

The Battle of Neighborhoods



Source image: <https://it.wikivoyage.org/wiki/Roma>

Visit to Rome

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1. Introduction

Rome is one of the most interesting tourist destinations in the world, due to its immense artistic and cultural heritage. There are a lot of monuments: Colosseo, Il Vittoriano (or Altare della Patria), Pantheon, Fontana di Trevi, ... [<https://www.expedia.it/>]. Beside to many monuments, in Rome there are many other places of interest for a tourist. In particular, as the Italian capital, there are a lot of restaurants that allow tourists to eat wonderful Italian food! If you are going to go to Rome, you cannot taste some of the most typical Italian and Roman dishes, such as cacio e pepe, gnocchi alla romana, abbacchio a scottadito, carciofi alla giudia, crostata di ricotta, ... [<https://www.gamberorosso.it/>].

In order plan a travel in Rome, and to decide where it is better to reserve a hotel, it is important to evaluate where different interesting venues are located. Beside a global analysis about venues, I would like to focus my analysis on both main monuments and Italian restaurants.

In order to perform my analysis, it is important to know how Rome is organized. Its territory is divided into three types of areas: administrative, urban and historical areas. Since 2013, the Rome Capital Statute has reorganized the administrative areas dividing Rome in 15 municipalities. Rome is also divided into differing types of non-administrative units. The historic centre is divided into 22 "rioni", externally there are 35 "quartieri", 6 "suburbi" and 52 "zone". For more uniformity, I consider the 15 municipalities.

2. Data

For this project, I need data information about Rome's neighborhoods (called Municipi). Data about neighborhoods are available in the Italian web portal of Open Data (<http://www.datiopen.it/>): "Municipi di Roma". I downloaded the shape file that I elaborated it using QGIS (<https://www.qgis.org/>) to export a geojson file that associates for each neighborhood the latitude and the longitude of its centroid. The resulting file is available here: [municipi_centroidi_js.geojson](#). Figure 1 shows the map in QGIS.

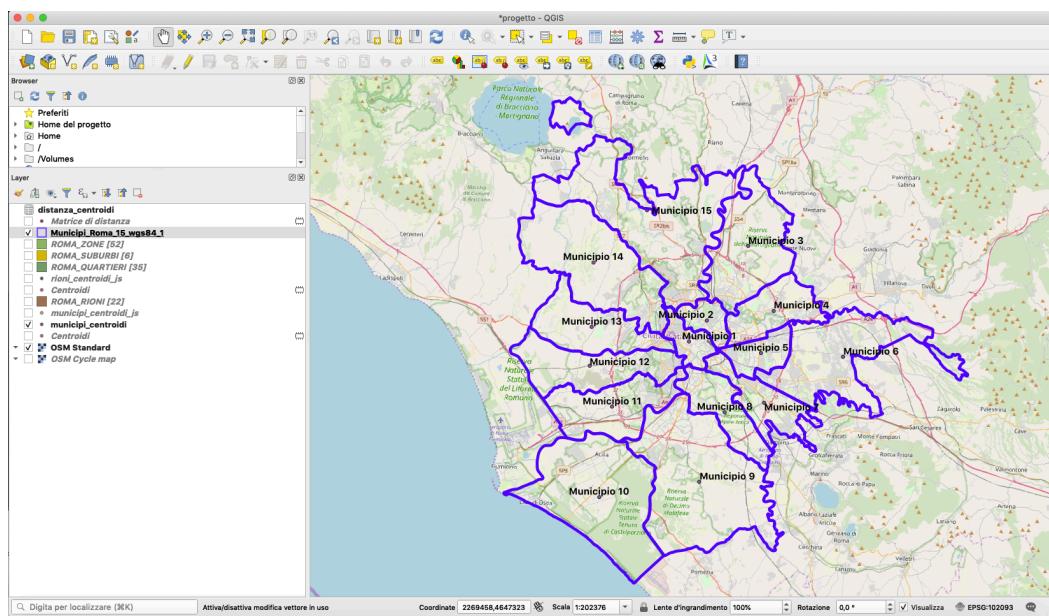


Figure 1. Rome's neighborhoods in QGIS.

