The four most liveable cities of Europe

Konstantoula Eleni

June 28, 2019

1 Introduction

1.1 Background

The idea for this problem was first conceived while looking for European cities to migrate to. More and more Greek graduates look for cities to migrate to due to the economic crisis in Greece. Although the economy in other countries, especially the ones referred to as the most livable is more or less at the same level, therefore the information regarding the similarities and the differences regarding the neighborhoods of these cities is more interesting.

1.2 Problem

Vienna (Austria), Copenhagen (Denmark), Zurich (Switzerland) and Frankfurt (Germany) are the most livable cities in Europe according to The Global Livability Index of 2018. They are located in different countries, they are multicultural, and two of them, Vienna and Copenhagen are capitals of their respective countries.

We want to explore how similar they are, to find out if there is any pattern in the city's view of restaurants, parks and places that make these cities the most livable in the world, or even discover the different aspects between them .

2 Data acquisition and cleaning

2.1 Data sources

I first consulted The Global Liveability Index of 2018 to obtain the four best cities to live in Europe, after which we will consult the neighborhoods of these cities using data available on the internet.

This project will rely mainly on the publicly available data from Wikipedia as well as Foursquare.

In order to plot the neighborhoods on the map, we will also be using the geographical co-ordinates of the several cities' neighborhoods.

I scraped information of several Wikipedia pages regarding each city's neighborhoods using the Beautiful soup package.
The main data sources used were :

- Wikipedia – Districts for each city were obtained.
- Foursquare API – Venues, types and locations in every neighborhood were obtained using Foursquare API.

2.2 Data Cleaning

Data scraped from multiple sources were first constructed in four tables, one for each city. I decided to use districts since there were not detailed information in trustworthy sites regarding more detailed neighborhoods. So the areas that will be considered are labeled neighborhoods but are maybe larger than the traditional concept of a neighborhood.

3 Methodology

In this project we will put our efforts on exploring the most common venues in the four most livable cities in Europe.

Step 1 : We have collected the required data: name and location of each neighborhood in all four cities. Then after importing the locations and names of all neighborhoods we combined all four cities and their venues in one table to be able to use clustering.

Step 2: After checking how many venues and how many unique categories can be curated from all the returned venues we analyze each neighborhood. By selecting the ten most common venues for each neighborhood we started clustering neighborhoods.

S**tep 3 :** In this last step we will present in maps of each city the clusters (using k-means clustering and folium) and by comparing the and examining the clusters made by the ten most common venues of all four cities we ended with the results shown in Wordclouds for better visualization.

4 Exploratory Data Analysis

4.1 Importing neighborhoods , mapping and clustering

We start by importing the neighborhoods by scrapping data with Beautifulsoup and then adding the coordinates of each neighborhood of each city.

	City	District	Latitude	Longitude
0	Vienna	Innere Stadt	48.2091	16.37
1	Vienna	Leopoldstadt	48.2006	16.4269
2	Vienna	Landstraße	48.1936	16.3963
3	Vienna	Wieden	59.675	14.5209
4	Vienna	Margareten	48.1881	16.3534
5	Vienna	Mariahilf	48.1955	16.347
6	Vienna	Neubau	48.2019	16.3491
7	Vienna	Josefstadt	48.2109	16.3474
8	Vienna	Alsergrund	48.2251	16.3584
9	Vienna	Favoriten	48.1734	16.3779
10	Vienna	Simmering	48.1631	16.458
11	Vienna	Meidling	48.1778	16.3307
12	Vienna	Hietzing	48.1785	16.253
13	Vienna	Penzing	48.2257	16.2228
14	Vienna	Rudolfsheim-Fünfhaus	48.1955	16.3263
15	Vienna	Ottakring	48.215	16.3022
16	Vienna	Hernals	48.2354	16.2842
17	Vienna	Währing	48.2341	16.3216
18	Vienna	Döbling	48.2613	16.3285
19	Vienna	Brigittenau	48.2432	16.3757
20	Vienna	Floridsdorf	48.2798	16.4121
21	Vienna	Donaustadt	48.2144	16.4861
22	Vienna	Liesing	48.1411	16.2939

	City	District	Latitude	Longitude
0	Copenhagen	Christianshavn	55.6724	12.5886
1	Copenhagen	Holmen	58.6352	9.12557
2	Copenhagen	Nørrebro	55.6959	12.545
3	Copenhagen	Østerbro	55.7051	12.5826
4	Copenhagen	Nordhavn	55.705	12.591
5	Copenhagen	Vesterbro	55.6682	12.5591
6	Copenhagen	Carlsberg	49.504	8.04175
7	Copenhagen	Kongens Enghave	55.7719	12.5587
8	Copenhagen	Amager West	55.6244	12.6039
9	Copenhagen	Ørestad	55.6288	12.5793
10	Copenhagen	Amager East	55.6244	12.6039
11	Copenhagen	Valby	55.6618	12.517
12	Copenhagen	Vanløse	55.6856	12.4888
13	Copenhagen	Brønshøj	55.7041	12.4985
14	Copenhagen	Husum	54.4854	9.05382
15	Copenhagen	Tingbjerg	55.3171	9.32328
16	Copenhagen	Bispebjerg	55.711	12.534
17	Copenhagen	Frederiksberg	55.678	12.5326

