

Capstone Project - The Battle of Neighborhoods (Week 2)

1 Introduction

Investment is in general a complex and challenging task. One of the most difficulty is to collect right data. Today there are certainly lots of data sources thanks to internet data centers developpement ,data processing technologies which make it possible to collect, process and store data in real time. Although these technologies are present in our day life and more often availables as open source tools, they still need to be carefully used in order to obtain right data.

1.1 PROBLEM

*The problem as set consists collecting ,porcessing and analyzing the cities **NEW YORK CITY, Toronto And Paris**. More precisely ,the problem is about Collecting informations about all the venues of different neighborhood of all borough in each of these cities in order to find the similarities between them base on data collected using data anlysis tools ,here is python and external API such as foursquar. The result obtained results will be use to suggest a suitable location for investment .*

1.2 interest

Evidently, interested are either poeple interested in investing in one of these tree cities or somme one willing to know a litle bit about kaind of venues in these cities.

1.3 Data socuces

1.3.1 PROBLEM 1 CITIES ANLYSIS

1.3.1.1-NYC(new york city) all data where provided

Link to the data set: https://cocl.us/new_york_dataset

From this link data are downloaded using python api pandas ,process and transform into usable data format. The foursquare API is then used to generate the final data set including geografical coordinate of each neighbouhood. Thinal data set in the generated (Data frame including geographical coordinates of each neighborhood.

1.3.1.2 -Toronto links To

dataset: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M - http://cocl.us/Geospatial_data

From this link data are downloaded usind python api pandas ,process and transform into usable data format. The foursquare API is then used to generate the final data set including geografical coordinate of each neighbouhood. Thinal data set in the generated (Data frame including geographical coordinates of each neighborhood.

1.3.1.3 Paris links to data

sets: https://fr.wikipedia.org/wiki/Liste_des_quartiers_administratifs_de_Paris https://opendata.paris.fr/explore/dataset/quartier_paris/download/?format=csv&timezone=Europe/Berlin&use_labels_for_header=true&csv_separator=%3B

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1.3.2 PROBLEM 2 (VENUE SUGESTION FOR RISTAURANT INVESTMENT)

data set used here is the results of the data collected and transform (using python and foursquere api) into strutured and usable data format in the previous section.

II-DATA COLLECTION , PROCESSING AND ANLYSIS FOR EACH CITY

II.1 New York City.

II.1.1 New york city data collection and tranformation

New York City (NYC), also known as the **City of New York** or simply **New York (NY)**, is the most populous **city** in the United States with polpulation of 8398748 inhabitants.This is the first city on which ours first analisys will be focussed.

AS previously said,data are collected from links provided,the programming language used is python on IMD cloud,more precisely IBM service.Thanks to these tools we have colletted and tranformed data from unusable data forrmat to structured data frame.Below is the scrreshut of the final data structure where in the columns we have from left to right exactly :**Borough's name ,Neighborhood's name ,Latitude and Longitude** of the overall newyork city.

Newyork city data set with geogaphical coordinates

	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40.894705	-73.847201
1	Bronx	Co-op City	40.874294	-73.829939
2	Bronx	Eastchester	40.887556	-73.827806
3	Bronx	Fieldston	40.895437	-73.905643
4	Bronx	Riverdale	40.890834	-73.912585

The total number of Neighborhood in newyork city is : **103**

Using External fousquare API and further processing data are transformed in the usable the final data structure wifhi can be seen in the following.

The total number of venues in newyork city is : 1.22 per 100 inhabitants.

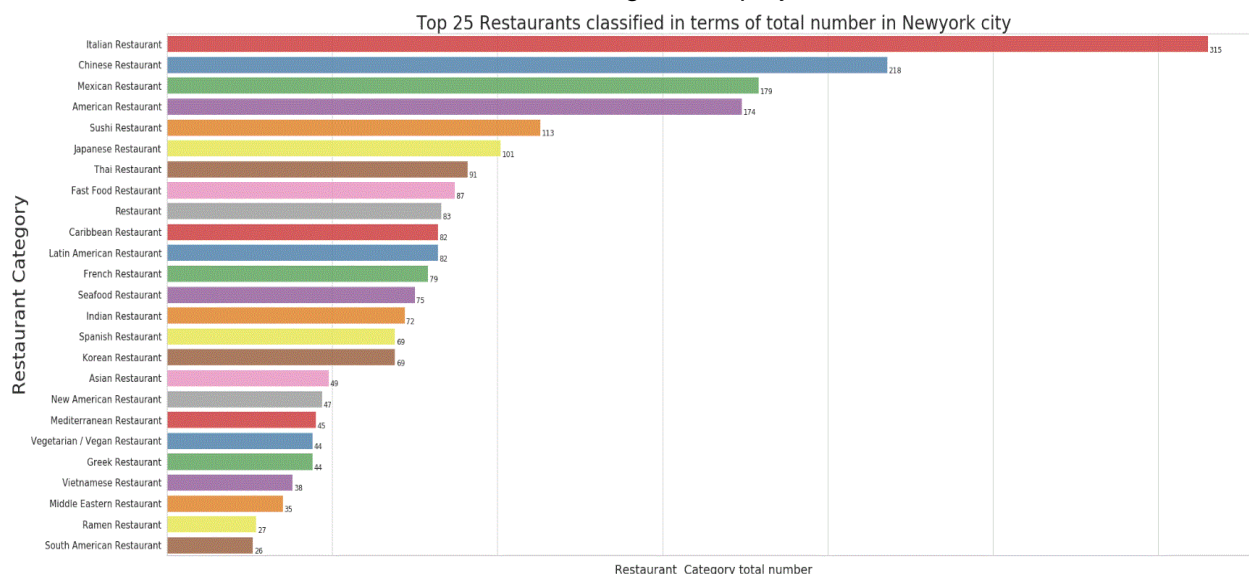
Table including venue categorie

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Wakefield	40.894705	-73.847201	Lollipops Gelato	40.894123	-73.845892	Dessert Shop
1	Wakefield	40.894705	-73.847201	Rite Aid	40.896649	-73.844846	Pharmacy
2	Wakefield	40.894705	-73.847201	Carvel Ice Cream	40.890487	-73.848568	Ice Cream Shop
3	Wakefield	40.894705	-73.847201	Dunkin'	40.890459	-73.849089	Donut Shop
4	Wakefield	40.894705	-73.847201	Shell	40.894187	-73.845862	Gas Station

In terms of venues diversity, there are 429 venue categories.

As we are interested in this analysis in investing on a Restaurant, we need to extract from the dataframe only rows corresponding to restaurant venues. The final data in the following is shown the first 5 elements of the final table.

