COMPARATIVE ANALYSIS OF TWO EUROPEAN CAPITALS:

PARIS VS ROME

Alessandro Fiumara

1. INTRODUCTION

The idea of this project is the comparative analysis of two European cities: Paris and Rome. Both these cities have common characteristics: both are capitals of European countries (respectively France and Italy), both are touristic, both lies by a river. Considering these similarities the aim of the project is to deeper focus in the structure and position of the neighborhood composing the two towns to better understand if their global structure can be considered similar or if there are differences. We would expect that in the downtown of both the towns the neighborhoods are essentially residential and touristic with presence of shops, restaurants and museums. But what the matter for all the neighborhoods surrounding the downtown or the ones in the close countryside? They are mainly residential or industrial and are equally placed in both town?

To answer these questions the data of the two towns have been retrieved and processed in order to cluster the neighborhoods of the two towns in different groups basing on the most common venues of each neighborhood. The clusters of the two towns will be directly compared in order to analyze and detect the similarities and difference between the two towns.

2. DATA

For this study the data of the neighborhoods composing the two towns together with their venues carried out from the Foursquare API data.

- **Paris**:

To analyze Paris it is necessary to retrieve the data of all the Neighborhoods composing “Paris Metropole”. “Paris Metropole” is composed by the borough of the “City of Paris” (department 75), by the boroughs 92, 93 and 94 and by 7 towns of boroughs 91 and 95. The borough of Paris is composed of 20 neighborhoods (arrondissement). The suburb boroughs are composed by different small towns which can be considered as neighborhoods. It is hence necessary to obtain the name of each neighborhood, together with its ID and the number of the Borough of which is part of. For each neighborhood the geographical coordinates are needed.

To obtain the data of the “City of Paris” (department 75), we will scrap the data from the “opendata.paris” webpage. These data are ready to be used, containing already the neighborhoods, their ID and the geographical coordinates. We need to add the data of the neighborhoods of the suburb boroughs. These further information was taken from the list of all the French towns (obtained from “SQL.sh”) containing the Borough number, the ID of the town and their name together to with the geographical coordinates. Only the town of Boroughs 92, 93 and 94 and the seven towns of boroughs 91 and 95 have been retained. Since the geographical coordinates of these suburb neighborhoods were not accurate, more accurate coordinates have been gathered scrapping the Wikipedia page of each suburb neighborhood. Finally, the downtown data have been merged to the ones of the suburbs to obtain the dataframe containing the data of “Paris Metropole”.

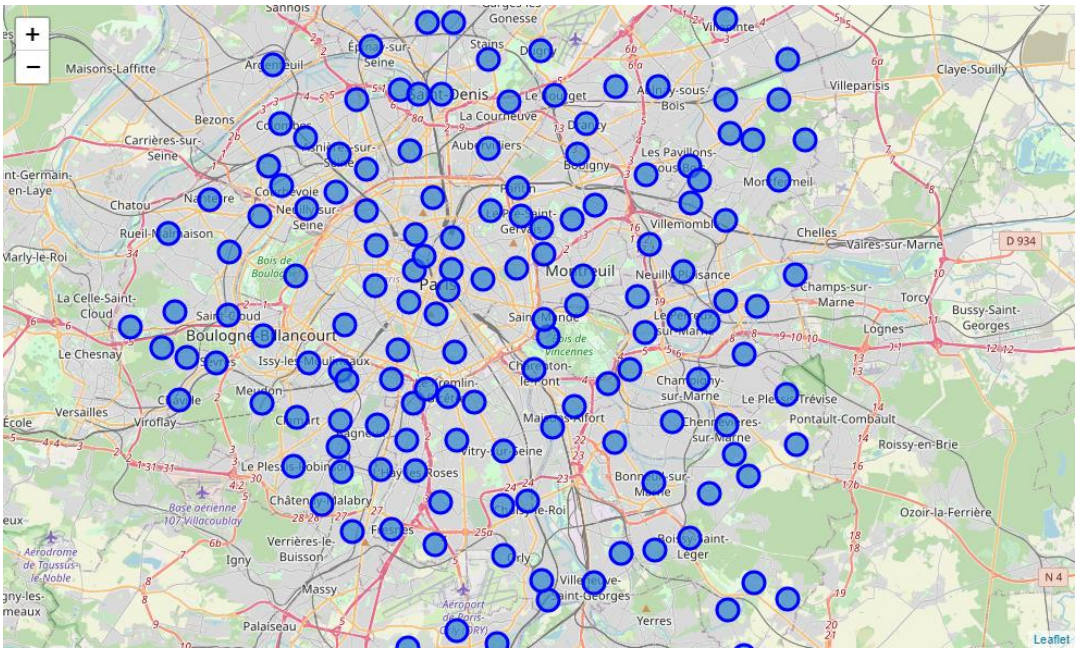

Figure 1: Map of Paris with all its neghborhoods

- **Rome**:

The territory of Rome is divided in 155 zones (“zone urbanistiche”). Each of this zone can be considered a neighborhood. More neighborhoods are regrouped in 15 boroughs (Municipi). The list of the neighborhoods and their correspondent boroughs were retrieved scrapping the Wikipedia page “https://it.wikipedia.org/wiki/Zone_urbanistiche_di_Roma”. To obtain the geographical coordinates of each neighborhoods it has been necessary to scrap the Wikipedia page of each single neighborhood.

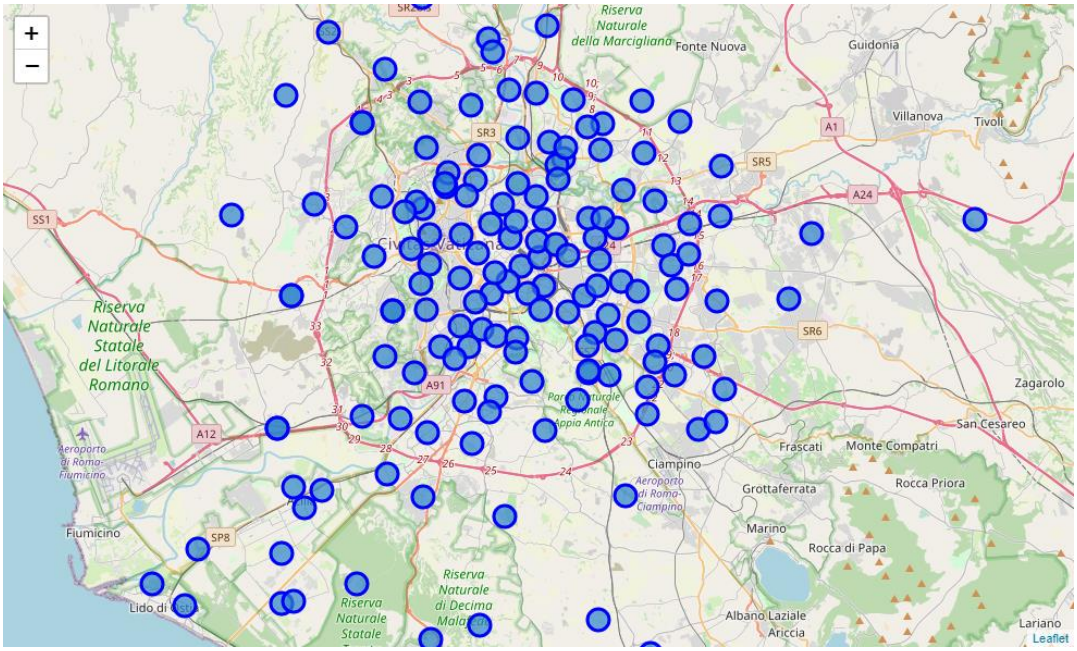

Figure 2: Map of Rome with all its neighborhoods

- **Venues**:

The venues of each neighborhood of the two towns were retrieved using the Foursquare API. Since the different neighborhoods composing the two towns can have very different extensions (particularly for Rome), the radius to gather the venues for each neighborhood has been imposed as the half of the distance with the closest surrounding neighborhood.

Furthermore, to better analyze the type of the venues and improve the clustering of the neighborhoods, the categories of the venues obtained from Foursquare have been re-collected in the following macro–categories.

Asian Restaurant, European Restaurant, French Restaurant, Exotic Restaurant, Other Food Place, Fast Food Restaurant, Sport place, School/Education, Shop/Store, Discount Store, Lux Store, Grocery, Hotel, Low cost accommodation, Touristic, Airport, Bar, Coffee Shop, Market, Games, Entertainment, Opera/Theater, Offices, IT, Transports, Park, Services, Business, Medical, Building, Auto/Moto, Farm, Factory.