Next, I need data about venues in Rome, as hotels, monuments and restaurants. I obtained them working with the Foursquare API. As an example of data, Figure 2 shows the map of venues obtained with an explore in Foursquare with respect each Rome's neighbourhood centroid (blue in the map) using a radius equals to 6000 (the value is defined checking the distances between the neighborhoods' centroids).

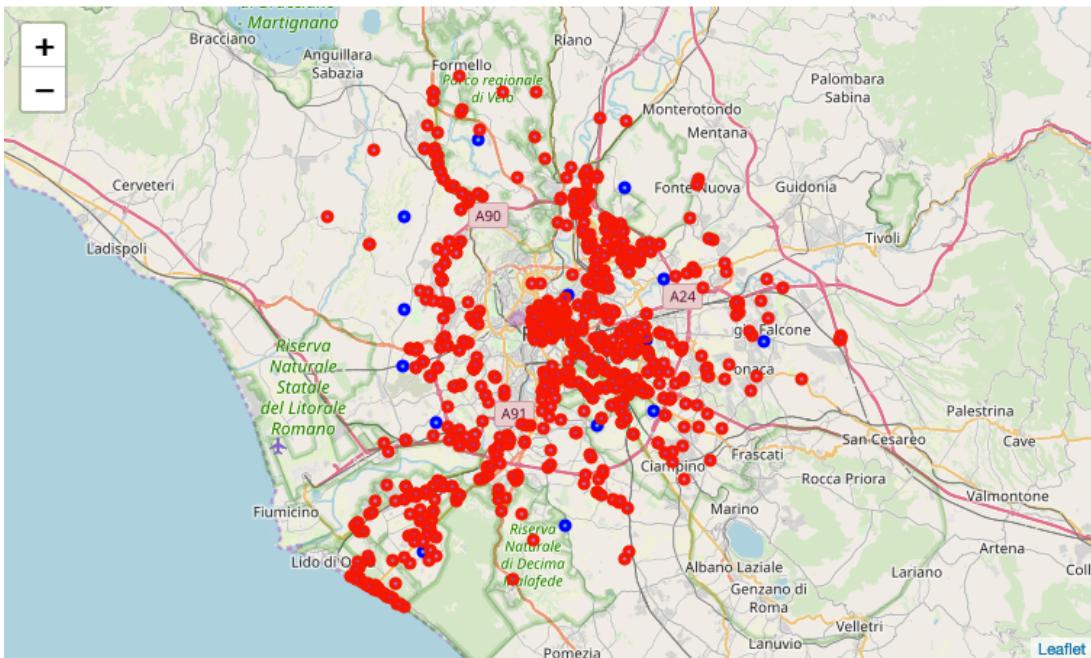


Figure 2. Rome's venues (red) and centroids of neighborhoods (blue) in folium (Python).

An example of alphanumeric data of venues is also visible in Figure 3. For each venue there is the name of the neighbourhood, its latitude and longitude, the name of the venue, its latitude and longitude, and its category.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Municipio 1	41.898628	12.47795	Pantheon	41.899133	12.476805	Monument / Landmark
1	Municipio 1	41.898628	12.47795	Pizza e Mozzarella	41.897598	12.479097	Pizza Place
2	Municipio 1	41.898628	12.47795	Il Panino Ingegnoso	41.899982	12.479195	Sandwich Place
3	Municipio 1	41.898628	12.47795	Piazza della Rotonda	41.899253	12.476779	Plaza
4	Municipio 1	41.898628	12.47795	Venchi	41.900042	12.480883	Ice Cream Shop

Figure 3. An example of venues' dataset.

This is only a short description of used datasets, more details are available in Sections 0, and in the Notebook used for the development of the project [https://github.com/gubiani/Coursera_Capstone/blob/master/battleOfNeighborhoods.ipyn].

3. Methodology

The synthesis of my work is described in Figure 4. A description of different steps of the work is described in the following.