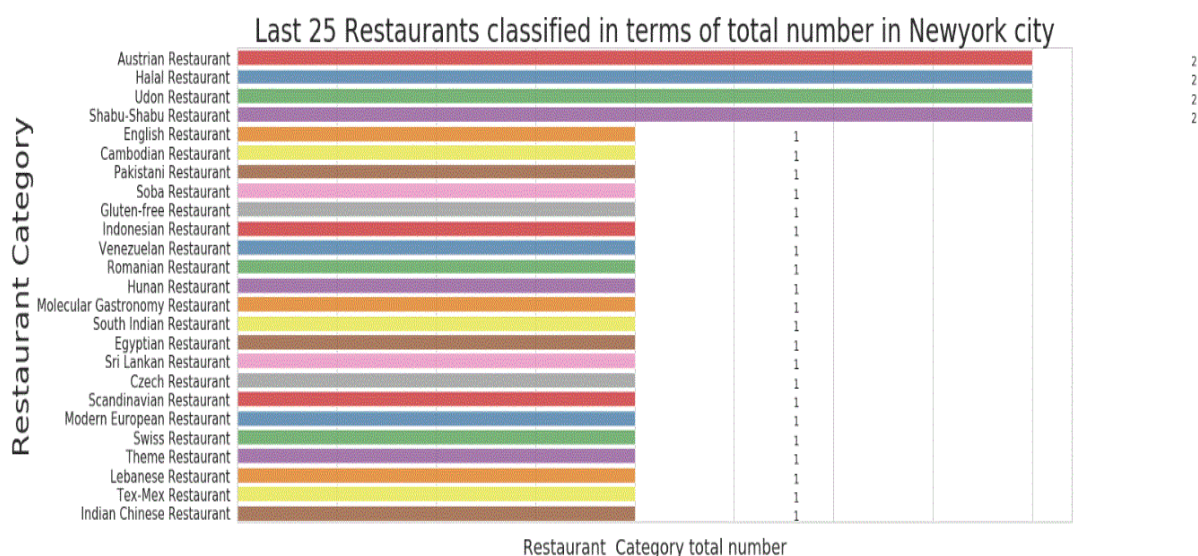
The above data frame is the one we will be using for this project.



Top 25 restaurants NYC

Herlet plot the top 25 and the 25 last restaurants in terms of number of restaurant in New York city.

With 315 restaurants in NYC, Italian restaurant in terms of number is the most represented, followed by Chinese, Mexican and American Restaurant with total number respectively 219, 179, 174 and 113. Unexpectedly, the Italian restaurant comes first in USA.



Last 25 restaurants NYC

This last graph shows that, in NYC, there are lots of restaurant categories with only one building such as Indian Chinese restaurant, South Indian Restaurant, and so on.

Let look a little bit deeper into the data set. Here below are the top five venues for 6 neighborhoods in New York city.

----Allerton----			----Arrochar----			----Astoria----		
	venue	freq		venue	freq		venue	freq
0	Chinese Restaurant	0.33	0	Italian Restaurant	0.4	0	Middle Eastern Restaurant	0.17
1	American Restaurant	0.17	1	Mediterranean Restaurant	0.2	1	Greek Restaurant	0.14
2	Fast Food Restaurant	0.17	2	Middle Eastern Restaurant	0.2	2	Seafood Restaurant	0.11
3	Mexican Restaurant	0.17	3	Polish Restaurant	0.2	3	Mediterranean Restaurant	0.08
4	Spanish Restaurant	0.17	4	Afghan Restaurant	0.0	4	Japanese Restaurant	0.06

----Annadale----			----Arverne----			----Astoria Heights----		
	venue	freq		venue	freq		venue	freq
0	Restaurant	0.5	0	Thai Restaurant	1.0	0	Italian Restaurant	1.0
1	Sushi Restaurant	0.5	1	Afghan Restaurant	0.0	1	Afghan Restaurant	0.0
2	Afghan Restaurant	0.0	2	Moroccan Restaurant	0.0	2	New American Restaurant	0.0
3	New American Restaurant	0.0	3	Romanian Restaurant	0.0	3	Russian Restaurant	0.0
4	Romanian Restaurant	0.0	4	Restaurant	0.0	4	Romanian Restaurant	0.0

In this project, our analysis will be totally dedicated to Restaurant, thus they will be used in the first time to seek the similarity and dissimilarity between New York city, Toronto and Paris and secondly with deeper analysis will be used to suggest the most appropriate place if not an acceptable place to invest in restaurant event which Restaurant category may be the best choice according to our analysis.

Let create a new data frame with the 10 most common restaurants as following.

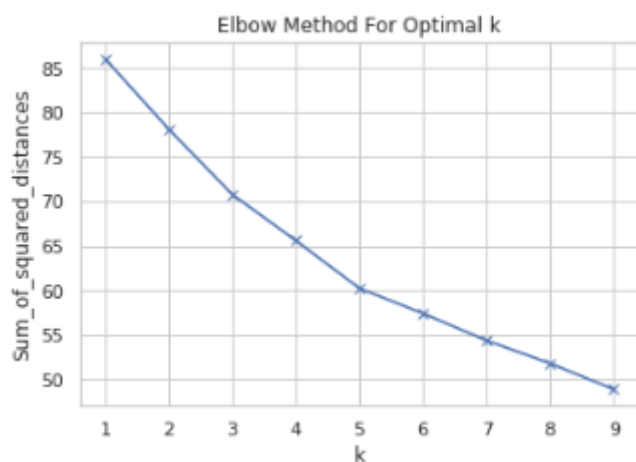
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0 Allerton	Chinese Restaurant	American Restaurant	Fast Food Restaurant	Mexican Restaurant	Spanish Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant
1 Annadale	Restaurant	Sushi Restaurant	Vietnamese Restaurant	Egyptian Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
2 Arrochar	Italian Restaurant	Polish Restaurant	Mediterranean Restaurant	Middle Eastern Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
3 Arverne	Thai Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
4 Astoria	Middle Eastern Restaurant	Greek Restaurant	Seafood Restaurant	Mediterranean Restaurant	Italian Restaurant	Japanese Restaurant	Indian Restaurant	Sushi Restaurant	Mexican Restaurant	Comfort Food Restaurant

In the next section, we are going to use this data to group the data set into different clusters.

II.1.2-Clustering (K-mean) :

II.1.2.1-Parameter turning (Best k parameter for kmeans).

The first step of our clustering is to choose the appropriate value of k (number of cluster).