3. METHODOLOGY

After creation of the dataframe of the two towns and the dataframe containing the venues data for each neighborhood of the two towns. The clustering of the territory of the two towns is made by using the K-mean clustering tool. The model is fit on the dataframe containing all the venues macro-categories of all the neighborhoods of the two towns.

A preliminary analysis was performed in order to choose the most appropriate number of clusters to divided the territory of the two cities. To do this, the intra-cluster inertia has been analyzed. The inertia has been calculated for different k values determining the elbow point characterizing the optimal k value to be retained for the clustering.

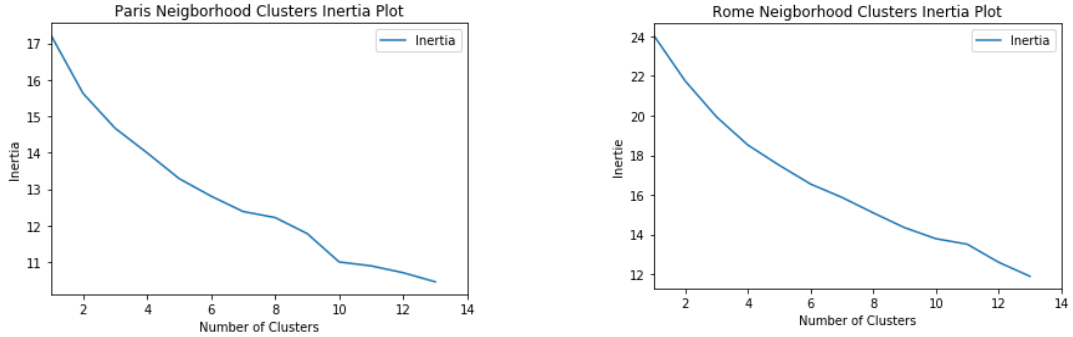

Figure 3: Clustering inertia variation with k for the two cities

For Paris an elbow point is observed for k=5, 7 and 10. The lowest values of k was retained for the analysis. For Rome the inertia behavior is smoother than the one of Paris. A soft elbow point appears for k=6. This value of k was then retained for Rome. The inertia for Rome is whatever more elevated than for Paris.

Once found the optimal k for the two cities (k=5 for Paris and k=6 for Rome), the territory of these two cities was clustered. The next step of the analysis is to understand the characteristics of the clusters inside the same town, detecting the residential zones, the industrial ones, the commercial ones looking at the top 10 venues of each neighborhood. Once understood the territory characteristics of the two towns, the similar clusters of the two towns have been compared (i.e. the two downtown cluster, the two residential ones, the two commercial ones).

4. RESULTS

The clustered maps of Rome and Paris are represented in Figure 4.

Paris is made of a big cluster covering the downtown (cluster0), surrounded by cluster3 and cluster2 which are equally distributed around the downtown. There are then two small clusters, one (cluster1) closest to the downtown and the other (cluster4) farther.