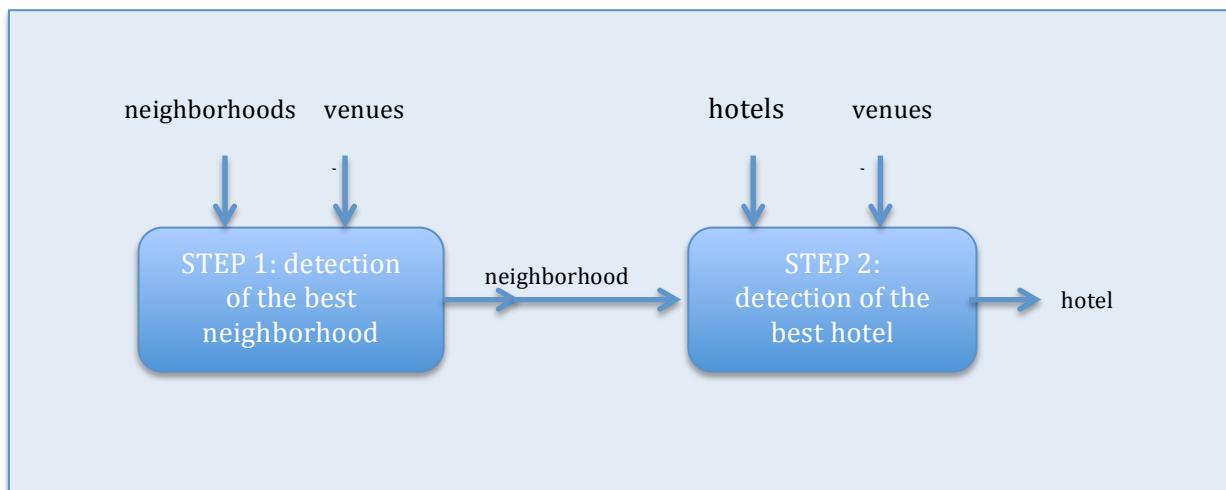


Figure 4. Schema of the work.

STEP 1. Detection of the best neighbourhood

For each neighbourhood's centroid, by Foursquare, a venue "explore" allows us to obtain the venues (of all categories) within a specific radius.

Starting from this dataset, after a look to data, a clustering of neighbours to detect the neighbours that better satisfy my requests.

STEP 2. Detection of the best hotel

For the selected neighbourhood, by Foursquare, a venue "explore" allows us to obtain the hotels (categoryId='4bf58dd8d48988d1fa931735') within a specific radius.

For each hotel, by Foursquare, a venue "explore" allows us to obtain the venues (of all categories o solo quelle che mi interessano di più?) within a specific radius.

Starting from this dataset, after a look to data, a clustering of hotels to detect one or more hotels that satisfy my requests.

4. Results

In the following subsections, I present and discuss, step by step, the results achieved applying the methodology described in the previous section on data introduced in Section 2.

