

Capstone Project – The Battle of Neighborhoods

Restaurants in Zürich

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15/03/2021

Prologue

Every time I visit a city I am interested in understanding where to eat local foods and where to eat based on different cuisines. Often visiting cities on foot, a map is extremely convenient to avoid wandering around. The last time I was in Zürich I was looking 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 Bahnhofstrasse?) 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 provide you with a map that answers these questions: In which district can you find the largest number of Indian Restaurants and any other type of restaurant? Where to eat Vietnamese, 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, Thai or a steak can make your stay more enjoyable.

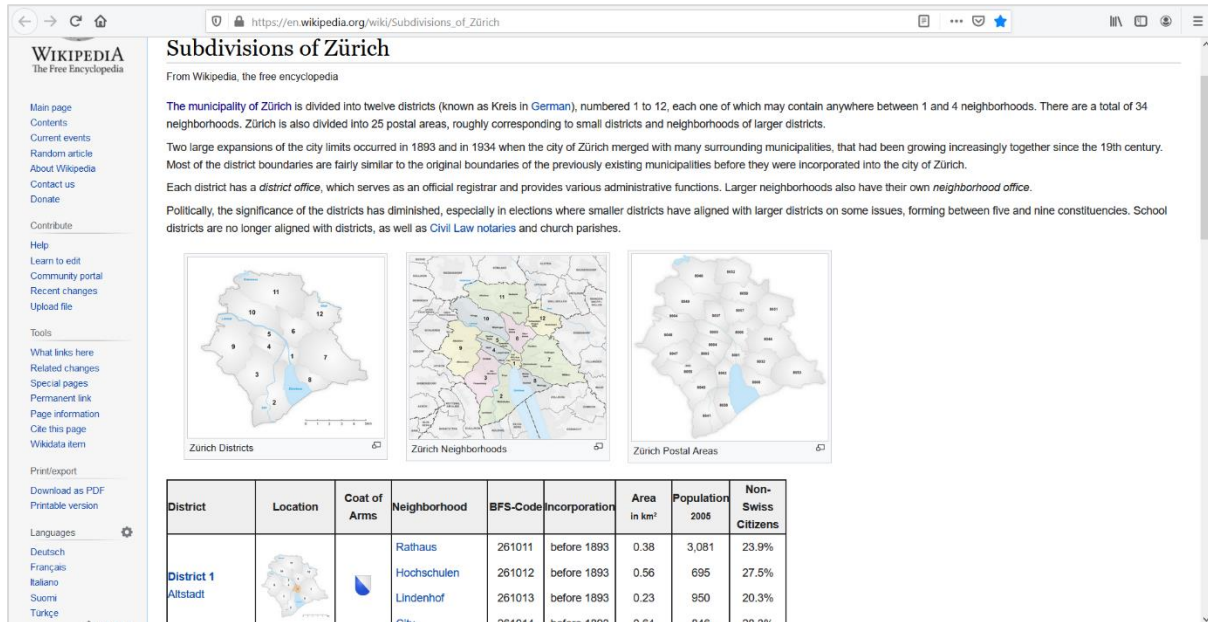
Data description

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

- From Wikipedia I will get the list of the 12 districts in Zürich.
 - Here is the reference link:
https://en.wikipedia.org/wiki/Subdivisions_of_Z%C3%BCrich
- From Foursquare I will get the list of restaurants for each district.
 - For each restaurant I will retrieve 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



Here an example of Indian restaurant:

<https://foursquare.com/explore?mode=url&near=Z%C3%BCrich%2C%20Switzerland&near=GeoId=72057594040585832&q=Indian>