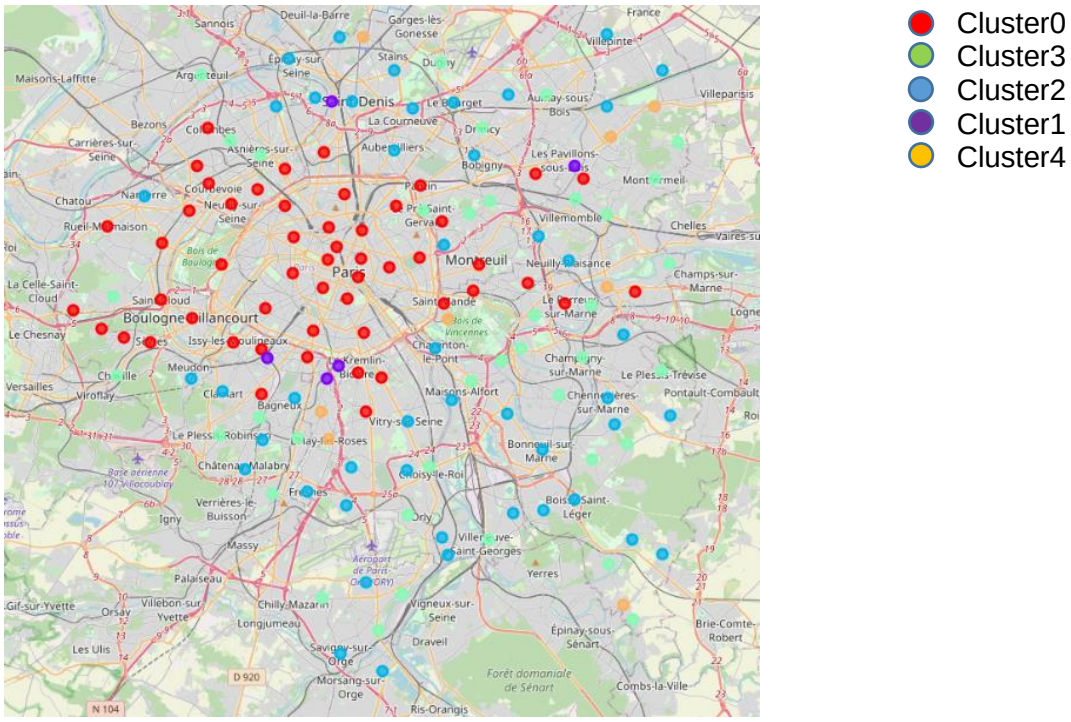

Figure 4: Clusters of Paris and Rome

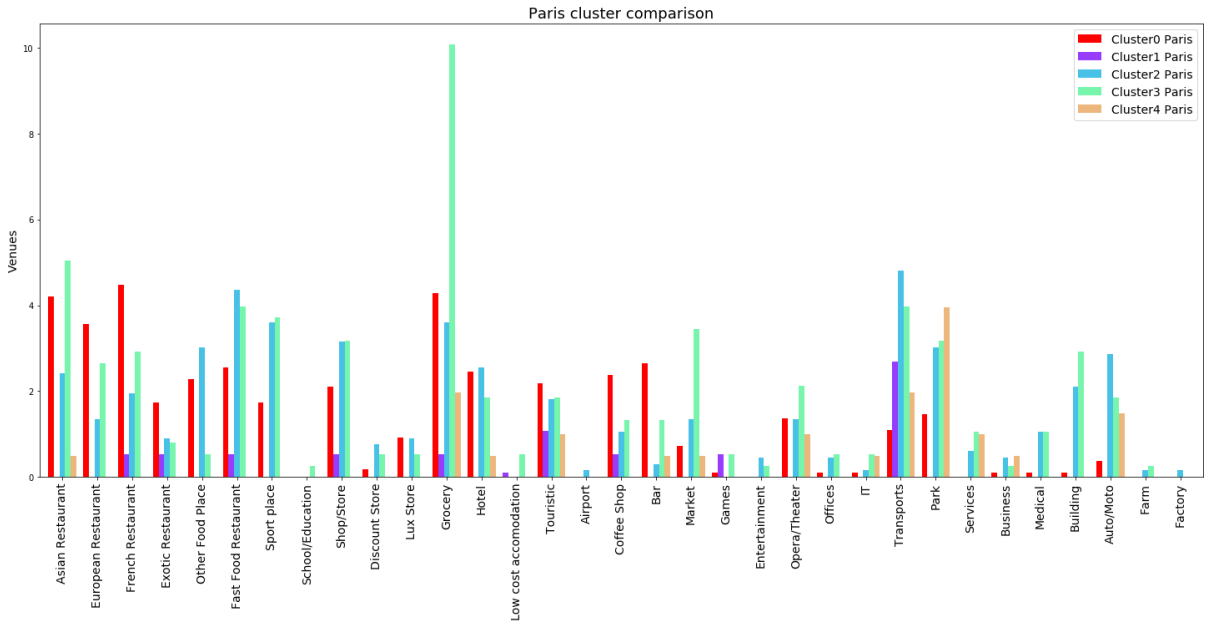

Figure 5: Percentage of the venues for each cluster of Paris

Cluster0 and cluster2 have similar venues of the residential category (restaurants, bar, groceries, stores). However in cluster0 there is a lack of services, offices, farm and factories

that instead exist in cluster2. Cluster2 has then a residential and business and services aim. The same observation can be made for cluster3. Again in this cluster both residential and commercial activities are present. In particular most part of the groceries and markets venues are located in this cluster. Cluster1 includes small venues for restaurants, touristic, games and transport. It is more neighborhoods where people moves to do activities or to visit some places. Cluster4 gathers the business and services activities together with some groceries and markets. The park venues are also larger than in other clusters.