	City	District	Latitude	Longitude
0	Frankfurt	Innenstadt I	50.7197	12.4975
1	Frankfurt	Innenstadt II	48.37	10.9058
2	Frankfurt	Innenstadt III	48.3711	10.9216
3	Frankfurt	Bornheim/Ostend	50.1231	8.7042
4	Frankfurt	Süd	48.7069	21.2606
5	Frankfurt	West	0.50904	34.5731
6	Frankfurt	Mitte-West	50.7185	12.4843
7	Frankfurt	Nord-West	49.1827	9.49965
8	Frankfurt	Mitte-Nord	50.7232	12.4935
9	Frankfurt	Nord-Ost	43.8749	135.483
10	Frankfurt	Ost	1.17872	38.6026
11	Frankfurt	Kalbach-Riedberg	50.1766	8.63208
12	Frankfurt	Nieder-Erlenbach	50.2088	8.7068
13	Frankfurt	Harheim	50.1856	8.69045
14	Frankfurt	Nieder-Eschbach	50.2013	8.66715
15	Frankfurt	Bergen-Enkheim	50.1577	8.76256

	City	District	Latitude	Longitude
0	Zurich	Affoltern	47.2782	8.45215
1	Zurich	Albisrieden	47.3749	8.48466
2	Zurich	Altstadt	31.5046	34.4641
3	Zurich	Altstetten	47.3874	8.48606
4	Zurich	Aussersihl	47.3787	8.5212
5	Zurich	Enge	47.3618	8.52871
6	Zurich	Fluntern	47.3768	8.55877
7	Zurich	Hirslanden	47.3629	8.56427
8	Zurich	Höngg	47.4017	8.49771
9	Zurich	Hottingen	47.3697	8.55508
10	Zurich	Oberstrass	47.3857	8.54912
11	Zurich	Oerlikon	47.4104	8.54459
12	Zurich	Riesbach	49.0871	13.1119
13	Zurich	Schwamendingen	47.405	8.57241
14	Zurich	Seebach	48.9693	7.99134
15	Zurich	Unterstrass	47.3914	8.53957
16	Zurich	Wiedikon	47.3663	8.51071
17	Zurich	Wipkingen	47.3935	8.5286
18	Zurich	Witikon	47.3583	8.59063
19	Zurich	Wollishofen	47.3424	8.53071

By using Circelmarkers we can see the neighborhoods of each city.