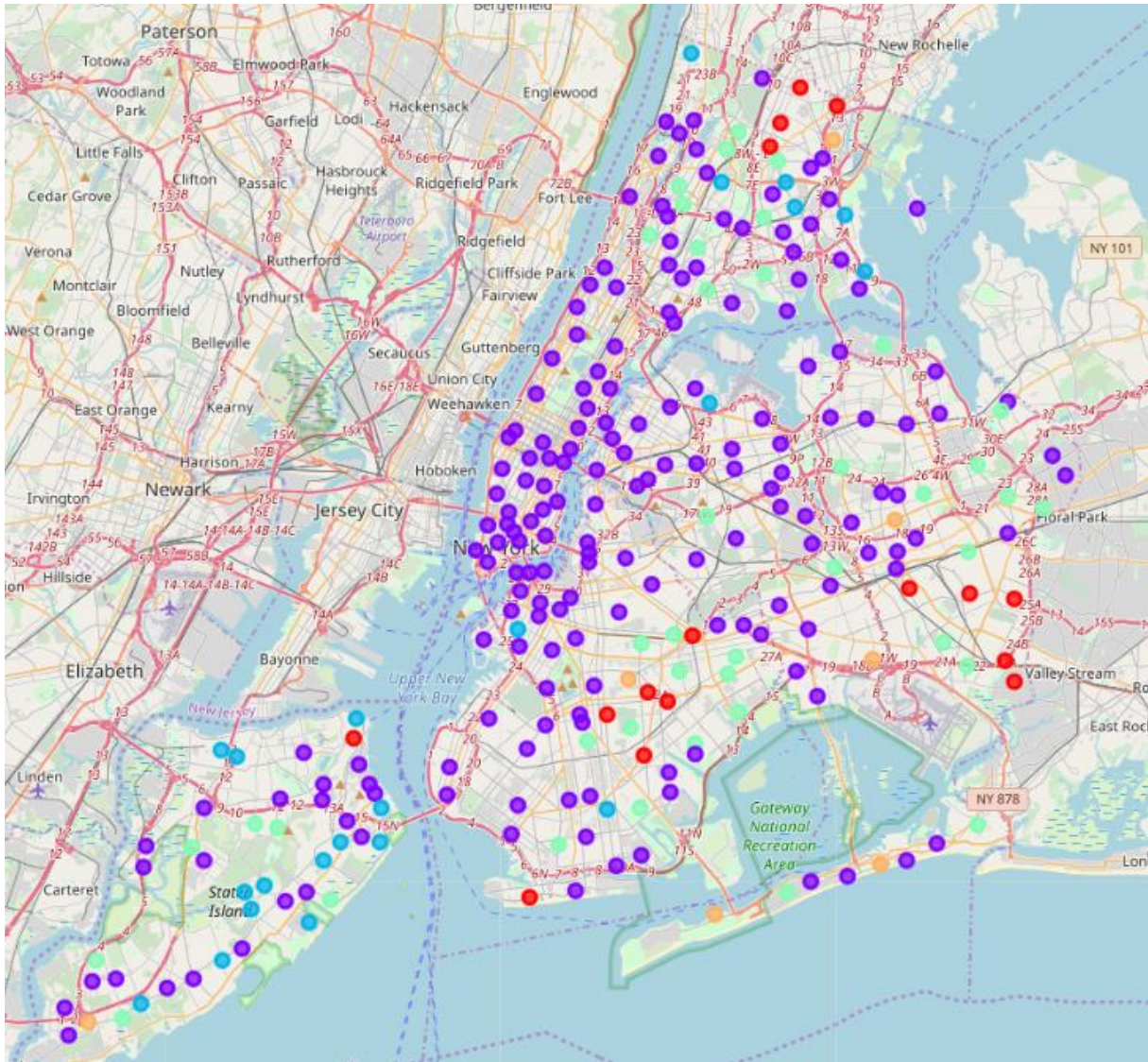
best k for the kmean cluster 1, best k = 5

In the plot above the elbow is at $k=5$ indicating the optimal k for this dataset is 5

II.1.2.2-Model fitting

This section consists in clustering the Newyork city data set using the best value of k obtained in the parameter turning section. In the below figure : [best k for the kmeans cluster in the Newyork City map] are the different neighborhoods clusters.

best k for the kmeans cluster in the Newyork City map



In the tables(*table cluster 1 NYC,table cluster 2 NYC,table cluster 3 NYC,table cluster 4 NYC,Table cluster 5 NYC*) are these obtained cluster with the overall information on them.

In the following table, the neighborhoods present in the same cluster are close to each other, thus they share most of the common restaurants. For instance, as the neighborhoods **Wakefield** and **Eastchester** it means the share lot of most common restaurants categories. Similarly, the neighborhoods present in different clusters may share fewer most common restaurants of the most common restaurants. Let print the first rows of our clusters.

Table cluster 1 NYC

8

nmon Venue

0	Wakefield	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
2	Eastchester	Caribbean Restaurant	Seafood Restaurant	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
9	Williamsbridge	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
41	Olinville	Caribbean Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
75	Flatlands	Fast Food Restaurant	Caribbean Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
78	Coney Island	Caribbean Restaurant	Vegetarian / Vegan Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
164	South Jamaica	Vegetarian / Vegan Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
165	St Albans	Caribbean Restaurant	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
168	Cambria Heights	Caribbean Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
169	Rosedale	Chinese Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
188	Laurelton	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
218	Tompkinsville	Mexican Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
223	Rugby	Caribbean Restaurant	Seafood Restaurant	Chinese Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
259	Rensselaer Village	Caribbean Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
282	Broadway Junction	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
300	Erasmus	Caribbean Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant

Table cluster 2 NYC

	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
5	Kingsbridge	Latin American Restaurant	Mexican Restaurant	Spanish Restaurant	Vegetarian / Vegan Restaurant	Seafood Restaurant	Fast Food Restaurant	Chinese Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Ethiopian Restaurant
6	Marble Hill	Seafood Restaurant	American Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
7	Woodlawn	American Restaurant	Italian Restaurant	Indian Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
10	Baychester	Fast Food Restaurant	Mexican Restaurant	Spanish Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
12	City Island	Seafood Restaurant	Italian Restaurant	American Restaurant	Tapas Restaurant	French Restaurant	Spanish Restaurant	Gluten-free Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant
15	Morris Heights	Spanish Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
16	Fordham	Fast Food Restaurant	Spanish Restaurant	Chinese Restaurant	Latin American Restaurant	Caribbean Restaurant	African Restaurant	American Restaurant	Greek Restaurant	Restaurant	Ethiopian Restaurant
17	East Tremont	Fast Food Restaurant	Paela Restaurant	Spanish Restaurant	Vietnamese Restaurant	Egyptian Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
18	West Farms	Latin American Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
20	Melrose	Mexican Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
21	Mott Haven	Spanish Restaurant	Peruvian Restaurant	Latin American Restaurant	Chinese Restaurant	Vietnamese Restaurant	Gluten-free Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant

Table cluster 3 NYC

	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
8	Norwood	Chinese Restaurant	Spanish Restaurant	American Restaurant	Fast Food Restaurant	Mexican Restaurant	Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Ethiopian Restaurant	Falafel Restaurant
13	Bedford Park	Chinese Restaurant	Mexican Restaurant	Spanish Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
14	University Heights	Fast Food Restaurant	Chinese Restaurant	African Restaurant	Latin American Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
19	High Bridge	Latin American Restaurant	Chinese Restaurant	Asian Restaurant	Spanish Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
23	Longwood	Latin American Restaurant	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
26	Soundview	Chinese Restaurant	Latin American Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
32	Van Nest	Caribbean Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Vietnamese Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
50	Gravesend	Italian Restaurant	Chinese Restaurant	Eastern European Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
54	Flatbush	Caribbean Restaurant	Mexican Restaurant	Chinese Restaurant	Middle Eastern Restaurant	Vietnamese Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
56	East Flatbush	Fast Food Restaurant	Chinese Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
60	Brownsville	Restaurant	Chinese Restaurant	Spanish Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
72	East New York	Caribbean Restaurant	Fast Food Restaurant	Asian Restaurant	Chinese Restaurant	Vietnamese Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
73	Stannett City	Caribbean Restaurant	American Restaurant	Chinese Restaurant	Vietnamese Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
74	Canarsie	Caribbean Restaurant	Asian Restaurant	Chinese Restaurant	Vietnamese Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
83	Marine Park	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
89	Ocean Hill	Southern / Soul Food Restaurant	Mexican Restaurant	Chinese Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
136	Kew Gardens	Chinese Restaurant	Indian Restaurant	Italian Restaurant	American Restaurant	South American Restaurant	New American Restaurant	Sushi Restaurant	Gluten-free Restaurant	Ethiopian Restaurant	Falafel Restaurant
142	Maspeth	Chinese Restaurant	Sushi Restaurant	Italian Restaurant	Japanese Restaurant	North Indian Restaurant	Vietnamese Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
154	Douglaston	Italian Restaurant	Fast Food Restaurant	Cajun / Creole Restaurant	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
156	Bellerose	Italian Restaurant	Chinese Restaurant	American Restaurant	Seafood Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
158	Fresh Meadows	Chinese Restaurant	Vegetarian / Vegan Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
161	Oakland Gardens	Korean Restaurant	Chinese Restaurant	Vietnamese Restaurant	Taiwanese Restaurant	Sushi Restaurant	Greek Restaurant	English Restaurant	Falafel Restaurant	Fast Food Restaurant	Fast Food Restaurant
163	Hollis	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
166	Rosedale	Southern / Soul Food Restaurant	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Egyptian Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
167	Springfield Gardens	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
170	Far Rockaway	Chinese Restaurant	Caribbean Restaurant	Fast Food Restaurant	Comfort Food Restaurant	Southern / Soul Food Restaurant	Vietnamese Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
174	Beechhurst	Chinese Restaurant	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
184	Queensboro Hill	Chinese Restaurant	Vegetarian / Vegan Restaurant	Dumpling Restaurant	Indian Restaurant	Asian Restaurant	Malay Restaurant	Vietnamese Restaurant	Greek Restaurant	Falafel Restaurant	Fast Food Restaurant
190	Belle Harbor	Italian Restaurant	Mexican Restaurant	Chinese Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant

Table cluster 4 NYC

	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
11	Pelham Parkway	Italian Restaurant	Thai Restaurant	Chinese Restaurant	Sushi Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant
29	Country Club	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
33	Morris Park	Italian Restaurant	Azeka Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
34	Belmont	Italian Restaurant	Mexican Restaurant	Eastern European Restaurant	American Restaurant	Japanese Restaurant	Fast Food Restaurant	Spanish Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant
36	North Riverdale	Italian Restaurant	Sushi Restaurant	Mexican Restaurant	Chinese Restaurant	Vietnamese Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
39	Edgewater Park	Italian Restaurant	American Restaurant	Asian Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
66	Carroll Gardens	Italian Restaurant	French Restaurant	Thai Restaurant	Restaurant	Dumpling Restaurant	Cuban Restaurant	Filipino Restaurant	Greek Restaurant	Sushi Restaurant	Latin American Restaurant
197	St. George	Italian Restaurant	American Restaurant	Thai Restaurant	Tapas Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant
206	Mariner's Harbor	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
213	Great Kills	Italian Restaurant	Japanese Restaurant	Chinese Restaurant	Spanish Restaurant	Gluten-free Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant
217	Tottenville	Italian Restaurant	Mexican Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
228	Arrochar	Italian Restaurant	Polish Restaurant	Mediterranean Restaurant	Middle Eastern Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
230	Old Town	Italian Restaurant	American Restaurant	Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
231	Dongan Hills	Italian Restaurant	Sushi Restaurant	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant
234	New Dorp Beach	Italian Restaurant	Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
236	Huguenot	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
251	Richmond Town	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
252	Shore Acres	Italian Restaurant	Restaurant	Chinese Restaurant	Vietnamese Restaurant	Greek Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
258	Elm Park	Italian Restaurant	American Restaurant	Chinese Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant
266	Astoria Heights	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
287	Egbertville	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
292	Lighthouse Hill	Italian Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
296	Madison	Italian Restaurant	Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Filipino Restaurant	French Restaurant

Table cluster 5 NYC

	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
1	Co-op City	Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Greek Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant
148	South Ozone Park	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
185	Hillcrest	Dim Sum Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
222	Wingate	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
237	Pleasant Plains	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
288	Roxbury	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant
302	Hammels	Fast Food Restaurant	Vietnamese Restaurant	Halal Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Filipino Restaurant	French Restaurant	German Restaurant	Gluten-free Restaurant