In Rome the clustering is more complex. The downtown is divided in two clusters (cluster4 and cluster2). Cluster2 propagates quite far away from the city center and it is surrounded by cluster10 that develops in the near suburb of the city. Two smaller clusters are also present in the suburb (cluster 5 and cluster1) while another small cluster (cluster3) is present far from the town.

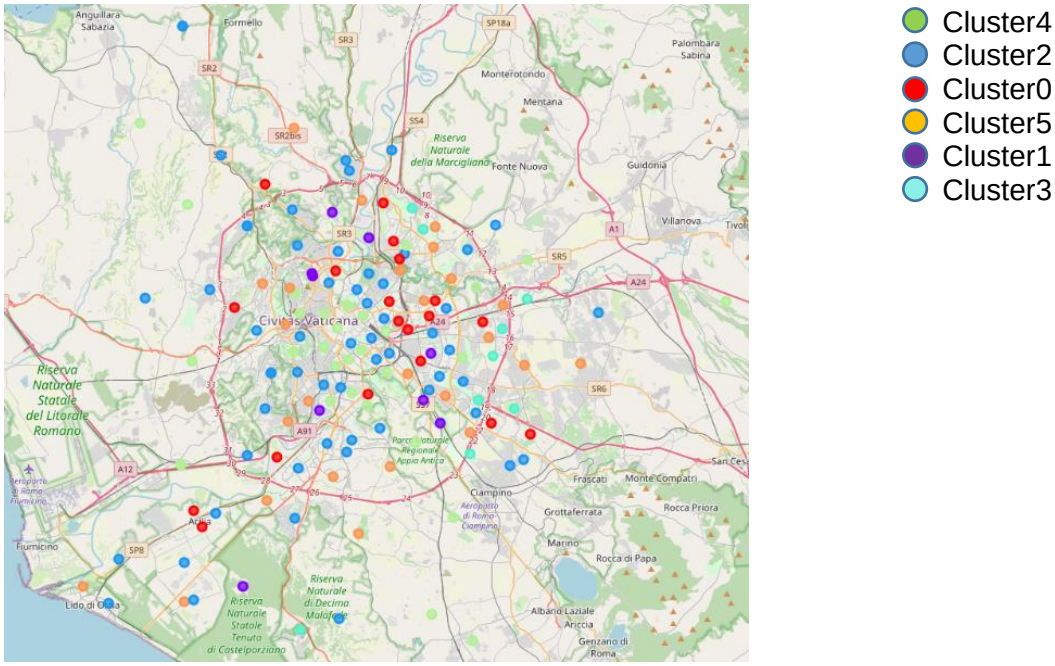

Figure 6: Map of Rome clustered

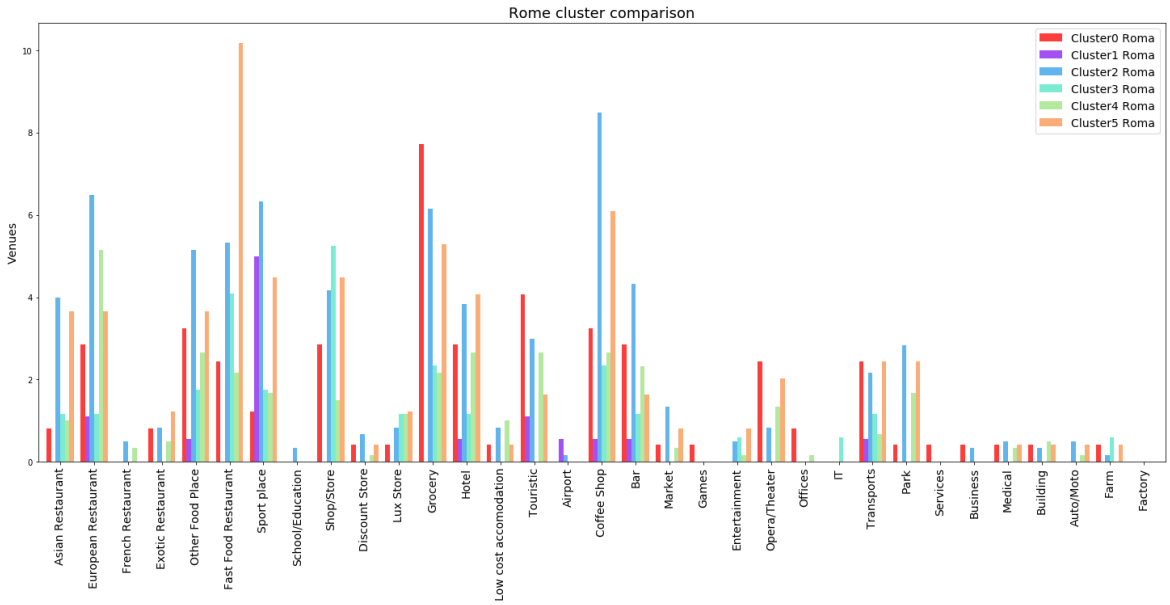

Figure 7 : Percentage of the top10 venues for each cluster of Rome

Cluster4 together with cluster2 have the characteristic of touristic and residential zones with presence of restaurant, stores and also some services. Cluster0 is a kind of mixed touristic /working-class residential cluster. The touristic venues are more elevated than in downtown. There is a high concentration of European restaurant, fast food and other food places. The groceries and stores are also elevated but not the lux stores. The services are all distributed in this cluster. Cluster5 is a resident/commercial zone. Stores and restaurant are present with a peak in the fast food. Groceries and coffee