STEP 1. Detection of the best neighbourhood

From a first analysis on the most common venues for each neighborhood (Figure 5), I can see that the most common venue for several neighborhoods is represented by the “Italian restaurants” or “Pizza place”. If they are not the most common, they usually are in the first following places. “Hotel”s are frequently from 2nd to 3rd position (6 neighborhoods). Differently, “Historical Site” is the 3rd most common venue in Municipio 1, the 4th in Municipio 2 and 8, the 6th in Municipio 7 and 10. Moreover, “Monument/Landmark” is in the 5th position in Municipio 7 and 9th in Municipio 1.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Municipio 1	Plaza	Ice Cream Shop	Historic Site	Italian Restaurant	Sandwich Place	Wine Bar	Church	Fountain	Monument / Landmark	Pizza Place
1	Municipio 10	Italian Restaurant	Beach	Seafood Restaurant	Ice Cream Shop	Fast Food Restaurant	Historic Site	Park	Pizza Place	Restaurant	Campground
2	Municipio 11	Italian Restaurant	Pizza Place	Hotel	Café	Park	Pool	Ice Cream Shop	Fast Food Restaurant	Gym / Fitness Center	Steakhouse
3	Municipio 12	Italian Restaurant	Hotel	Supermarket	Electronics Store	American Restaurant	Event Space	Sandwich Place	Pizza Place	Park	Department Store
4	Municipio 13	Italian Restaurant	Café	Department Store	Hotel	Sandwich Place	Furniture / Home Store	Steakhouse	Supermarket	Cafeteria	Gym / Fitness Center
5	Municipio 14	Italian Restaurant	Hotel	Pub	Asian Restaurant	Pool	Supermarket	Deli / Bodega	Restaurant	Clothing Store	Electronics Store
6	Municipio 15	Italian Restaurant	Gym / Fitness Center	Hotel	Café	Supermarket	Restaurant	Pub	Asian Restaurant	BBQ Joint	Pool
7	Municipio 2	Plaza	Ice Cream Shop	Hotel	Historic Site	Monument / Landmark	Sandwich Place	Art Museum	Italian Restaurant	Pizza Place	History Museum
8	Municipio 3	Italian Restaurant	Pizza Place	Café	Steakhouse	Gym / Fitness Center	Hotel	Grocery Store	Supermarket	Electronics Store	Clothing Store
9	Municipio 4	Italian Restaurant	Pizza Place	Café	Ice Cream Shop	Gastropub	Restaurant	Nightclub	Park	Gym / Fitness Center	Beer Garden
10	Municipio 5	Pizza Place	Ice Cream Shop	Park	Italian Restaurant	Hotel	Cocktail Bar	Café	Dessert Shop	Gastropub	Gym / Fitness Center
11	Municipio 6	Clothing Store	Italian Restaurant	Fast Food Restaurant	Café	Rest Area	Electronics Store	Shopping Mall	Discount Store	Restaurant	Ice Cream Shop
12	Municipio 7	Italian Restaurant	Pizza Place	Park	Café	Ice Cream Shop	Historic Site	Wine Bar	Hotel	Burger Joint	Gym
13	Municipio 8	Pizza Place	Park	Café	Historic Site	Italian Restaurant	Ice Cream Shop	Pub	Bakery	Hotel	Kebab Restaurant
14	Municipio 9	Italian Restaurant	Hotel	Soccer Field	Farm	Café	Pizza Place	Rock Club	Fast Food Restaurant	Food	Food Court

Figure 5. Most common venues in each neighborhood.

For a more global analysis, I cluster the neighborhoods with respect to venues. Considering the number of neighborhoods (15), I decided to apply k-Means with k=5 (supposing a general average of 3 neighborhoods per cluster). The resulting clustering is visible in Figure 6.



Figure 6. Map of neighborhoods' clusters.

From an exploration of the clusters (Figure 7), I can try to characterize them:

- The **1st cluster** (red on the map) is the most populated and includes neighbourhood with Italian restaurants, pizza places and other restaurants, coffee, bars and ice-cream. Only in some cases, Municipio 8, 7 and 10, there are available also historical sites, respectively in the 4th position and 6th for last two;
- The **2nd cluster** (violet on the map) is in the north-west of the center and, besides Italian restaurants and hotels, supermarkets and stores, pools and fitness centers;
- The **3rd cluster** (blue on the map) is the center of Rome (two neighbourhoods) and it is characterized by plazas, historical sites, monuments/landmarks, churches and fountains, with ice-cream, sandwich and snack places;
- The **4th cluster** (green on the map) includes neighborhoods with mainly Italian restaurants and hotels;
- The **5th cluster** (orange on the map) includes only one neighbourhood and is the neighbourhood of the shop.

The goal of this first step of the analysis is to determine the neighbourhood where I want to reserve a hotel. Since my starting requirements, monuments (historical sites, plazas, ...) and Italian restaurants are relevant venues. Only for monuments I could choose a neighbourhood in the cluster 3rd but considering also Italian restaurants, which should be close to the hotel for good Italian dinners, I select the 1st cluster.

