The Battle of Neighborhood

Capstone Project, Coursera
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1. Introduction

Paris, also called a city of love, is a capital city of France and each year attracts several million tourists from around the world. France is also well known for its cuisine. Given the mix of nationalities living in and visiting its capital city, there is demand for other world cuisines than traditional French one. We will explore the data from Foursquare in order to help an investor decide where to open a restaurant.

To achieve this, we will look at two datasets:

- Foursquare's venue data in order to understand what restaurants are popular in Paris,
- Paris neighborhood data from opendata.paris.fr that provides geolocation information about 20 administrative districts of Paris, called 'arrondissements':

(source: https://parismap360.com/paris-arrondissement-map)

Neighborhood Number	Neighborhood Name
I.	Louvre
II.	Bourse
III.	Temple
IV.	Hôtel de Ville
V.	Panthéon
VI.	Luxembourg
VII.	Palais Bourbon
VIII.	Elysée
IX.	Opéra
X.	Enclos Saint Laurent
XI.	Popincourt
XII.	Reuilly
XIII.	Gobelins
XIV.	Observatoire
XV.	Vaugirard
XVI.	Passy
XVII.	Batignolles Monceau
XVIII.	Buttes Montmartre
XIX.	Buttes Chaumont
XX.	Ménilmontant

2. DATA

2.1. Loading packages and Datasets

Data was analyzed using Python and the following packages: pandas, numpy, requests, Beautiful Soup, folium, Nominatim, and matplotlib.
First, all necessary packages were loaded, and two datasets were downloaded:

- Geolocation information of Paris neighborhoods from opendata.paris.fr
- Information about the venues in Paris from Foursquare

3. METHODOLOGY

3.1. Explore the venues

Foursquare data includes various categories of venues. For the analysis, only the venues that are restaurants were extracted. The other venues were excluded.

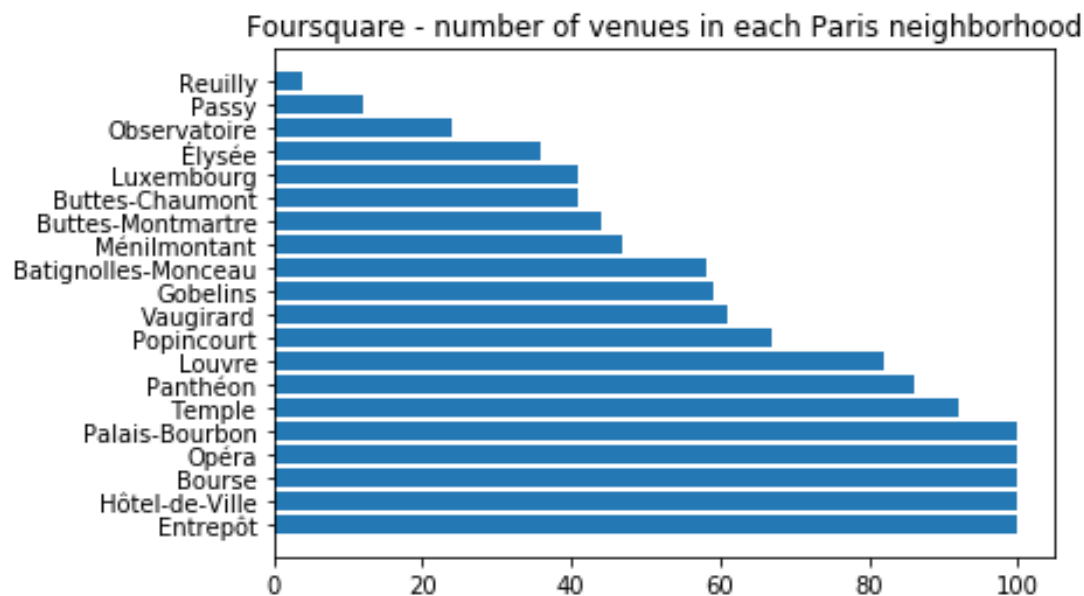The 10 most frequent restaurants and non-restaurant venues are shown below.