shop venues are also elevated. Cluster3 is a suburb commercial cluster. The restaurant venues are not elevated (most part are fast food) while there is a high concentration of stores and groceries. Services, business and medical are not present while the IT activities are concentrated in this cluster. Farm are also present. Cluster1 is a suburb cluster where the most part of the venues are for the sport place. Some restaurants venues exist also but there are neither services nor shops.

5. DISCUSSION

The different type of clusters can be directly compared between the two cities. The downtown clusters (cluster0 for Paris and cluster4 and 2 for Rome) presents globally the same characteristics for the two cities with presence of restaurants, stores, groceries and touristic place. The cluster2 of Rome is whatever more popular with a larger venues in discount stores, groceries and markets.

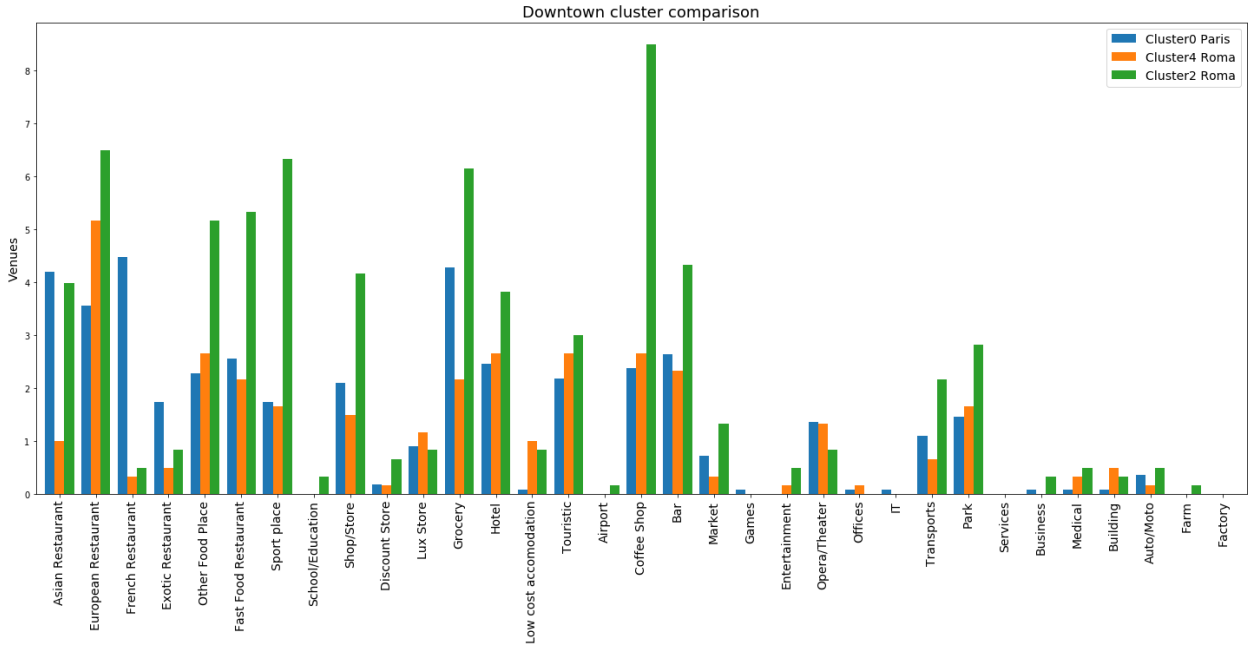

Figure 8: Downtown cluster comparisons

As mixed residential zones, cluster3 of Paris and cluster0 of Rome are similar. In both there are the both restaurant , store, and services. In Paris there are IT activities that are not present in Rome.