Methodology

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

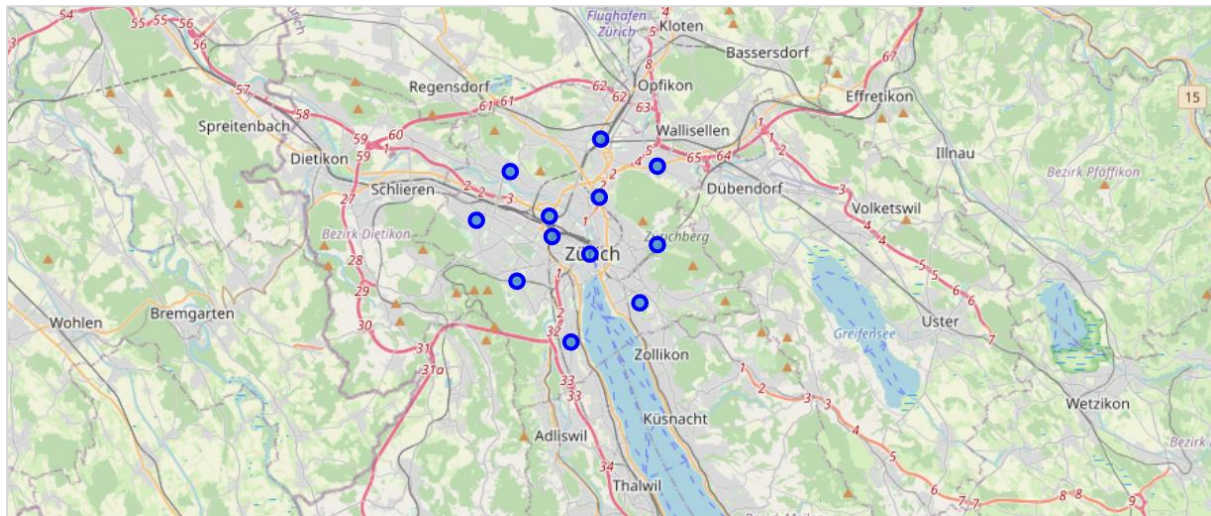
The final table is composed of the following 4 columns: *District*, *Neighborhood*, *Longitude* and *Latitude*

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 package.

Here the figure with the map of Zürich. Each point is a District of the city.



The next step was to use Foursquare API to get the list of venues for each District. I used a limit of 100 venues and radius of 750 meters.

I got a list of 679 venues for a total of 169 unique categories.

I grouped the venues for each District and then extracted only the venues in which I was interested. For this analysis I extracted the venues that ends with the word Restaurants. 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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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	0.000000	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 the new dataframe and display the top 10 venues (restaurants) for each District.

Here the Figure representing the top 10 restaurants type for each District. The figure represents the first 5 rows.

	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

I chose to apply an unsupervised machine learning algorithm. In this case I applied the k-means clustering algorithm from the scikit-learn package.

I chose k=5, without using the Elbow method in determining the number of clusters in the data set.

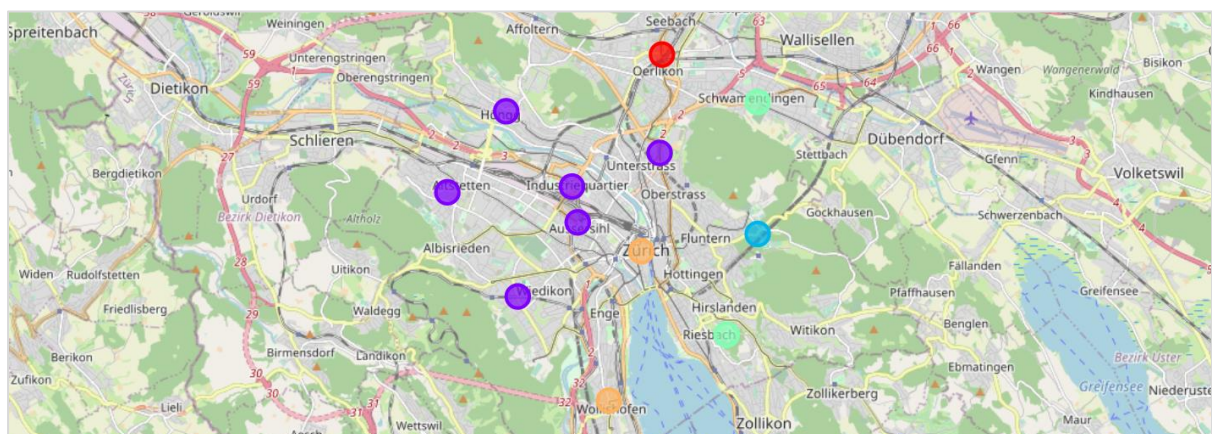
I added the Latitude and Longitude column to the dataframe.

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	Mediterranean Restaurant
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 Restaurant
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 Restaurant
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	Vietnamese Restaurant
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 Restaurant

Results

I used folium to create the map with the 5 clusters. Here the figure representing the 5 clusters.



Each cluster is represented by a different color for a total of 5 colors.

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 Global 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-means 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 and to go to the right District to eat the desired dish!

A special thanks to all the IBM and Coursera Team for the fantastic courses!