a) Top 10 restaurants in Paris – according to Foursquare

	Venue Category	Count
0	French Restaurant	163
1	Italian Restaurant	47
2	Japanese Restaurant	34
3	Vietnamese Restaurant	22
4	Restaurant	22
5	Asian Restaurant	18
6	Thai Restaurant	15
7	Seafood Restaurant	10
8	Chinese Restaurant	10
9	Vegetarian / Vegan Restaurant	7

b) Top 10 non-restaurant venues in Paris – according to Foursquare

	Venue Category	Count
0	Hotel	82
1	Bakery	39
2	Plaza	35
3	Café	35
4	Bistro	31
5	Cocktail Bar	27
6	Coffee Shop	26
7	Wine Bar	26
8	Bar	25
9	Pizza Place	16

Most venues that are reported in Foursquare are in the following Paris neighborhoods: Entrepôt, Hôtel-de-Ville, Bourse, Opéra, and Palais-Bourbon.

Foursquare - number of venues in each Paris neighborhood

As expected, French restaurant is most frequent in Paris. It is more than three times more frequent restaurant type than the 2nd most common, Italian Restaurant. Therefore, for further analysis French Restaurant was excluded from the dataset. There is also a venue type called just 'restaurant' that does not say in what cuisine this venue specializes. As the analysis looks at the type of the restaurant cuisines, the venue 'restaurant' was excluded as well.
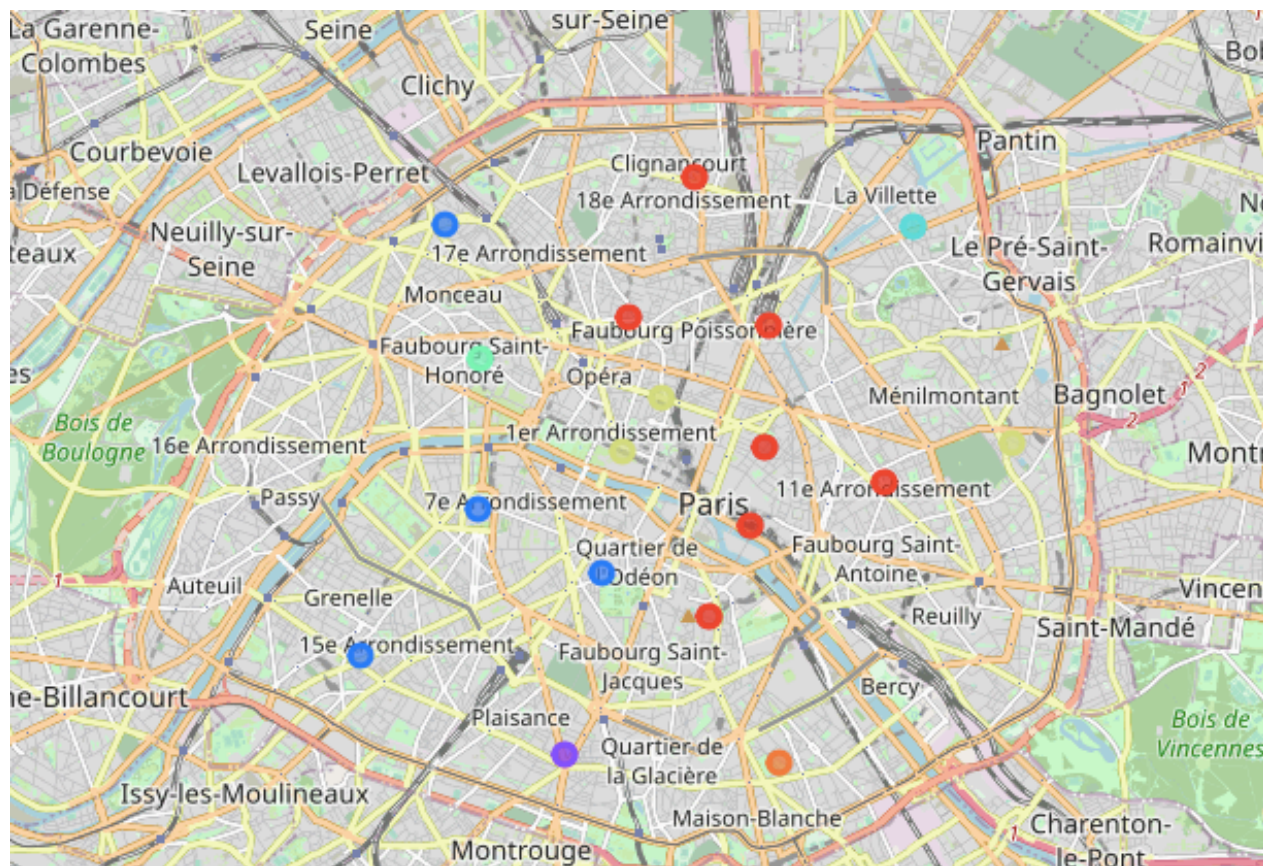
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3.2. Venues clustering