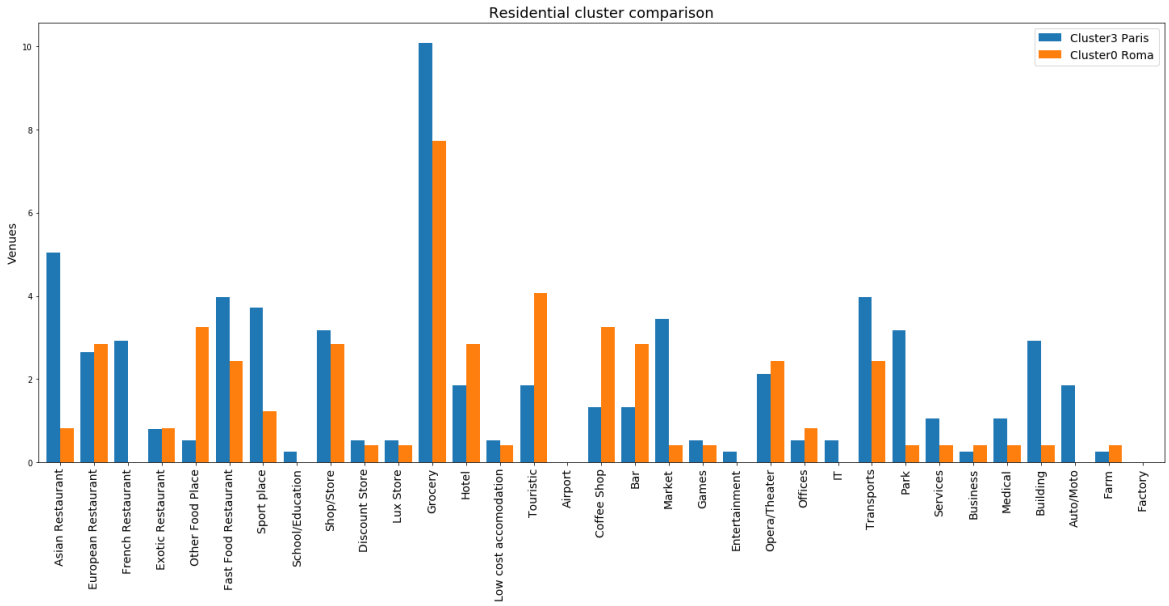

Figure 9: Residential venues (close suburb) cluster comparison

In the suburb cluster we can identify cluster2 for Paris and clusters 2 and 5 for Rome. The only difference between the two cities is the present of Offices, IT and services in Paris that are not present in Rome.

