Capstone Project – The Battle of Neighborhoods

Restaurants in Zürich

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Prologue

Every time I have visided a city I have been interested in understanding where to eat local food and where to eat based on different cuisines. Often when visiting cities on foot, a map is extremely handy to avoid wandering around. The last time I went in Zürich I looked for an Indian restaurant. My project was born from this.

Introduction / Business problem

Zürich is the largest city in Switzerland with a population of over 428'700, constantly growing in recent years. 1,5 million people live in Zürich agglomeration. The city is well known for being one of the world's largest financial centres, but it is also famous for its luxurious lifestyles, shopping (Did you never heard of Bahnofstrasse?) and chocolates. Last but not least, it's one of the top ranked cities to live in the world!

The City of Zürich is divided into 12 districts and 34 quarters. The goal of this project is to give you a map that answers this question: Where to eat Italian, Chinese, Vegan or any other dish you would like to eat?

If you are traveling to this city for work or a short break, or if you've just moved to this city, knowing where to eat Indian, Italian or Mediterranean can make your stay more enjoyable.

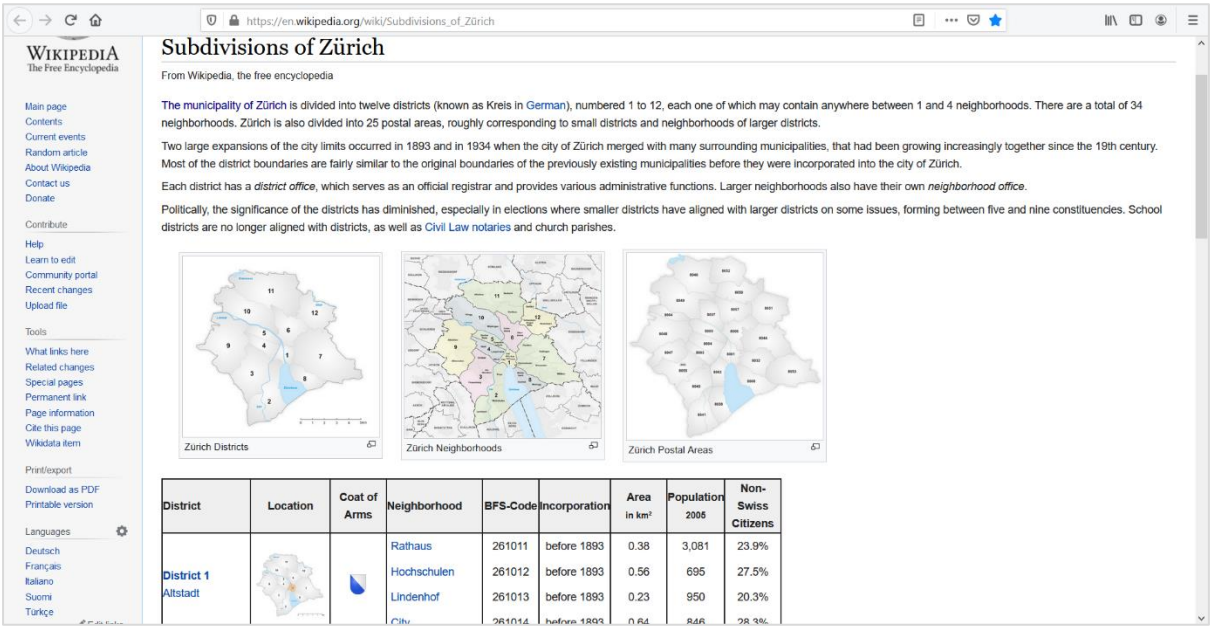
Data description

For this project I used two data source: Foursquare, as requested by the course, and Wikipedia.

- From Wikipedia I extracted the list of the 12 districts in Zürich.
    - Reference link: https://en.wikipedia.org/wiki/Subdivisions_of_Z%C3%BCrich

- From Foursquare I extracted the list of restaurants for each district.
    - For each restaurant I retrieved the following fields: ID, Name, location and category.
    - Here the reference link with API details: https://developer.foursquare.com/docs/api-reference/venues/details

Here the overview of Wikipedia page



Subdivisions of Zürich

From Wikipedia, the free encyclopedia

The municipality of Zürich is divided into twelve districts (known as Kreis in German), numbered 1 to 12, each one of which may contain anywhere between 1 and 4 neighborhoods. There are a total of 34 neighborhoods. Zürich is also divided into 25 postal areas, roughly corresponding to small districts and neighborhoods of larger districts.