# Cluster 1 rome_merged.loc[rome_merged['Cluster Labels'] == 0, rome_merged.columns[[0] + list(range(4, rome_merged.shape[1]))]]										
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
2 Municipio 3	Italian Restaurant	Pizza Place	Café	Steakhouse	Gym / Fitness Center	Hotel	Grocery Store	Supermarket	Electronics Store	Clothing Store
3 Municipio 4	Italian Restaurant	Pizza Place	Café	Ice Cream Shop	Gastropub	Restaurant	Nightclub	Park	Gym / Fitness Center	Beer Garden
4 Municipio 5	Pizza Place	Ice Cream Shop	Park	Italian Restaurant	Hotel	Cocktail Bar	Café	Dessert Shop	Gastropub	Gym / Fitness Center
6 Municipio 7	Italian Restaurant	Pizza Place	Park	Café	Ice Cream Shop	Historic Site	Wine Bar	Hotel	Burger Joint	Gym
7 Municipio 8	Pizza Place	Park	Café	Historic Site	Italian Restaurant	Ice Cream Shop	Pub	Bakery	Hotel	Kebab Restaurant
9 Municipio 10	Italian Restaurant	Beach	Seafood Restaurant	Ice Cream Shop	Fast Food Restaurant	Historic Site	Park	Pizza Place	Restaurant	Campground
10 Municipio 11	Italian Restaurant	Pizza Place	Hotel	Café	Park	Pool	Ice Cream Shop	Fast Food Restaurant	Gym / Fitness Center	Steakhouse
# Cluster 2 rome_merged.loc[rome_merged['Cluster Labels'] == 1, rome_merged.columns[[0] + list(range(4, rome_merged.shape[1]))]]										
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
13 Municipio 14	Italian Restaurant	Hotel	Pub	Asian Restaurant	Pool	Supermarket	Deli / Bodega	Restaurant	Clothing Store	Electronics Store
14 Municipio 15	Italian Restaurant	Gym / Fitness Center	Hotel	Café	Supermarket	Restaurant	Pub	Asian Restaurant	BBQ Joint	Pool
# Cluster 3 rome_merged.loc[rome_merged['Cluster Labels'] == 2, rome_merged.columns[[0] + list(range(4, rome_merged.shape[1]))]]										
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0 Municipio 1	Plaza	Ice Cream Shop	Historic Site	Italian Restaurant	Sandwich Place	Wine Bar	Church	Fountain	Monument / Landmark	Pizza Place
1 Municipio 2	Plaza	Ice Cream Shop	Hotel	Historic Site	Monument / Landmark	Sandwich Place	Art Museum	Italian Restaurant	Pizza Place	History Museum
# Cluster 4 rome_merged.loc[rome_merged['Cluster Labels'] == 3, rome_merged.columns[[0] + list(range(4, rome_merged.shape[1]))]]										
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
8 Municipio 9	Italian Restaurant	Hotel	Soccer Field	Farm	Café	Pizza Place	Rock Club	Fast Food Restaurant	Food	Food Court
11 Municipio 12	Italian Restaurant	Hotel	Supermarket	Electronics Store	American Restaurant	Event Space	Sandwich Place	Pizza Place	Park	Department Store
12 Municipio 13	Italian Restaurant	Café	Department Store	Hotel	Sandwich Place	Furniture / Home Store	Steakhouse	Supermarket	Cafeteria	Gym / Fitness Center
# Cluster 5 rome_merged.loc[rome_merged['Cluster Labels'] == 4, rome_merged.columns[[0] + list(range(4, rome_merged.shape[1]))]]										
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
5 Municipio 6	Clothing Store	Italian Restaurant	Fast Food Restaurant	Café	Rest Area	Electronics Store	Shopping Mall	Discount Store	Restaurant	Ice Cream Shop

Figure 7. Exploration of neighborhoods' clusters.

The 1st cluster has 7 neighborhood but, due to the historical sites, I can focus my selection on 3 of them Municipio 7, 8, 10. From the map, I can see the Municipio 10 is far from the center of Rome and I exclude it. Between 7 and 8, I choose **Municipio 8** because the historical sites are the 4th most common venues (6th for Municipio 7).

STEP 2. Detection of the best hotel

Defined the neighbourhood of interesting, I can proceed with the second step of my analysis.

I have to start retrieving data for Municipio 8. The first set of data concerns hotels in the neighbourhood: I obtain it with an explore in Foursquare focusing my request on the category hotel in a buffer of 5000 from the centroid of the neighborhood. The result includes 40 hotels that are visible in Figure 8 (to the left).

Starting from each hotel, I explore in Foursquare all venues around them (radius=1000, a walking distance) and I obtained 1433 venues, from 5 to 96 for each hotel. All retrieved venues are shown in Figure 8 (to the left).