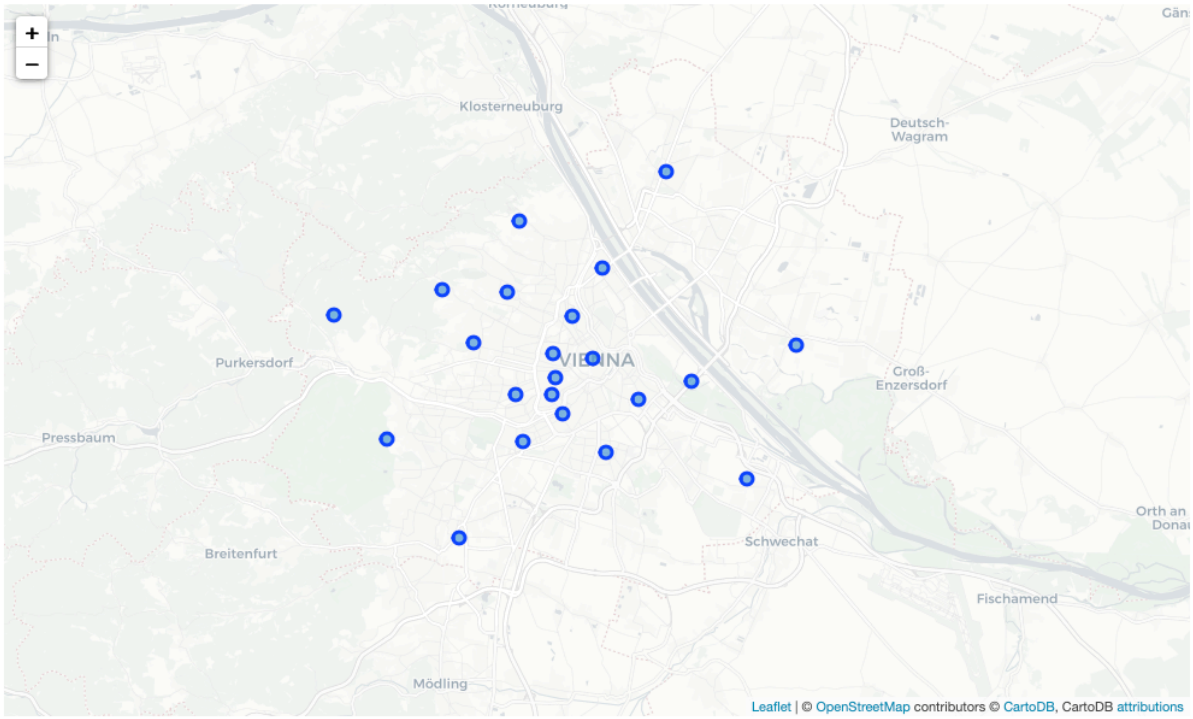


Figure 1 Vienna

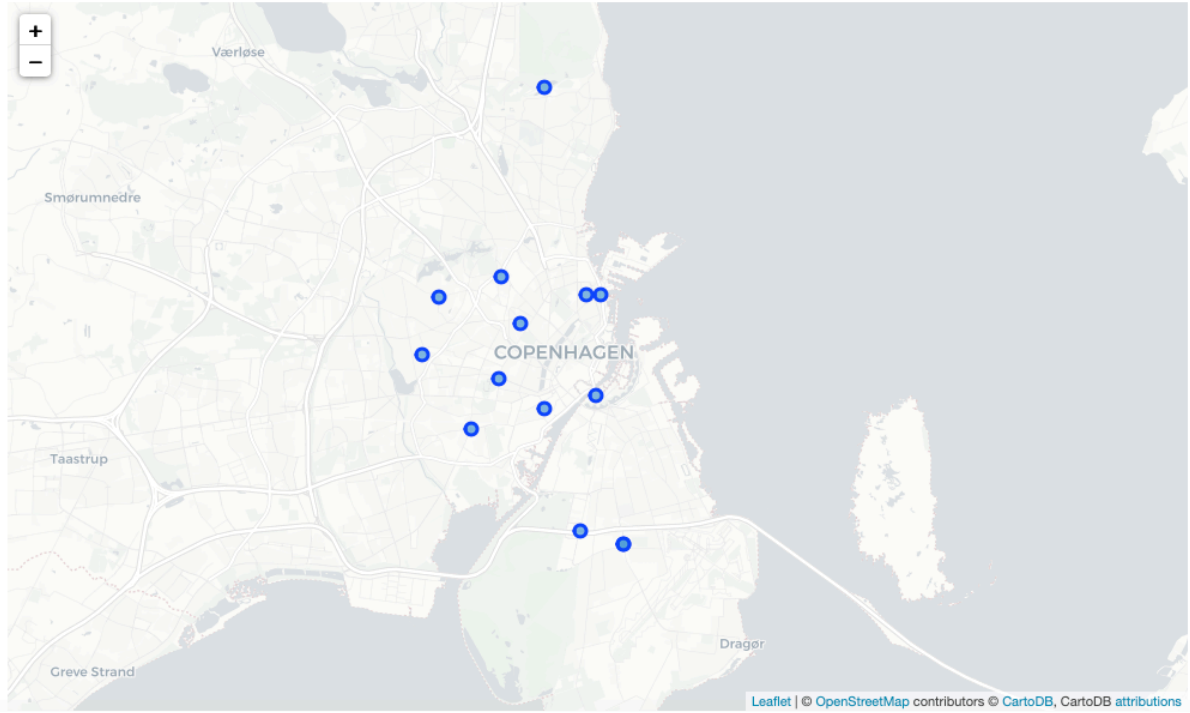


Figure 2 Copenhagen

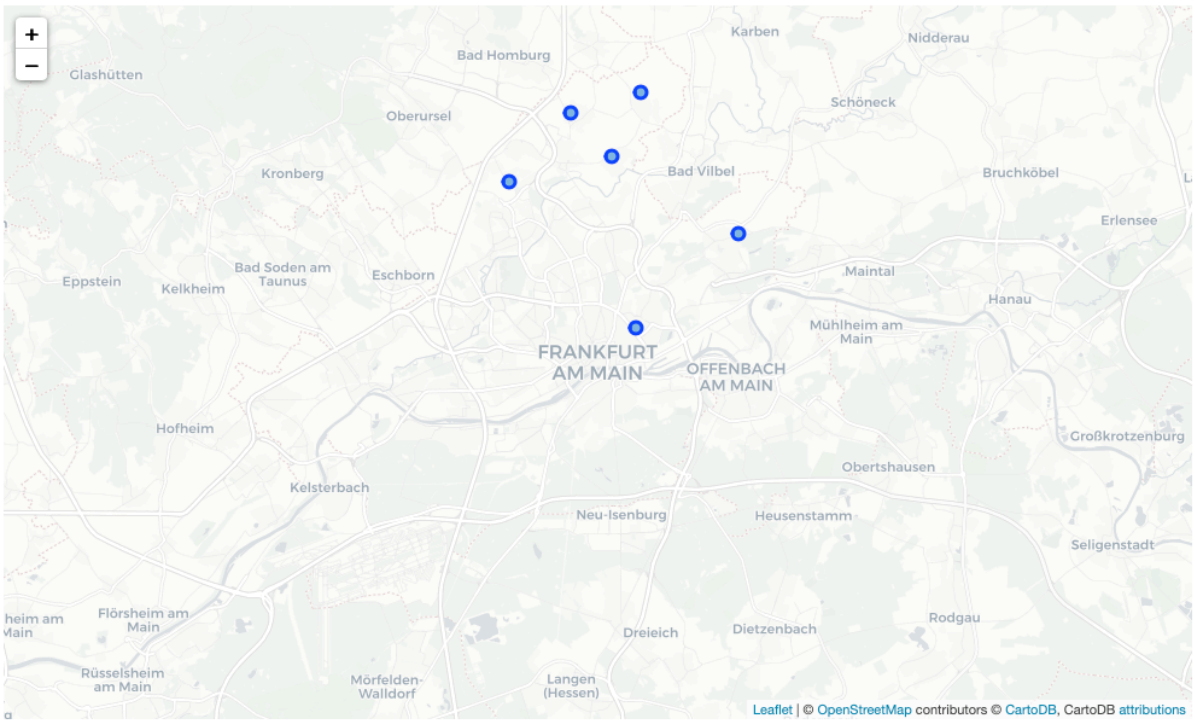


Figure 3 Frankfurt

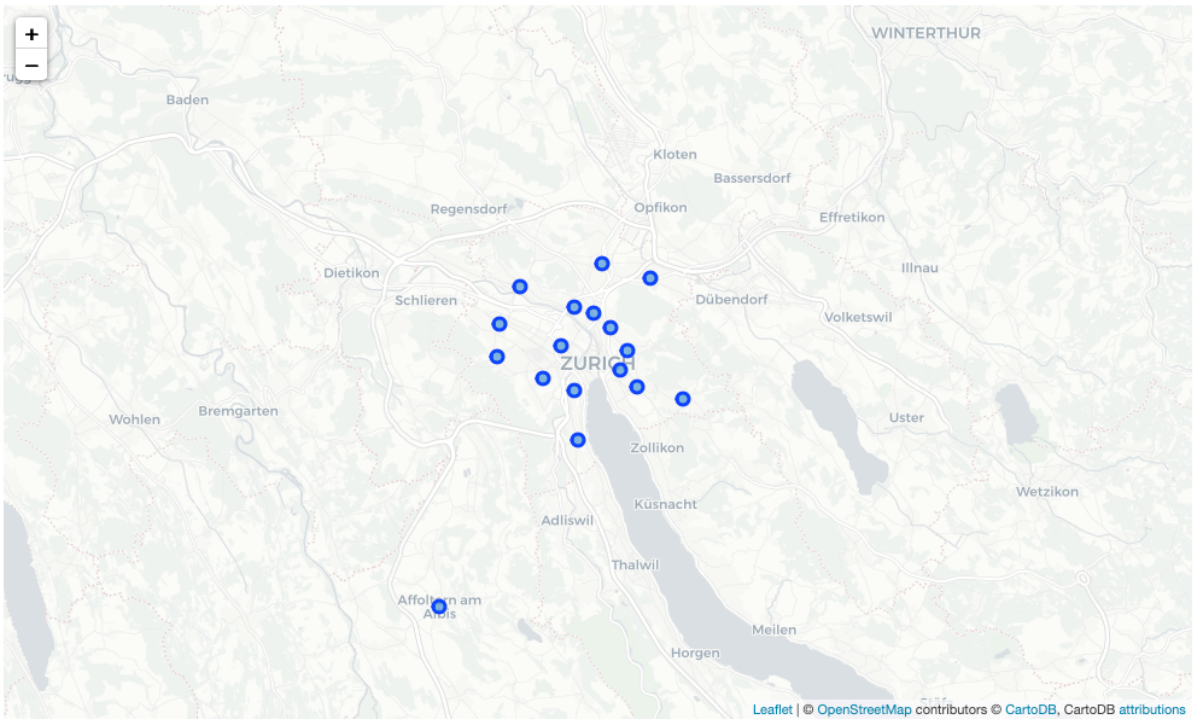


Figure 4 Zurich

For exploring the neighborhoods using foursquare API , we first got all the venues that are in the neighborhoods. There were 249 unique categories curated from all the returned venues.

4.2 Clustering

By analyzing each neighborhood we were able to finally create a dataframe that could display the top 10 venues for each neighborhood.