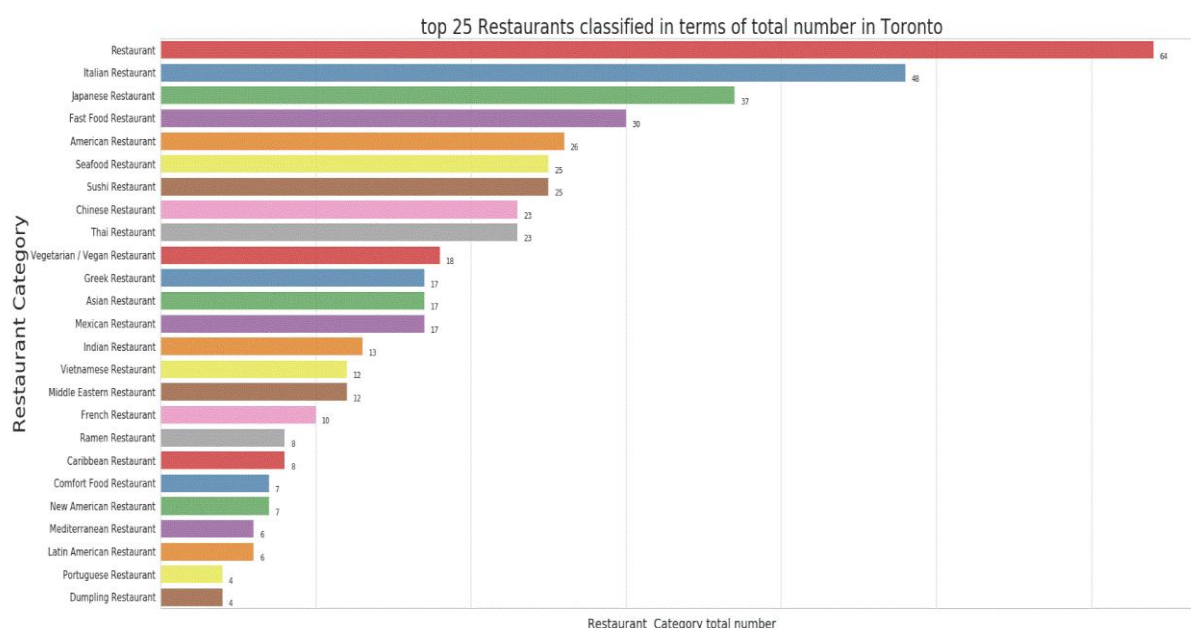
II.2 Toronto

II.2.1-Toronto Data collection and transformation

The City of **Toronto** Is the Canada's largest city, the fourth largest in North America with a population of 6196731 inhabitants. Data for this analysis were obtained using web crawling python API and secondly processed using the same processing methods described in the previous city analysis (NYC). For this new city, making the same analysis as the one previously described in the section NYC DATA analysis produces the following results.

Final data structure including only the first rows :

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Rouge, Malvern	43.806688	-79.194353	Wendy's	43.807448	-79.199056	Fast Food Restaurant
1	Rouge, Malvern	43.806688	-79.194353	Interprovincial Group	43.805630	-79.200378	Print Shop
2	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497	Chris Effects Painting	43.784343	-79.163742	Construction & Landscaping
3	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497	Royal Canadian Legion	43.782533	-79.163085	Bar
4	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497	Affordable Toronto Movers	43.787919	-79.162977	Moving Target



As shown by the above graphical representation, Italian Restaurant still the most represented restaurants, followed by Japanese, Fast food, American.

Seafood Restaurant ect.. with respectively 64, 48, 37, 30 and 26 restaurants in Toronto city.

Top 25 restaurants Toronto



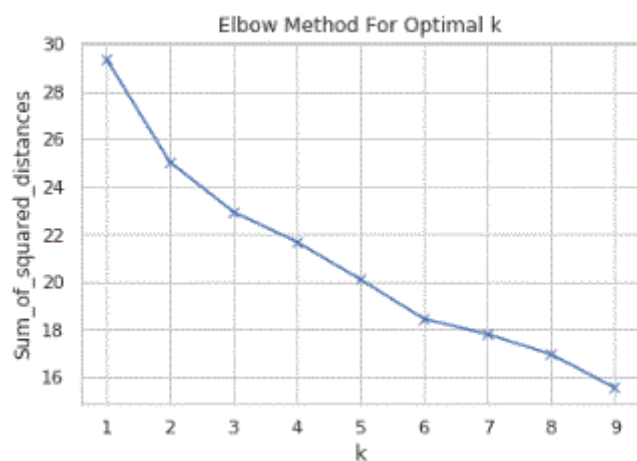
Last 25 restaurants Toronto

For the last 25 restaurants category, they are 13 with only 1 restaurant, interesting for investment as they are few restaurants in these categories.

Let look a little bit deeper into the data set. Here below are the top five venues for 6 neighborhoods in Toronto city

II.2.2-Clustering

II.2.2.1-Parameter turning(Toronto)



II.2.2.1-Model fitting(kmeans)