Two large expansions of the city limits occurred in 1893 and in 1934 when the city of Zürich merged with many surrounding municipalities, that had been growing increasingly together since the 19th century. Most of the district boundaries are fairly similar to the original boundaries of the previously existing municipalities before they were incorporated into the city of Zürich.

Each district has a *district office*, which serves as an official registrar and provides various administrative functions. Larger neighborhoods also have their own *neighborhood office*.

Politically, the significance of the districts has diminished, especially in elections where smaller districts have aligned with larger districts on some issues, forming between five and nine constituencies. School districts are no longer aligned with districts, as well as Civil Law notaries and church parishes.

Zürich Districts | Zürich Neighborhoods | Zürich Postal Areas

District	Location	Coat of Arms	Neighborhood	BFS-Code	Incorporation	Area in km²	Population 2005	Non-Swiss Citizens
District 1 Altstadt			Rathaus	261011	before 1893	0.38	3,081	23.9%
			Hochschulen	261012	before 1893	0.56	695	27.5%
			Lindenhof	261013	before 1893	0.23	950	20.3%
			City	261014	before 1893	0.64	846	28.3%

Here an example of Indian restaurant: https://foursquare.com/explore?mode=url&near=Z%C3%BCrich%2C%20Switzerland&nearGeoId=72057594040585832&q=Indian

Methodology

In this section I will explain what I did and how I did it.

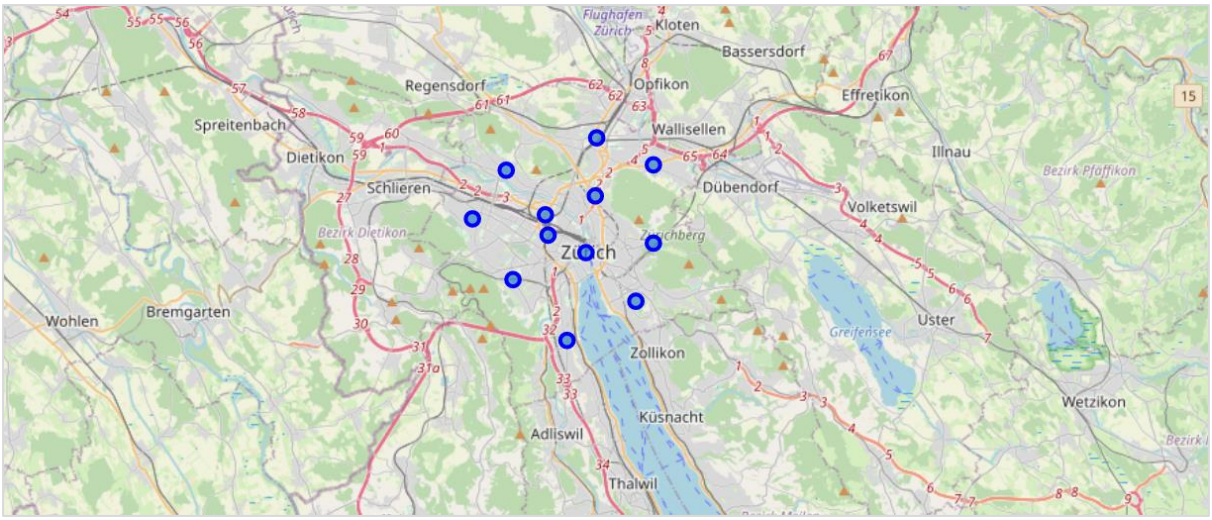
I created a dataframe with the districts of Zürich. I used the Pandas dataframe read function.

The dataframe has the following 4 columns: *District*, *Neighboorhood*, *Longitude and Latitude*

Here the figure with the first 5 rows.