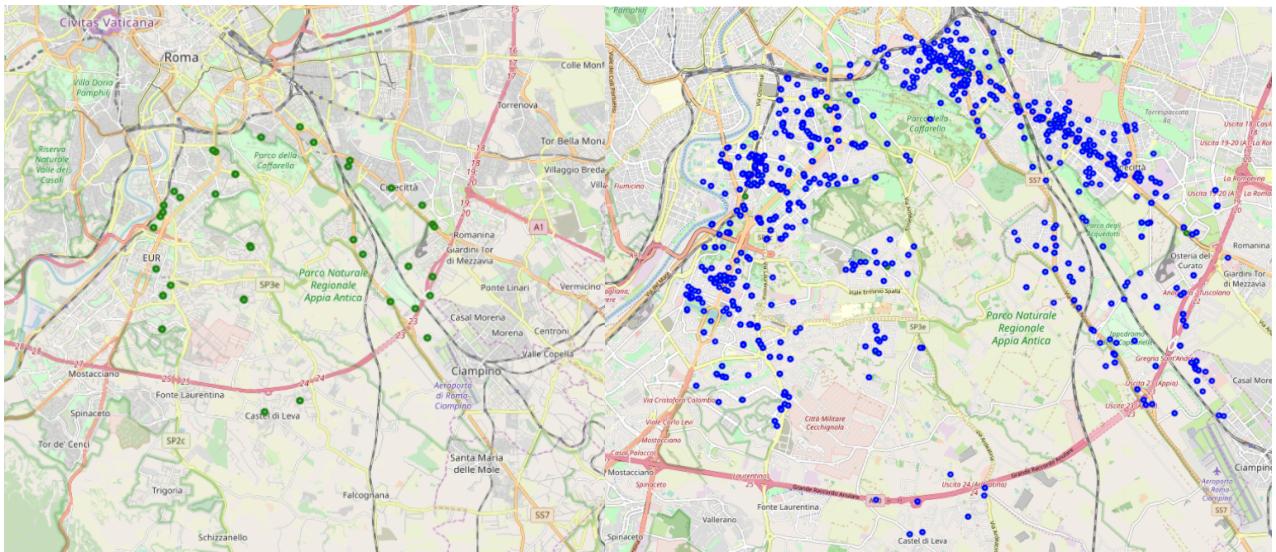


Figure 8. Map of hotels in Municipio 8 (left) and venues around them (right).

I cluster the hotels using k-Means (with k=5) obtaining the clusters depicted in Figure 9: cluster0 – red, cluster 1 – violet, cluster 2 - blue, cluster 3 - green, and cluster 4 - orange.