best k for the kmeans cluster in the Toronto City m

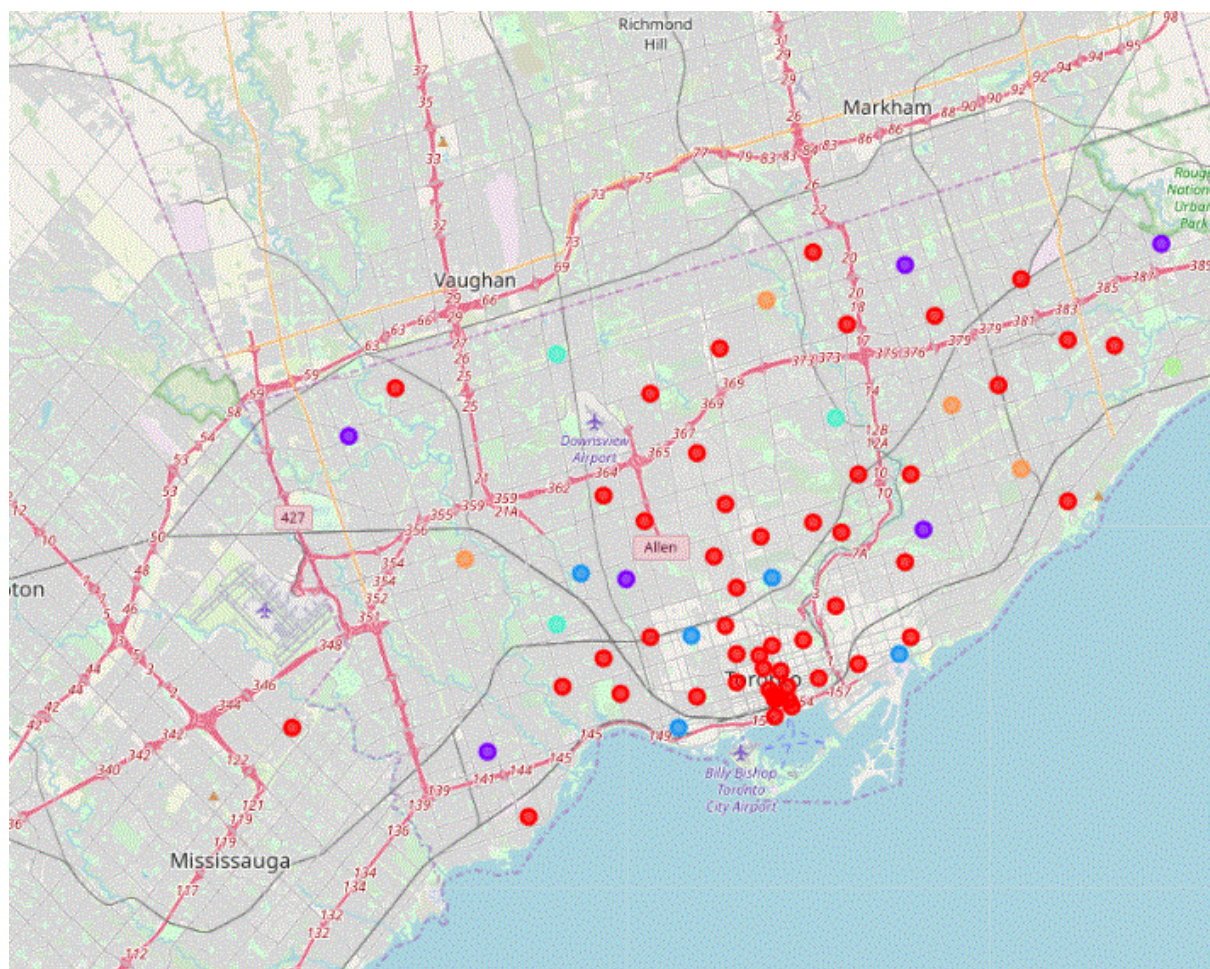


Table cluster 1 Toronto

Borough	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	9th Most Common Venue	10th Most Common Venue
3	Scarborough	0.0	Korean Restaurant	Vietnamese Restaurant	Gluten-free Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
4	Scarborough	0.0	Hakka Restaurant	Thai Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant
8	Scarborough	0.0	American Restaurant	Vietnamese Restaurant	Doner Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant
10	Scarborough	0.0	Indian Restaurant	Vietnamese Restaurant	Chinese Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant
12	Scarborough	0.0	Latin American Restaurant	Vietnamese Restaurant	Gluten-free Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
13	Scarborough	0.0	Thai Restaurant	Fast Food Restaurant	Italian Restaurant	Chinese Restaurant	Vietnamese Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant
17	North York	0.0	Mediterranean Restaurant	Vietnamese Restaurant	Gluten-free Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
18	North York	0.0	Fast Food Restaurant	Japanese Restaurant	Greek Restaurant	American Restaurant	Thai Restaurant	Asian Restaurant	Chinese Restaurant	Dumpling Restaurant	French Restaurant
22	North York	0.0	Ramen Restaurant	Sushi Restaurant	Restaurant	Japanese Restaurant	Vietnamese Restaurant	Fast Food Restaurant	Indonesian Restaurant	Middle Eastern Restaurant	Dim Sum Restaurant
27	North York	0.0	Asian Restaurant	Fast Food Restaurant	Italian Restaurant	Japanese Restaurant	Restaurant	Chinese Restaurant	Dim Sum Restaurant	Vietnamese Restaurant	Dumpling Restaurant
28	North York	0.0	Middle Eastern Restaurant	Sushi Restaurant	Restaurant	Chinese Restaurant	Vietnamese Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant
34	North York	0.0	Portuguese Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
36	East York	0.0	Asian Restaurant	Vietnamese Restaurant	Doner Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant
38	East York	0.0	Sushi Restaurant	Restaurant	Mexican Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant
39	East York	0.0	Indian Restaurant	Fast Food Restaurant	Middle Eastern Restaurant	Vietnamese Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant
41	East Toronto	0.0	Greek Restaurant	Italian Restaurant	Restaurant	American Restaurant	Caribbean Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant
42	East Toronto	0.0	Fast Food Restaurant	Sushi Restaurant	Italian Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant

Table cluster 2 Toronto

	Borough	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	9th Most Common Venue	10th Most Common Venue
0	Scarborough	1.0	Fast Food Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
15	Scarborough	1.0	Fast Food Restaurant	Chinese Restaurant	Vietnamese Restaurant	Doner Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
35	East York	1.0	Fast Food Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
74	York	1.0	Fast Food Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
92	Etobicoke	1.0	Fast Food Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
101	Etobicoke	1.0	Fast Food Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant

Table cluster3 Toronto

	Borough	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	9th Most Common Venue	10th Most Common Venue
48	Central Toronto	2.0	Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
75	Downtown Toronto	2.0	Italian Restaurant	Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
78	West Toronto	2.0	Italian Restaurant	Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
80	York	2.0	Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
87	East Toronto	2.0	Fast Food Restaurant	Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant

Table cluster 4 Toronto

	Borough	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	9th Most Common Venue	10th Most Common Venue
26	North York	3.0	Japanese Restaurant	Caribbean Restaurant	Vietnamese Restaurant	Doner Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
29	North York	3.0	Caribbean Restaurant	Vietnamese Restaurant	Doner Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
81	York	3.0	Caribbean Restaurant	Vietnamese Restaurant	Doner Restaurant	German Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant

Table cluster 5 Toronto

	Borough	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	9th Most Common Venue	10th Most Common Venue
2	Scarborough	4.0	Mexican Restaurant	Vietnamese Restaurant	Gluten-free Restaurant	French Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant

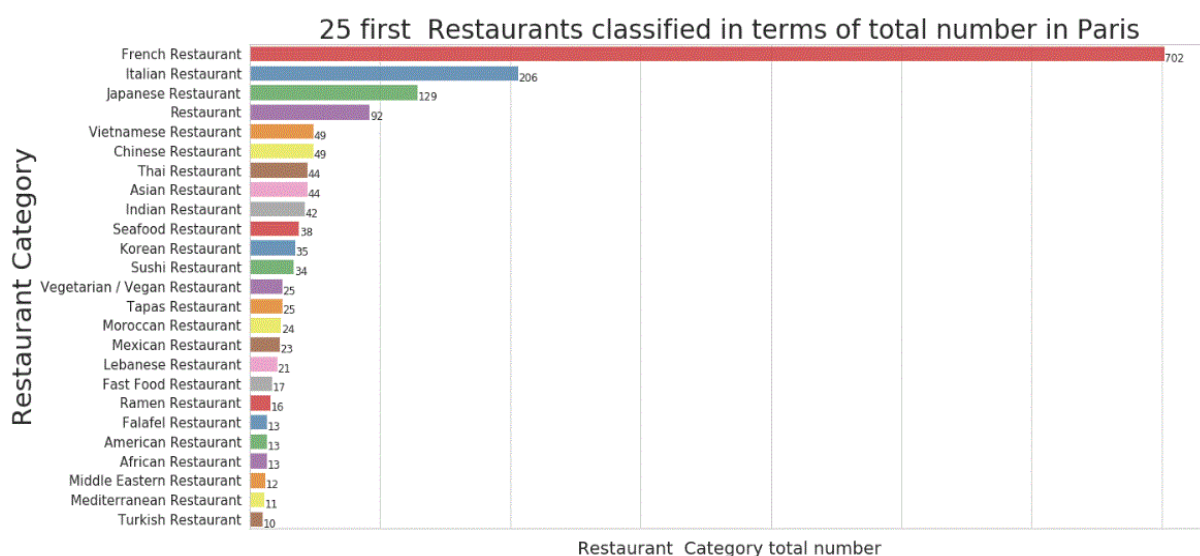
II.3 Paris

II.3.1 Paris Data collection and transformation

Paris is the capital and most populous city of France, with a population of 2,148,271 residents (official estimate, 1 January 2020) in an area of 105 square kilometres (41 square miles). The data