	District	Neighborhood	Latitude	Longitude
0	District 1	Rathaus, Hochschulen, Lindenhof, City	47.3742	8.5396
1	District 2	Wollishofen, Leimbach , Enge	47.3441	8.5300
2	District 3	Alt-Wiedikon, Friesenberg, Sihlfeld	47.3651	8.5026
3	District 4	Werd, Langstrasse, Hard	47.3801	8.5207
4	District 5	Gewerbeschule, Escher Wyss, Unterstrass, Obers...	47.3873	8.5190

Then I used **Geopy** to get the spacial coordinates of Zürich and created the map using the **Folium** library to visualize geographic details of Zürich and its districts. Each point on the map is a District of the city.



Then I utilized the **Foursquare API** to explore the districts. I designed the limit as 100 venue and the radius 750 meter for each district from their given latitude and longitude coordinates. I got a list of 679 venues for a total of 169 unique categories.

I grouped the venues by district and extracted only those of my interest. For the purpose of this project I extracted all the venues ending with the word "Restaurant". Each restaurant belongs to one of the unique 36 restaurant categories.

I saved the data as pandas dataframe.

Here the Figure representing the dataframe

	Neighborhood	American Restaurant	Argentinian Restaurant	Asian Restaurant	Chinese Restaurant	Cuban Restaurant	Doner Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant	French Restaurant	Indi Res
0	District 1	0.000000	0.010000	0.000000	0.010000	0.01	0.000000	0.00000	0.000000	0.000000	0.000000	0.010000	0.00
1	District 10	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.00000	0.000000	0.033333	0.000000	0.000000	0.00
2	District 11	0.017857	0.017857	0.000000	0.017857	0.00	0.000000	0.00000	0.017857	0.017857	0.000000	0.000000	0.03
3	District 12	0.000000	0.000000	0.047619	0.000000	0.00	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.00
4	District 2	0.033333	0.000000	0.000000	0.000000	0.00	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.00
5	District 3	0.000000	0.000000	0.048780	0.000000	0.00	0.000000	0.02439	0.024390	0.000000	0.000000	0.000000	0.00
6	District 4	0.000000	0.000000	0.040000	0.030000	0.00	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.01
7	District 5	0.000000	0.000000	0.020000	0.000000	0.00	0.000000	0.00000	0.000000	0.010000	0.000000	0.000000	0.01
8	District 6	0.000000	0.000000	0.037037	0.000000	0.00	0.018519	0.00000	0.018519	0.000000	0.000000	0.000000	0.01
9	District 7	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.00000	0.000000	0.000000	0.034483	0.000000	0.00
10	District 8	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.00000	0.000000	0.000000	0.000000	0.030769	0.01
11	District 9	0.000000	0.000000	0.018868	0.018868	0.00	0.000000	0.00000	0.000000	0.018868	0.000000	0.018868	0.00

The next step was to write a function to sort the venues in descending order and to create a new Dataframe showing the top 10 venues for each district.

Here the Figure representing the top 10 restaurants type for each District.

	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	District 1	Vegetarian / Vegan Restaurant	Swiss Restaurant	Restaurant	Thai Restaurant	Chinese Restaurant	French Restaurant	Cuban Restaurant	Mediterranean Restaurant	Spanish Restaurant	Sushi Restaurant
1	District 10	Italian Restaurant	Fast Food Restaurant	Mexican Restaurant	Asian Restaurant	Chinese Restaurant	Cuban Restaurant	Doner Restaurant	Ethiopian Restaurant	Falafel Restaurant	Korean Restaurant
2	District 11	Restaurant	Italian Restaurant	Vietnamese Restaurant	Thai Restaurant	Swiss Restaurant	Indian Restaurant	Kebab Restaurant	Middle Eastern Restaurant	Argentinian Restaurant	Chinese Restaurant
3	District 12	Swiss Restaurant	Italian Restaurant	Asian Restaurant	Thai Restaurant	Restaurant	Vietnamese Restaurant	Fast Food Restaurant	Indonesian Restaurant	Indian Restaurant	French Restaurant
4	District 2	Restaurant	Mediterranean Restaurant	Swiss Restaurant	American Restaurant	Thai Restaurant	Tibetan Restaurant	Argentinian Restaurant	Asian Restaurant	Chinese Restaurant	Cuban Restaurant

After this step I used unsupervised learning K-means algorithm to cluster the Districts. K-Means algorithm is one of the most common cluster method of unsupervised learning.