K-means clustering method was used to cluster restaurants into 7 clusters. Before running the clustering algorithm, one-hot encoding was performed to prepare the data. Then, the venues were grouped by their neighborhood and by taking the mean of the frequency of occurrence of each venue category (i.e., restaurant type/cuisine). Ten most common venues in each of the Paris neighborhoods were selected.

4. RESULTS

The data was split into seven clusters. The following table shows the size of each cluster and the map visualize the cluster results on a map.

Cluster Number	Number of Venues	Color on map
1	60	Red
2	14	Purple
3	45	Blue
4	19	Turquoise
5	8	Aquamarine Blue
6	23	Yellow
7	13	Orange

Each cluster was examined and unique venues that do not appear in any of the other clusters were highlighted.

Cluster 1:

neighborhood Name	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
Opéra	Vegetarian / Vegan Restaurant	Japanese Restaurant	Italian Restaurant	Vietnamese Restaurant	Chinese Restaurant	Venezuelan Restaurant	Modern European Restaurant	Falafel Restaurant	Corsican Restaurant	Seafood Restaurant
Buttes-Montmartre	Vietnamese Restaurant	Seafood Restaurant	Fast Food Restaurant	Indian Restaurant	Italian Restaurant	Japanese Restaurant	Middle Eastern Restaurant	Mediterranean Restaurant	Szechuan Restaurant	Sushi Restaurant
Panthéon	Italian Restaurant	Vietnamese Restaurant	Lebanese Restaurant	Greek Restaurant	Sushi Restaurant	Ethiopian Restaurant	Mexican Restaurant	Moroccan Restaurant	Peruvian Restaurant	Portuguese Restaurant
Temple	Japanese Restaurant	Italian Restaurant	Vietnamese Restaurant	Chinese Restaurant	Vegetarian / Vegan Restaurant	Seafood Restaurant	Thai Restaurant	Argentinian Restaurant	Auvergne Restaurant	Moroccan Restaurant
Entrepôt	Japanese Restaurant	Indian Restaurant	Mediterranean Restaurant	Asian Restaurant	Italian Restaurant	Seafood Restaurant	Korean Restaurant	African Restaurant	Thai Restaurant	Fast Food Restaurant
Popincourt	Vietnamese Restaurant	Italian Restaurant	Japanese Restaurant	Moroccan Restaurant	Asian Restaurant	Comfort Food Restaurant	Ethiopian Restaurant	Gluten-free Restaurant	Greek Restaurant	Korean Restaurant
Hôtel-de-Ville	Italian Restaurant	Tapas Restaurant	Scandinavian Restaurant	Israeli Restaurant	Portuguese Restaurant	Seafood Restaurant	Burgundian Restaurant	Falafel Restaurant	Jewish Restaurant	African Restaurant

Cluster 2:

neighborhood Name	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
Observatoire	Italian Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Venezuelan Restaurant	Latin American Restaurant	Korean Restaurant	Jewish Restaurant	Japanese Restaurant	Israeli Restaurant	Indian Restaurant

Cluster 3:

neighborhood Name	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
Batignolles-Monceau	Italian Restaurant	Japanese Restaurant	Mediterranean Restaurant	Turkish Restaurant	Indian Restaurant	Halal Restaurant	Portuguese Restaurant	Chinese Restaurant	Falafel Restaurant	Korean Restaurant
Vaugirard	Italian Restaurant	Japanese Restaurant	Lebanese Restaurant	Indian Restaurant	Thai Restaurant	Seafood Restaurant	Moroccan Restaurant	Persian Restaurant	Scandinavian Restaurant	Russian Restaurant
Luxembourg	Italian Restaurant	Mexican Restaurant	Lebanese Restaurant	Japanese Restaurant	Latin American Restaurant	Korean Restaurant	Jewish Restaurant	Israeli Restaurant	Indian Restaurant	Halal Restaurant
Palais-Bourbon	Italian Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Korean Restaurant	Asian Restaurant	Basque Restaurant	New American Restaurant	Vietnamese Restaurant	Falafel Restaurant	Jewish Restaurant