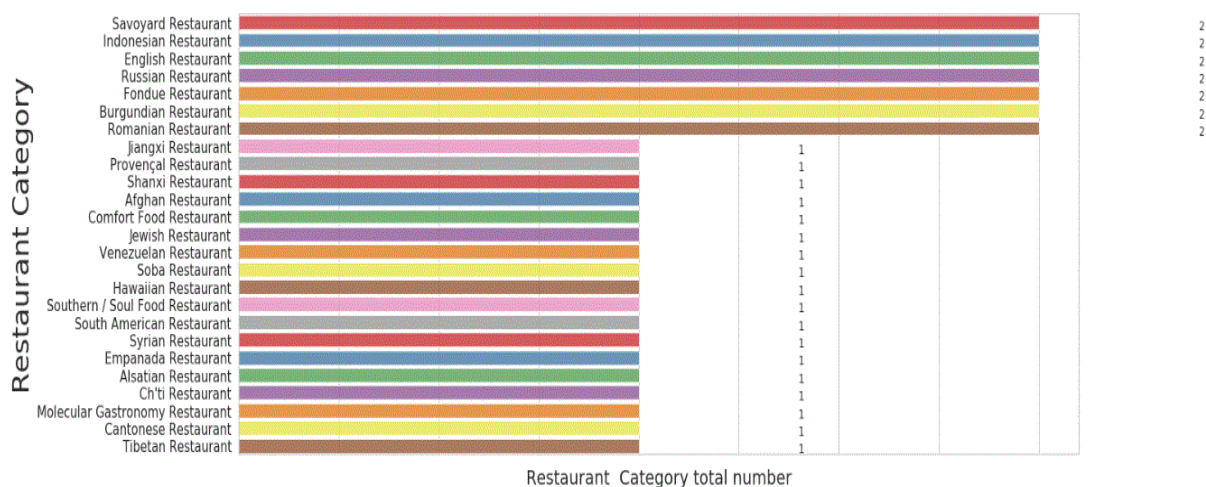
collection and transformation is done using the same techniques as previously describe for the two other cities(NYC and Toronto).The final data structure is :

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Amérique	48.881638	2.39544	Aux Petits Joueurs	48.880435	2.396212	Bistro
1	Amérique	48.881638	2.39544	Brasserie Le Danube	48.882164	2.393235	French Restaurant
2	Amérique	48.881638	2.39544	Parc de la Butte du Chapeau Rouge	48.881797	2.398892	Park
3	Amérique	48.881638	2.39544	Hipark by Adagio Paris La Villette	48.885537	2.397023	Bed & Breakfast
4	Amérique	48.881638	2.39544	Piscine Georges Hermant	48.882667	2.389732	Pool



Top 25 restaurants Paris

As shown by the above graphical representation, French Restaurant is the most represented restaurants, followed by Italian ,Japanese,Restaurant,Vietnamese ,Chinese etc... with respectively 702,206,129,92,49 restaurants in Paris city.



Last 25 restaurants Paris

For the last 25 restaurants category, they are 18 with only 1 restaurants, interesting for investment as they are few restaurants in these categories.

Let look a little bit deeper into the data set .Here below are the top fives venues for 8 neighborhoods in Paris.

----Amérique----			----Arsenal----		
	venue	freq		venue	freq
0	French Restaurant	0.67	0	French Restaurant	0.40
1	Asian Restaurant	0.33	1	Italian Restaurant	0.12
2	Afghan Restaurant	0.00	2	Tapas Restaurant	0.08
3	Peruvian Restaurant	0.00	3	Seafood Restaurant	0.08
4	Russian Restaurant	0.00	4	Vegetarian / Vegan Restaurant	0.08
----Archives----			----Arts-et-Métiers----		
	venue	freq		venue	freq
0	French Restaurant	0.35	0	French Restaurant	0.27
1	Italian Restaurant	0.12	1	Italian Restaurant	0.14
2	Japanese Restaurant	0.12	2	Restaurant	0.11
3	Falafel Restaurant	0.08	3	Chinese Restaurant	0.11
4	Korean Restaurant	0.04	4	Vietnamese Restaurant	0.08
----Auteuil----			----Bel-Air----		
	venue	freq		venue	freq
0	French Restaurant	1.0	0	French Restaurant	1.0
1	Afghan Restaurant	0.0	1	Afghan Restaurant	0.0
2	Korean Restaurant	0.0	2	Korean Restaurant	0.0
3	Russian Restaurant	0.0	3	Russian Restaurant	0.0
4	Romanian Restaurant	0.0	4	Romanian Restaurant	0.0
----Batignolles----			----Belleville----		
	venue	freq		venue	freq
0	French Restaurant	0.42	0	French Restaurant	0.33
1	Italian Restaurant	0.17	1	Japanese Restaurant	0.13
2	Japanese Restaurant	0.06	2	Vietnamese Restaurant	0.07
3	Restaurant	0.04	3	Restaurant	0.07
4	Turkish Restaurant	0.04	4	African Restaurant	0.07

As for the NYC case we will cluster neighborhoods based on the 10 most common restaurants in each neighborhood in Paris.

	Borough	Neighborhood	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	9th Most Common Venue	10th Most Common Venue
0	10e arrondissement « des Buttes-Chaumont »	Amérique	48.081838	2.369440	1.0	French Restaurant	Asian Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant
1	3e arrondissement « du Temple »	Archives	48.059192	2.362205	2.0	French Restaurant	Japanese Restaurant	Italian Restaurant	Falafel Restaurant	Restaurant	Moroccan Restaurant	Israeli Restaurant	Thai Restaurant	Tapas Restaurant	Korean Restaurant
2	4e arrondissement « de l'Hôtel-de-Ville »	Arsenal	48.051605	2.364788	2.0	French Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Tapas Restaurant	Seafood Restaurant	Southwestern French Restaurant	Brazilian Restaurant	Restaurant	Thai Restaurant	Szechuan Restaurant
3	3e arrondissement « du Temple »	Arts-et-Métiers	48.069470	2.357083	0.0	French Restaurant	Italian Restaurant	Restaurant	Chinese Restaurant	Vietnamese Restaurant	Moroccan Restaurant	Japanese Restaurant	Sushi Restaurant	Seafood Restaurant	Mexican Restaurant
4	16e arrondissement « de Passy »	Auteuil	48.050822	2.252277	1.0	French Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant	Gluten-free Restaurant