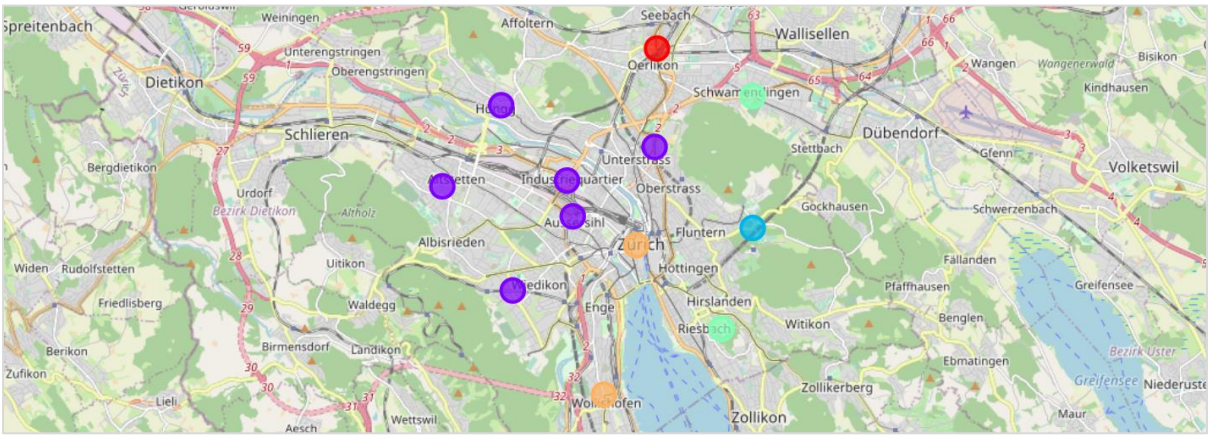
I chose k=5, without using the Elbow method in determining the number of clusters in the data set.I added the Latitude and Longitude column to the dataframe.

Here the figure with the final table.

	Neighborhood	City parts	Latitude	Longitude	Cluster Labels	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
0	District 1	Rathaus, Hochschulen, Lindenhof, City	47.3742	8.5396	4	Vegetarian / Vegan Restaurant	Swiss Restaurant	Restaurant	Thai Restaurant	Chinese Restaurant	French Restaurant	Cuban Restaurant	Mediterrar Restaurar
1	District 2	Wollishofen, Leimbach , Enge	47.3441	8.5300	4	Restaurant	Mediterranean Restaurant	Swiss Restaurant	American Restaurant	Thai Restaurant	Tibetan Restaurant	Argentinian Restaurant	Asian Restaurar
2	District 3	Alt-Wiedikon, Friesenberg, Sihlfeld	47.3651	8.5026	1	Asian Restaurant	Restaurant	Italian Restaurant	Thai Restaurant	Swiss Restaurant	Ethiopian Restaurant	Molecular Gastronomy Restaurant	Falafel Restaurar
3	District 4	Werd, Langstrasse, Hard	47.3801	8.5207	1	Italian Restaurant	Swiss Restaurant	Asian Restaurant	Thai Restaurant	Japanese Restaurant	Chinese Restaurant	Middle Eastern Restaurant	Vietnames Restaurar
4	District 5	Gewerbeschule, Escher Wyss, Unterstrass, Obers...	47.3873	8.5190	1	Italian Restaurant	Swiss Restaurant	Japanese Restaurant	Asian Restaurant	Spanish Restaurant	Restaurant	Vietnamese Restaurant	Modern European Restaurar

Results

Finally I created the map with the 5 clusters. Each cluster is represented by a different color.



I assigned a name to each Cluster.