	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	Alsergrund	Supermarket	Café	Hotel	Asian Restaurant	Japanese Restaurant	Indian Restaurant	Brewery	Vietnamese Restaurant	Restaurant	Italian Restaurant
1	Brigittenau	Bus Stop	Plaza	Hostel	Gym	Smoke Shop	Ice Cream Shop	Park	Chinese Restaurant	Supermarket	Drugstore
2	Donaustadt	Food & Drink Shop	Dessert Shop	Soccer Field	Restaurant	Indian Restaurant	Bakery	Café	Bus Stop	Sushi Restaurant	Dumpling Restaurant
3	Döbling	Winery	Wine Bar	Bus Stop	Campground	Doner Restaurant	Flower Shop	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Falafel Restaurant
4	Favoriten	Turkish Restaurant	Fast Food Restaurant	Café	Restaurant	Plaza	Bakery	Supermarket	Lounge	Dessert Shop	Cigkofte Place

Figure 5 Neighborhoods ssorted by venues (first 5 entries)

After a couple of trials to see which number of kclusters was the most appropriate we decided to cluster the neighborhoods in four clusters.
Now let's see those clusters in each city

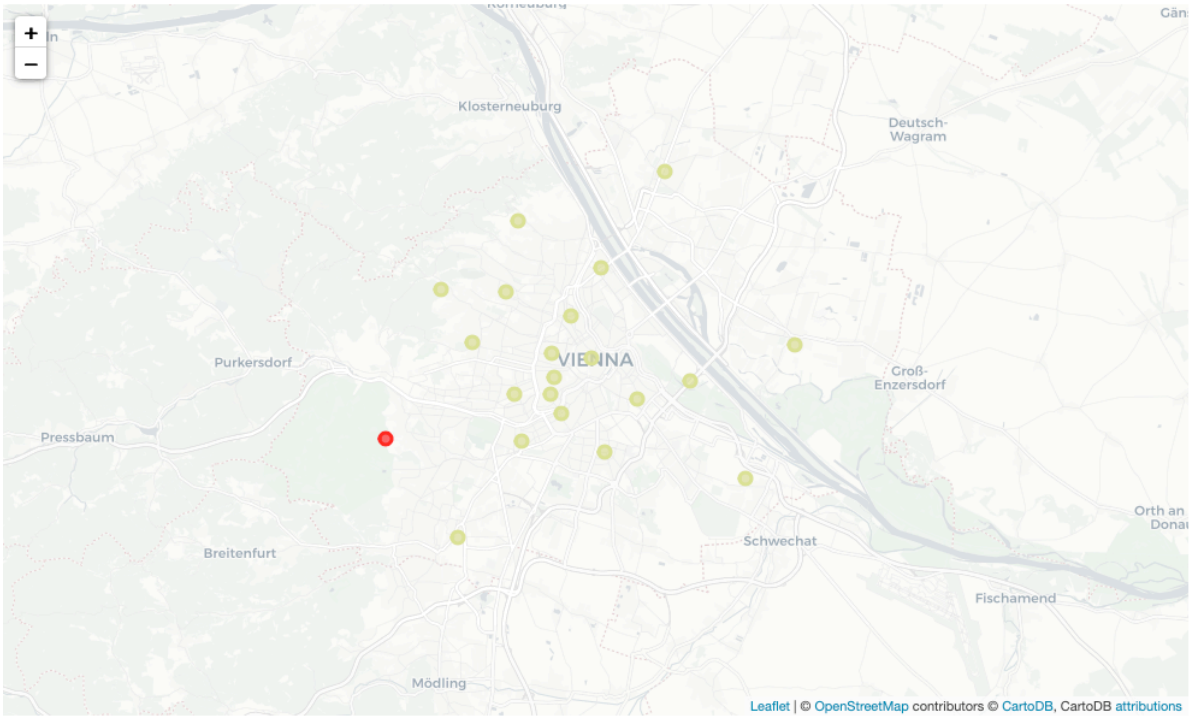


Figure 6 Vienna clusters

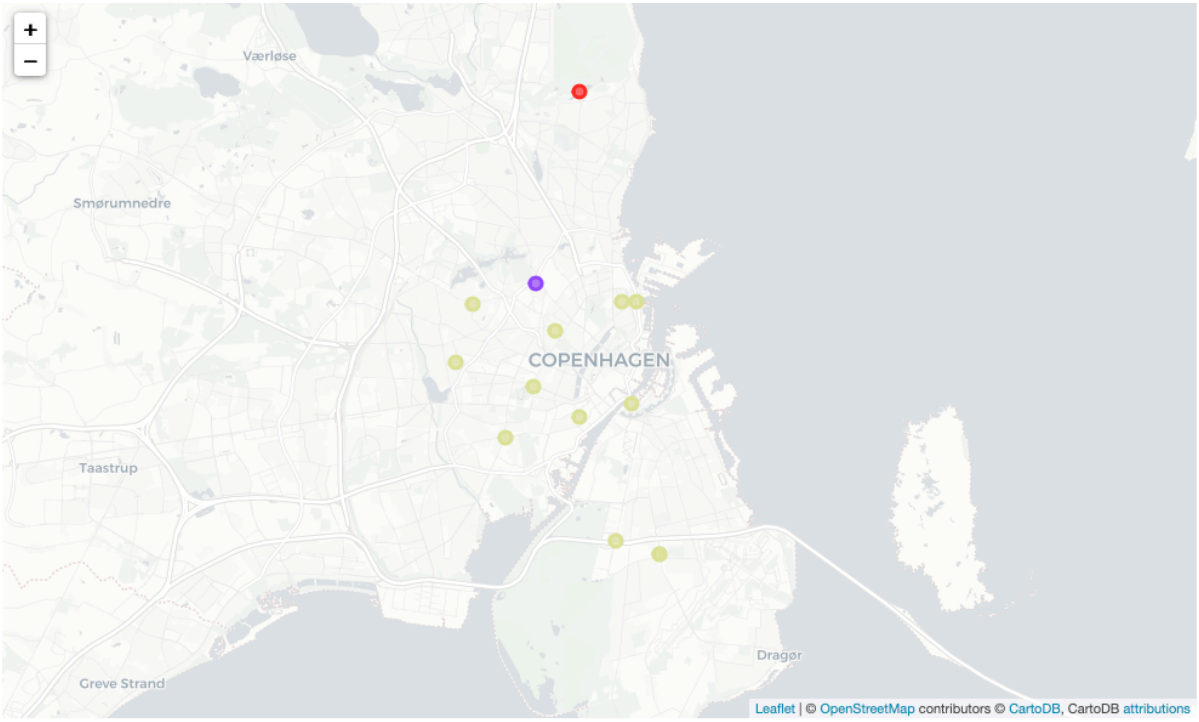


Figure 7 Copenhagen clusters

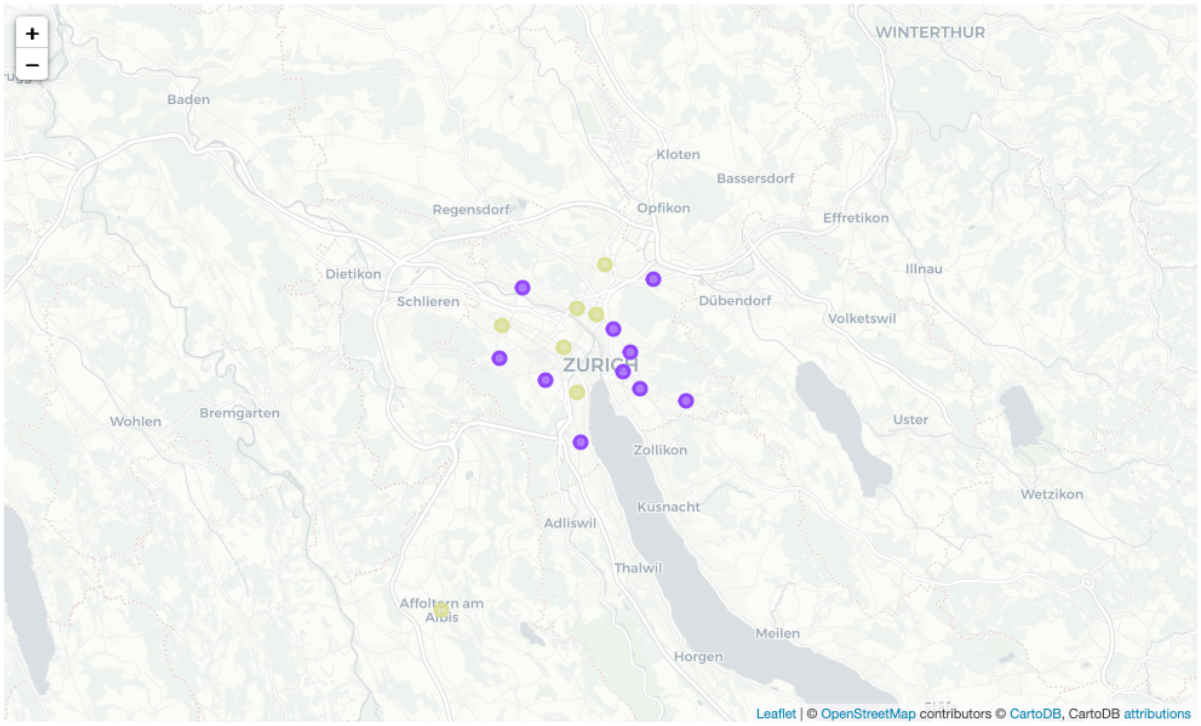


Figure 8 Zurich clusters

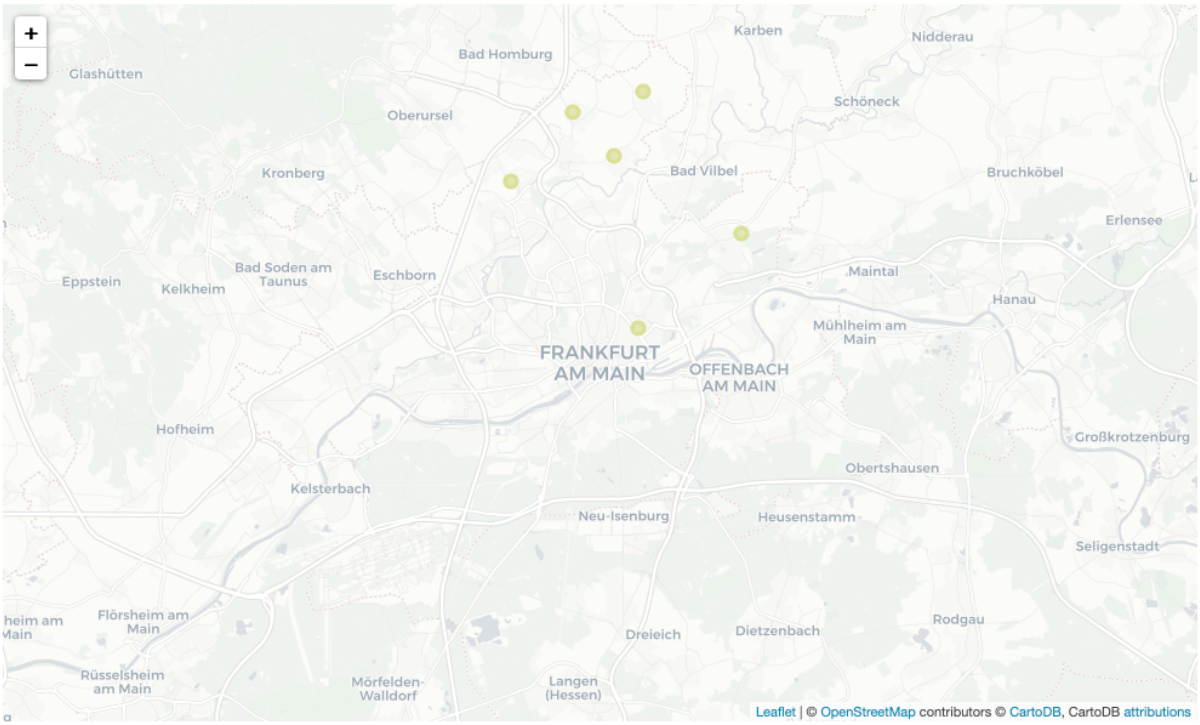


Figure 9 Frankfurt clusters

Now we explored for each city the top 5 most common venues and as it can be seen below in Copenhagen and in Vienna Café is the most common venue while in Frankfurt is the German Restaurant and in Zurich the Tram Station.

```
----Copenhagen----
                  venue  freq
0                 Café  0.06
1          Pizza Place  0.05
2               Bakery  0.04
3  Scandinavian Restaurant  0.04
4          Coffee Shop  0.04


----Frankfurt----
              venue  freq
0  German Restaurant  0.08
1              Café  0.07
2       Supermarket  0.07
3         Drugstore  0.04
4            Bakery  0.04


----Vienna----
               venue  freq
0               Café  0.07
1        Supermarket  0.05
2              Hotel  0.05
3  Italian Restaurant  0.04
4         Restaurant  0.04


----Zurich----
               venue  freq
0       Tram Station  0.07
1  Italian Restaurant  0.07
2        Supermarket  0.06
3    Swiss Restaurant  0.05
4        Bus Station  0.05
```

So we decided to sort the cities' venues in three clusters and map them in Europe.

