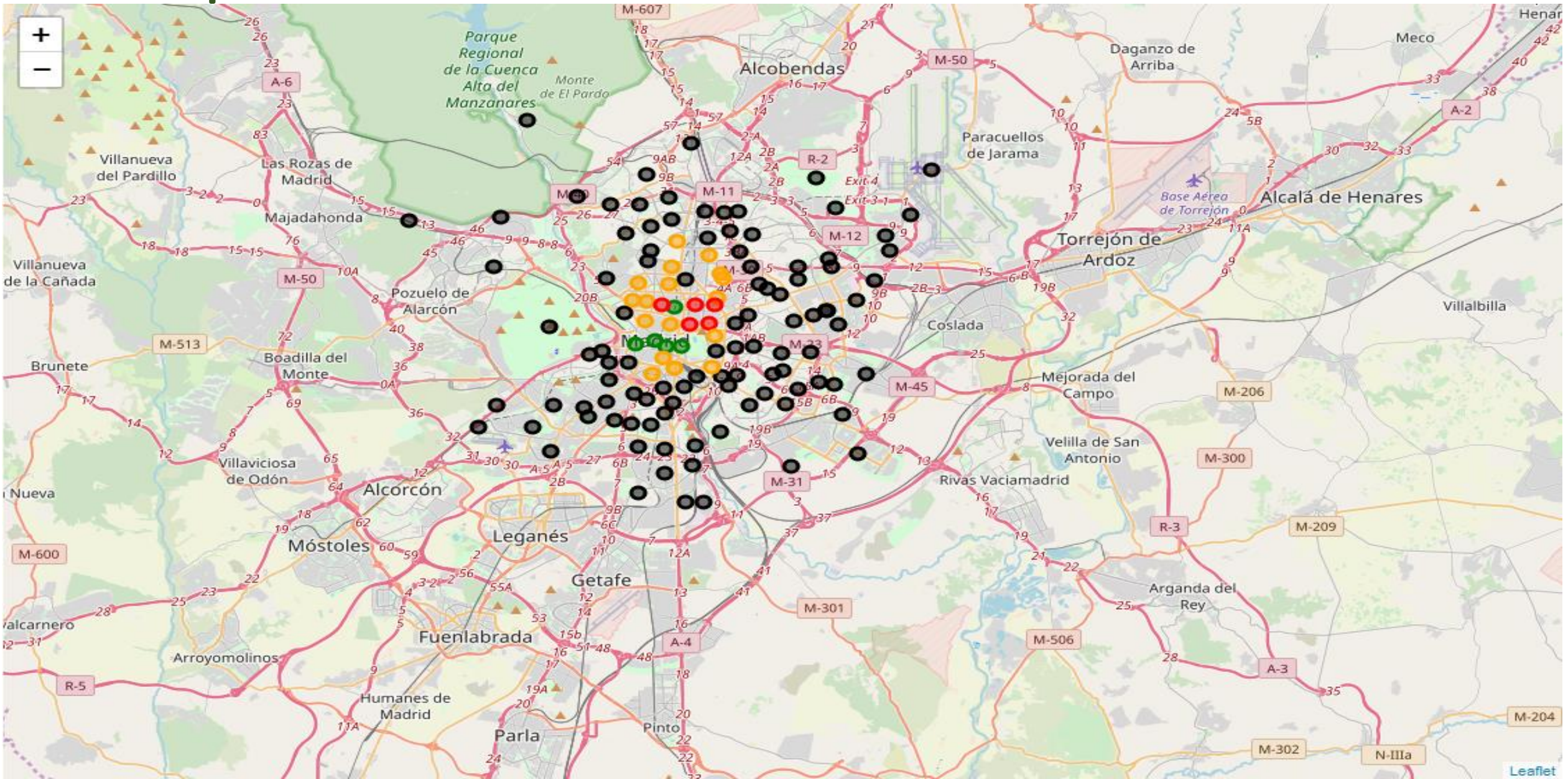
- Visually we can observe that Cluster 0 is the one that presents the greatest similarity to the Reference. This will be the "Best" Category.
- Next, Cluster 2 follows in similarity. This will be th[illegible]ory.
- Cluster 3 has values well below the reference. This will be the "Regular" category.
- Finally, Cluster 1 is the one that hardly matches the reference. This will be the "Bad" category



Putting in order the categories



Map the data.


Parque Regional de la Cuenca Alta del Manzanares
Monte de El Pardo
Alcobendas
Daganzo de Arriba
Meco
Paracuellos de Jarama
Base Aérea de Torrejón
Alcalá de Henares
Torrejón de Ardoz
Villanueva del Pardillo
Las Rozas de Madrid
Majadahonda
Villanueva de la Cañada
Pozuelo de Alarcón
Coslada
Villalbilla
Brunete
Boadilla del Monte
Mejorada del Campo
Villaviciosa de Odón
Velilla de San Antonio
Alcorcón
Rivas Vaciamadrid
Móstoles
Leganés
Getafe
Arganda del Rey
Fuenlabrada
Arroyomolinos
Humanes de Madrid
Parla
Pinto
M-607
M-50
A-6
R-2
M-11
M-12
M-513
M-45
M-206
M-300
M-31
R-3
M-209
M-600
M-301
M-506
A-4
A-3
R-5
M-204
M-302
N-IIIa
Leaflet

Results

- Here is how we can characterize the clusters by looking at venue scores
    - Cluster 0 (Red) has consistently high scores for all venue categories as seen in the reference pattern of the existing charging stations.
    - Cluster 1 (Green) has lower score for all venue categories than previos cluster.
    - Cluster 2 (Orange) has lowest marks for all venue categories.
    - Cluster 3 (Red) barely coincide with the selected venue categories.
- Cluster 0 is the best option because it its the most similar to the current locations of the selected charging stations.
- Plotting the clusters on a map shows us that
    - Cluster 0 corresponds to the large commercial districts of the city's commercial center.
    - Group 1 is also in the center but in neighborhoods with smaller capacity roads.
    - Groups 2 and 3 correspond to more peripheral neighborhoods.

Discussion

- To be fair, Foursquare data does not cover everything. The largest number of places are in the categories of Food, shops and services.
- In a more complete study, other indicators of the movement of people and vehicles should be included, but as a first approximation the results appear to be consistent.

Conclusion

- In this study, we have taken data on the environment of electric vehicle charging stations. They have been used as a pattern of comparison with the neighborhoods of Madrid, where there are no facilities of this type to establish a division of the city in areas where it is more interesting to install a new charging station.
- Four groups have been established to classify the neighborhoods from the best area to the worst, and the geographic results show a great correlation with the current location of the existing facilities, so the validity of this method for locating suitable locations is accepted because wecan answer the questions we had raised:
- What is best location in Madrid for stations charging electrical vehicles? The Cluster 0 or "The Best" locations.
- Which areas have potential station charging electrical vehicles market? The Cluster 1 or "Good" locations.
- Additional socio-economic factors that could better characterize neighborhoods have not been taken into account. Future developments in this field may provide more accurate results.