Cluster 4:

neighborhood Name	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
Buttes-Chaumont	Seafood Restaurant	Italian Restaurant	Japanese Restaurant	Vietnamese Restaurant	American Restaurant	Argentinian Restaurant	Asian Restaurant	Korean Restaurant	Jewish Restaurant	African Restaurant

Cluster 5:

neighborhood Name	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
Élysée	Corsican Restaurant	Italian Restaurant	Thai Restaurant	Modern European Restaurant	Mediterranean Restaurant	Argentinian Restaurant	Asian Restaurant	Korean Restaurant	Jewish Restaurant	African Restaurant

Cluster 6:

neighborhood Name	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
Ménilmontant	Japanese Restaurant	Italian Restaurant	Latin American Restaurant	Mexican Restaurant	Korean Restaurant	Sushi Restaurant	Fast Food Restaurant	Ethiopian Restaurant	Jewish Restaurant	Israeli Restaurant
Louvre	Japanese Restaurant	Italian Restaurant	Udon Restaurant	Thai Restaurant	Chinese Restaurant	Soba Restaurant	Corsican Restaurant	Jewish Restaurant	Israeli Restaurant	Indian Restaurant
Bourse	Japanese Restaurant	Italian Restaurant	Thai Restaurant	Korean Restaurant	Greek Restaurant	Romanian Restaurant	Peruvian Restaurant	Fast Food Restaurant	Sushi Restaurant	Mexican Restaurant

Cluster 7:

neighborhood Name	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
Gobelins	Vietnamese Restaurant	Asian Restaurant	Thai Restaurant	Chinese Restaurant	Japanese Restaurant	Italian Restaurant	Cambodian Restaurant	Falafel Restaurant	Korean Restaurant	Jewish Restaurant

One of the unique restaurants in Cluster 3 is New American Restaurant and a unique restaurant in Cluster 4 is American Restaurant. They may be considered as having similar type of cuisines.

5. DISCUSSION

As expected, most of the restaurants in Paris specialize in French cuisine. This is followed by Italian, Japanese and Vietnamese restaurants. From non-restaurant venues, very popular are bakeries, coffees, bistros and various bars.

After examining the individual clusters and looking at unique restaurants in each. Cluster 1 includes most unique types of restaurants (7). The table below summarizes unique restaurants in each of the clusters and how they ranked in their neighborhood.

Cluster	Neighborhood Name	Restaurant Type	Rank in Neighborhood
Cluster 1	Buttes-Montmartre	Middle Eastern Restaurant	7th
Cluster 1	Buttes-Montmartre	Szechuan Restaurant	9th
Cluster 1	Temple	Auvergne Restaurant	9th
Cluster 1	Popincourt	Comfort Food Restaurant	6th
Cluster 1	Popincourt	Gluten-free Restaurant	8th
Cluster 1	Hôtel-de-Ville	Tapas Restaurant	2nd
Cluster 1	Hôtel-de-Ville	Burgundian Restaurant	7th
Cluster 3	Batignolles-Monceau	Turkish Restaurant	4th
Cluster 3	Vaugirard	Persian Restaurant	8th
Cluster 3	Vaugirard	Russian Restaurant	10th
Cluster 3	Palais-Bourbon	Basque Restaurant	6th
Cluster 3	Palais-Bourbon	New American Restaurant	7th
Cluster 4	Buttes-Chaumont	American Restaurant	5th
Cluster 6	Louvre	Udon Restaurant	3rd
Cluster 6	Louvre	Soba Restaurant	6th
Cluster 6	Bourse	Romanian Restaurant	6th
Cluster 7	Gobelins	Cambodian Restaurant	7th

Apart from type of the venue in the neighborhood, it is recommended to look at other aspects of the neighborhoods, such as retail rental prices and where people and tourists visiting Paris spent most of their time and when.

6. CONCLUSION

There are various cuisines offered in Paris that tourist can taste. This analysis shows what types of restaurants can be found in Paris and in what neighborhood.