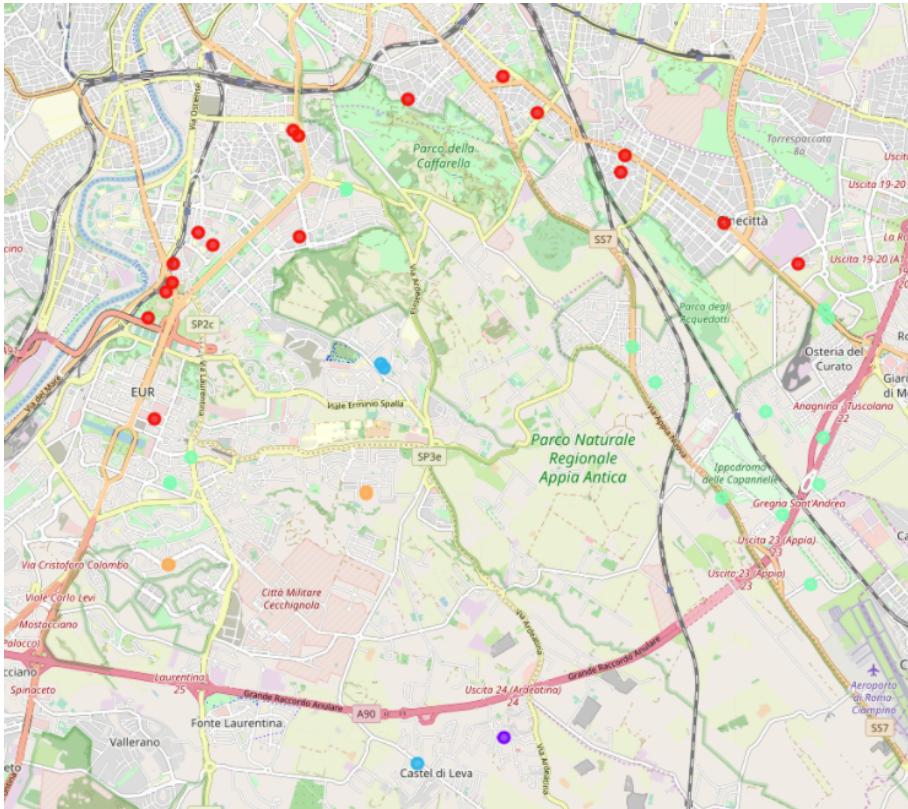


Figure 9. Hotels' clustering.

Exploring clusters (details into the notebook:), I can try to characterize them:

- The **1st cluster** (red on the map – cluster label 0) is the wider one, with 17 hotels. It is characterized mainly by Italian restaurants, pizza places, café and ice-cream shops, that are in the first 4 most common venues;
- The **2nd cluster** (violet on the map – cluster label 1) includes only 1 hotel, beside Italian restaurants and steakhouses, the markets/shops are very frequent;
- The **3rd cluster** (blue on the map – cluster label 2) is a more generic cluster but some particular kind of venues are visible: parks, gas stations, and in one case film studios;
- The **4th cluster** (green on the map – cluster label 3) is another wide cluster with 15 hotels. The most common venue is the hotels, except for one that hotels are in the second position;
- The **5th cluster** (orange on the map – cluster label 4) includes, beside pizza place coffee and hotels, “active” venues: gym/fitness centers, outdoors & recreation, and cultural centers.

Focus on my goal, I need to analysis deeper the restaurants of the first cluster and, in particular, I focus my choice on those that are close to the center of Rome (Figure 10) and close to main streets, to have direct connections with the center.

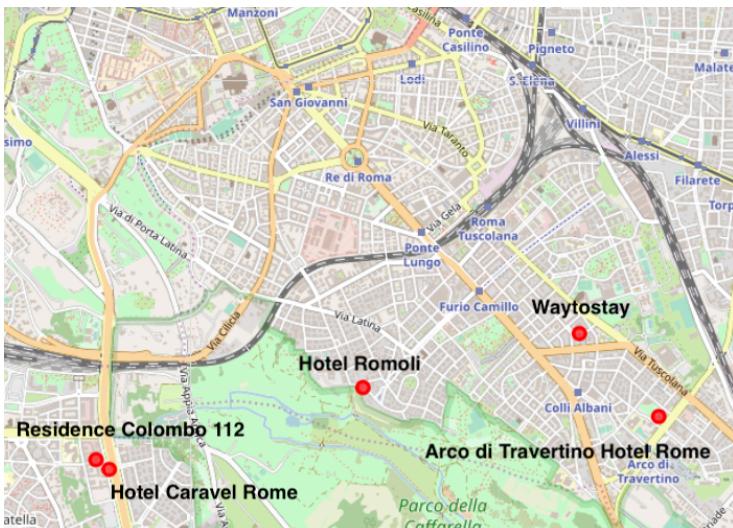


Figure 10. Hotels in the first cluster which are closer to the center of Rome.

For this reason, my choice is defined on one of these hotels:

- Arco di Travertino Hotel Rome;
- Hotel Caravel Rome;
- Residence Colombo 112;
- Waytostay.

To complete my decision, I will check the web sites of each hotel to be able to evaluate each feature and service of the hotel.

5. Conclusion

Using python, Foursquare data and data analysis, I can be able to retrieve a lot of interesting information. In particular, as described in this report, I can be supported to choose one or more hotels that satisfy my requests if I want to visit Rome.

I performed a two steps analysis that allows me:

- First, to define which neighborhood satisfy better my requests, and I decided that this neighborhood is Municipio 8;
- Second, focusing on this neighbourhood and their hotels and all venues, to define which hotels better satisfy my requests, and I selected 4 possible hotels.

The analysis could be improved extending it with a detailed analysis of the selected hotels on base of descriptions, ratings and tips.