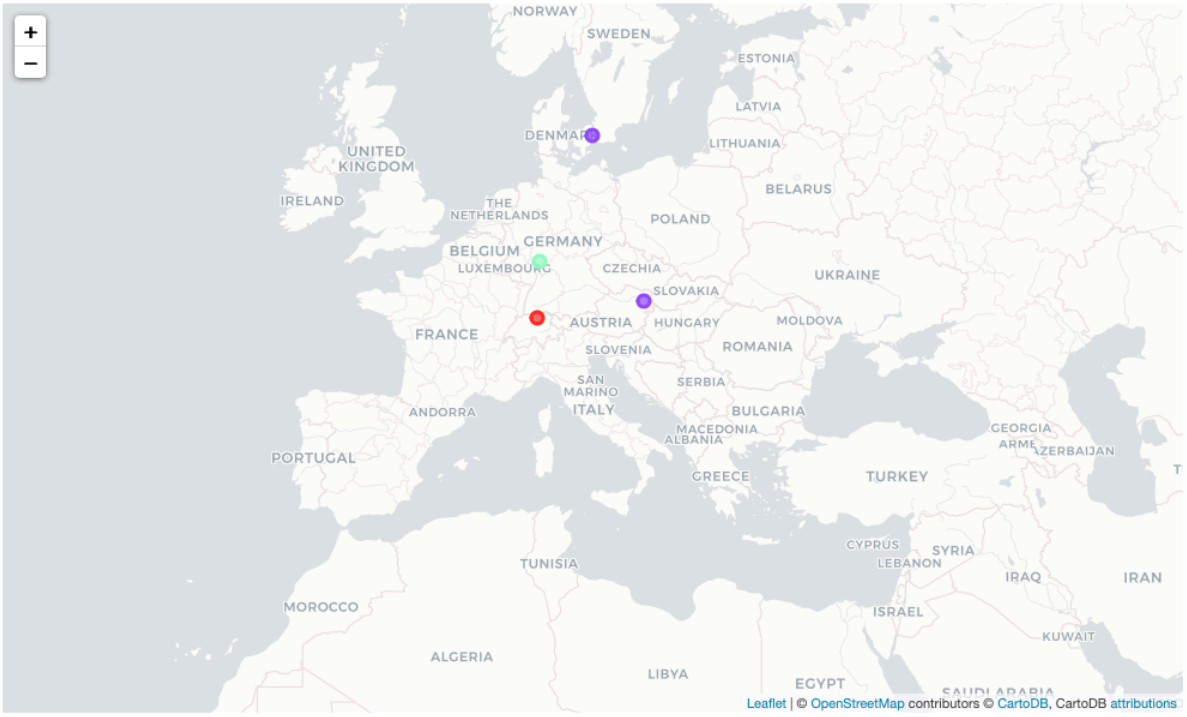
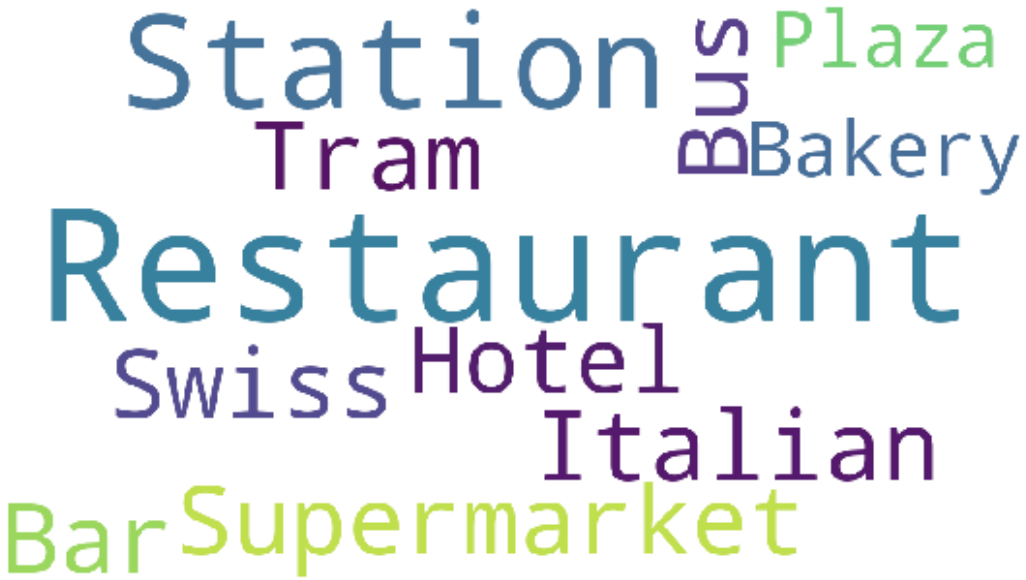


Figure 10 All four cities ' clusters

5 Results

In cluster 0 are the majority of the districts of the city of Zurich , that stand out by the large number of Tram Stations.



In cluster 1 are the majority of the districts of Vienna and Copenhagen.

And finally in cluster 2 the districts of Frankfurt

6 Conclusion

Well, with this research, we can conclude that Vienna and Copenhagen are quite similar in terms of their neighborhoods, with several of their main places in common such as Café, Hotels and Italian Restaurants that are in the top five places of the two cities, we note that despite the dissimilarity of Zurich and Frankfurt with these two cities, it is still at the top inhabited cities of the world in Europe, finally, we can also notice that despite multicultural cities, there are similar neighborhoods between the three, which is of great help for those who want to visit these places and is already accustomed to some of them.

7 Discussion

When we compared the neighborhoods, we saw that there are neighborhoods that flee from the pattern of their respective cities, which is very interesting and that Frankfurt has a great similarity between its neighborhoods.

When comparing the cities, there are a large number of restaurants among them, but individually, Vienna and Copenhagen stand out by number of Café and Zurich by the number of Tram Stations and Frankfurt by the number of German restaurants.

We could also observe that the two top cities in the ranking of livable cities, Vienna and Copenhagen are quite similar.