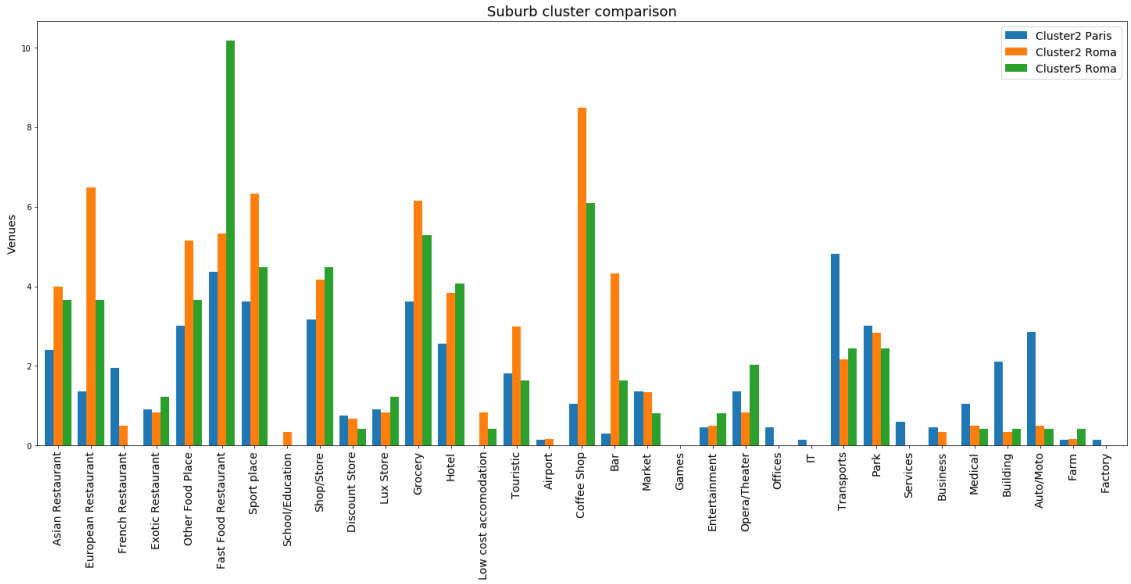

Figure 10: Suburb venues clusters comparison

The remaining clusters are the ones of the far suburb and they are quite different. In Paris in one of these clusters there is the presence of restaurant, tourstic, park and some services and business acticities. In Rome, cluster 3 is similar the two clusters of Paris with the presence of some restaurant, groceries and some IT activities. These clusters can be considered as mixed commercial/industrial places. Cluster 1 of Rome instead contains some touristic and restaurant venues but most part of the activities is linked to the sport places and to the airport. There are neither shops nor groceries. This cluster can be considered as an outsider.

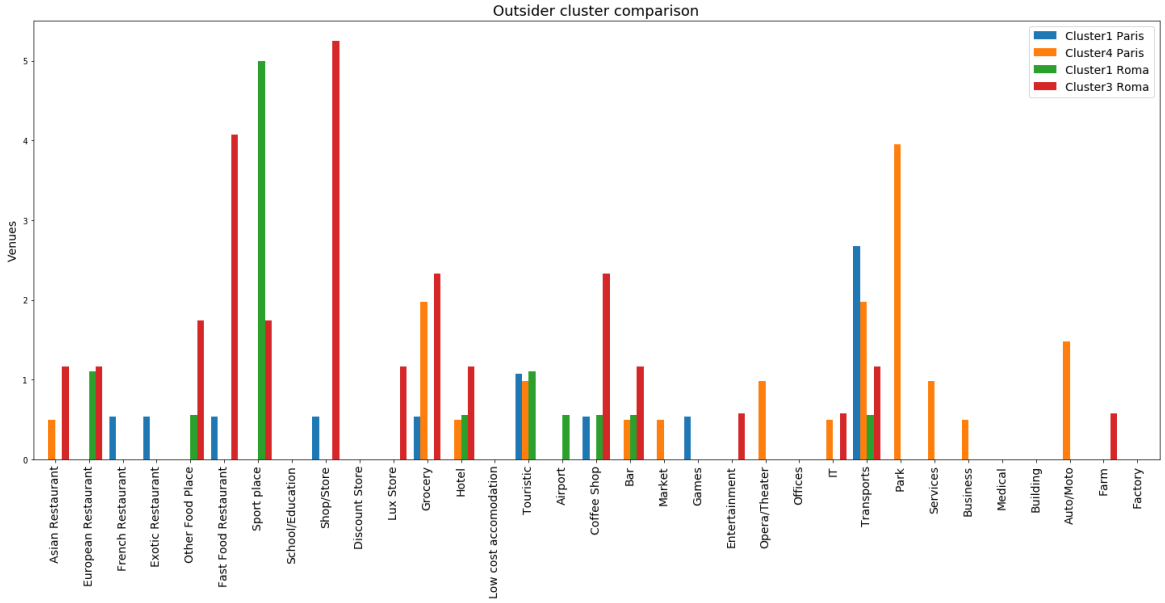

Figure 11: Far suburb venues clusters

6. CONCLUSIONS

The two cities Rome and Paris even if similar in their context have some different characteristics of their territory. In the downtown and in the close suburb both the cities have globally the same characteristics (touristic, restaurant and shop venues mainly). In the suburbs in Paris the zones are mixed with the presence with also business, IT and services that are not present in Rome. In Rome these zones are just working-class residential/commercial and also partially touristic. In the far suburb there is still the presence of affair activities in Paris while in Rome besides some restaurant activities these zones are characterized by the strong presence of sport places.

In Rome then there is not an affair zone as it is in Paris. In Rome most part of the territory is characterized by the touristic, residential and services. In the far suburbs in Paris there are still some residential zones while in Rome there isolated places exploited principally to do sport activities.

These differences are also due to the larger extension of the Rome territory with respect to the one of Paris and the lower density of population. Furthermore these results are probably in part skewed by the confinement for the COVID virus.