Cluster 1 – The Middle East and Asia Cluster

	City parts	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
10	Affoltern, Oerlikon, Seebach	Restaurant	Italian Restaurant	Vietnamese Restaurant	Thai Restaurant	Swiss Restaurant	Indian Restaurant	Kebab Restaurant	Middle Eastern Restaurant	Argentinian Restaurant	Chinese Restaurant

Cluster 2 – The Italian Cluster

	City parts	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	Alt-Wiedikon, Friesenberg, Sihlfeld	Asian Restaurant	Restaurant	Italian Restaurant	Thai Restaurant	Swiss Restaurant	Ethiopian Restaurant	Molecular Gastronomy Restaurant	Falafel Restaurant	Fondue Restaurant	Indonesian Restaurant
3	Werd, Langstrasse, Hard	Italian Restaurant	Swiss Restaurant	Asian Restaurant	Thai Restaurant	Japanese Restaurant	Chinese Restaurant	Middle Eastern Restaurant	Vietnamese Restaurant	Moroccan Restaurant	Indian Restaurant
4	Gewerbeschule, Escher Wyss, Unterstrass, Obers...	Italian Restaurant	Swiss Restaurant	Japanese Restaurant	Asian Restaurant	Spanish Restaurant	Restaurant	Vietnamese Restaurant	Modern European Restaurant	Fast Food Restaurant	Indian Restaurant
5	Unterstrass, Oberstrass	Italian Restaurant	Asian Restaurant	Middle Eastern Restaurant	Swiss Restaurant	Doner Restaurant	Indian Restaurant	Paella Restaurant	Falafel Restaurant	Restaurant	Thai Restaurant
8	Albisrieden, Altstetten	Italian Restaurant	Thai Restaurant	Swiss Restaurant	Japanese Restaurant	Mexican Restaurant	Middle Eastern Restaurant	French Restaurant	Fast Food Restaurant	Mediterranean Restaurant	Spanish Restaurant
9	Hoengg, Wipkingen	Italian Restaurant	Fast Food Restaurant	Mexican Restaurant	Asian Restaurant	Chinese Restaurant	Cuban Restaurant	Doner Restaurant	Ethiopian Restaurant	Falafel Restaurant	Korean Restaurant

Cluster 3 – The European Cluster

	City parts	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
6	Fluntern, Hottingen, Hirslanden, Witikon	Restaurant	Swiss Restaurant	Italian Restaurant	Molecular Gastronomy Restaurant	Fondue Restaurant	South American Restaurant	Falafel Restaurant	Indonesian Restaurant	Indian Restaurant	French Restaurant

Cluster 4 – The Swiss Cluster

	City parts	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
7	Seefeld, Mhlebach, Weinegg	Swiss Restaurant	Italian Restaurant	Restaurant	French Restaurant	Mediterranean Restaurant	Sushi Restaurant	Mexican Restaurant	Indian Restaurant	Modern European Restaurant	Fast Food Restaurant
11	Saatlen, Schwamendingen Mitte, Hirzenbach	Swiss Restaurant	Italian Restaurant	Asian Restaurant	Thai Restaurant	Restaurant	Vietnamese Restaurant	Fast Food Restaurant	Indonesian Restaurant	Indian Restaurant	French Restaurant

Cluster 5 – The World Cluster

	City parts	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	Rathaus, Hochschulen, Lindenhof, City	Vegetarian / Vegan Restaurant	Swiss Restaurant	Restaurant	Thai Restaurant	Chinese Restaurant	French Restaurant	Cuban Restaurant	Mediterranean Restaurant	Spanish Restaurant	Sushi Restaurant
1	Wollishofen, Leimbach , Enge	Restaurant	Mediterranean Restaurant	Swiss Restaurant	American Restaurant	Thai Restaurant	Tibetan Restaurant	Argentinian Restaurant	Asian Restaurant	Chinese Restaurant	Cuban Restaurant

Discussion

As stated before, Zürich is a big city with and walking around to find the desired restaurant can be an activity that takes long time.

Of course the analysis can be redone using a different K value and different methods of classification can be applied.

The code is available on my personal GitHub account, and can be easily used to proceed with further analysis.

Conclusion

The objective of this study has been achieved. Now you are ready to explore Zürich.
Bon appetit!