Table cluster 1 Paris

	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
3	Arts-et-Métiers	French Restaurant	Italian Restaurant	Restaurant	Chinese Restaurant	Vietnamese Restaurant	Moroccan Restaurant	Japanese Restaurant	Sushi Restaurant	Seafood Restaurant	Mexican Restaurant
8	Bercy	Italian Restaurant	French Restaurant	Japanese Restaurant	Sushi Restaurant	Latin American Restaurant	Restaurant	Chinese Restaurant	Portuguese Restaurant	Cambodian Restaurant	Doner Restaurant
9	Bonne-Nouvelle	French Restaurant	Italian Restaurant	Restaurant	Chinese Restaurant	Thai Restaurant	Sushi Restaurant	Moroccan Restaurant	Mexican Restaurant	Korean Restaurant	Romanian Restaurant
12	Channon	Japanese Restaurant	Fast Food Restaurant	Kebab Restaurant	Indian Restaurant	Brazilian Restaurant	French Restaurant	Indonesian Restaurant	Hawaiian Restaurant	Greek Restaurant	Gluten-free Restaurant
18	Enfants-Rouges	Restaurant	Vietnamese Restaurant	Japanese Restaurant	French Restaurant	Italian Restaurant	Moroccan Restaurant	South American Restaurant	Argentinian Restaurant	Okonomiyaki Restaurant	Chinese Restaurant
19	Epinettes	French Restaurant	Japanese Restaurant	Restaurant	Ethiopian Restaurant	Sushi Restaurant	Turkish Restaurant	Indonesian Restaurant	Indian Restaurant	Hawaiian Restaurant	Greek Restaurant
24	Gallion	Japanese Restaurant	French Restaurant	Italian Restaurant	Korean Restaurant	Taiwanese Restaurant	Sushi Restaurant	English Restaurant	Ramen Restaurant	Restaurant	Auvergne Restaurant
25	Gare	Japanese Restaurant	Thai Restaurant	French Restaurant	Vietnamese Restaurant	Italian Restaurant	Fast Food Restaurant	Restaurant	Fondue Restaurant	Eastern European Restaurant	Empanada Restaurant
26	Goutte-d'Or	Asian Restaurant	Chinese Restaurant	Fast Food Restaurant	Thai Restaurant	Sushi Restaurant	Vietnamese Restaurant	Arepas Restaurant	French Restaurant	Empanada Restaurant	English Restaurant
33	Jardin-des-Plantes	French Restaurant	Greek Restaurant	Moroccan Restaurant	Italian Restaurant	Vietnamese Restaurant	Cajun / Creole Restaurant	Indian Restaurant	Korean Restaurant	Mediterranean Restaurant	Falafel Restaurant
35	La Chapelle	Chinese Restaurant	Thai Restaurant	Vietnamese Restaurant	French Restaurant	Mexican Restaurant	Asian Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant
37	Mail	French Restaurant	Italian Restaurant	Thai Restaurant	Restaurant	Indian Restaurant	Chili Restaurant	Japanese Restaurant	Indonesian Restaurant	Greek Restaurant	Lebanese Restaurant
46	Palais-Royal	Japanese Restaurant	French Restaurant	Ramen Restaurant	Italian Restaurant	Korean Restaurant	Udon Restaurant	Restaurant	Taiwanese Restaurant	Vietnamese Restaurant	Thai Restaurant
47	Parc-de-Montsouris	Italian Restaurant	Vietnamese Restaurant	Sushi Restaurant	Chinese Restaurant	French Restaurant	Japanese Restaurant	Middle Eastern Restaurant	Restaurant	Kebab Restaurant	Szechuan Restaurant
53	Port-de-Flandre	Restaurant	Asian Restaurant	French Restaurant	Japanese Restaurant	Chinese Restaurant	Fast Food Restaurant	Mexican Restaurant	Italian Restaurant	Latin American Restaurant	American Restaurant
55	Porte-Saint-Denis	French Restaurant	Vietnamese Restaurant	Indian Restaurant	Japanese Restaurant	Korean Restaurant	Italian Restaurant	Mediterranean Restaurant	Corisian Restaurant	Restaurant	Vegetarian / Vegan Restaurant
56	Porte-Saint-Martin	French Restaurant	Asian Restaurant	Mexican Restaurant	Moroccan Restaurant	Indian Restaurant	Restaurant	Cambodian Restaurant	Tapas Restaurant	Ramen Restaurant	Japanese Restaurant
60	Père-Lachaise	Japanese Restaurant	French Restaurant	Italian Restaurant	Sushi Restaurant	Latin American Restaurant	Restaurant	Korean Restaurant	Moroccan Restaurant	Fast Food Restaurant	Eastern European Restaurant
67	Roquette	French Restaurant	Italian Restaurant	Japanese Restaurant	Korean Restaurant	Savoyard Restaurant	Ethiopian Restaurant	Seafood Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Mediterranean Restaurant
61	Saint-Ambroise	French Restaurant	Restaurant	Italian Restaurant	Japanese Restaurant	Mexican Restaurant	Vietnamese Restaurant	Asian Restaurant	Chinese Restaurant	Comfort Food Restaurant	Ethiopian Restaurant
72	Sainte-Avoyie	French Restaurant	Chinese Restaurant	Restaurant	Italian Restaurant	Japanese Restaurant	Vegetarian / Vegan Restaurant	Thai Restaurant	Seafood Restaurant	Lebanese Restaurant	Vietnamese Restaurant
74	Sapénière	Indian Restaurant	French Restaurant	Sushi Restaurant	Chinese Restaurant	Cajun / Creole Restaurant	Corisian Restaurant	Mediterranean Restaurant	Hawaiian Restaurant	Greek Restaurant	Gluten-free Restaurant
78	Villeite	French Restaurant	Asian Restaurant	Italian Restaurant	Fast Food Restaurant	Japanese Restaurant	Seafood Restaurant	Lebanese Restaurant	Middle Eastern Restaurant	American Restaurant	African Restaurant

Table cluster 2 Paris

	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	Amérique	French Restaurant	Asian Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant
4	Auteuil	French Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant	Gluten-free Restaurant
6	Bel-Air	French Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant	Gluten-free Restaurant
17	Ecole-Militaire	French Restaurant	Asian Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant
32	Invalides	French Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	Vietnamese Restaurant	Fondue Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant
41	Muette	French Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Falafel Restaurant	Fast Food Restaurant	Fondue Restaurant	Gluten-free Restaurant

Table cluster 3 Paris

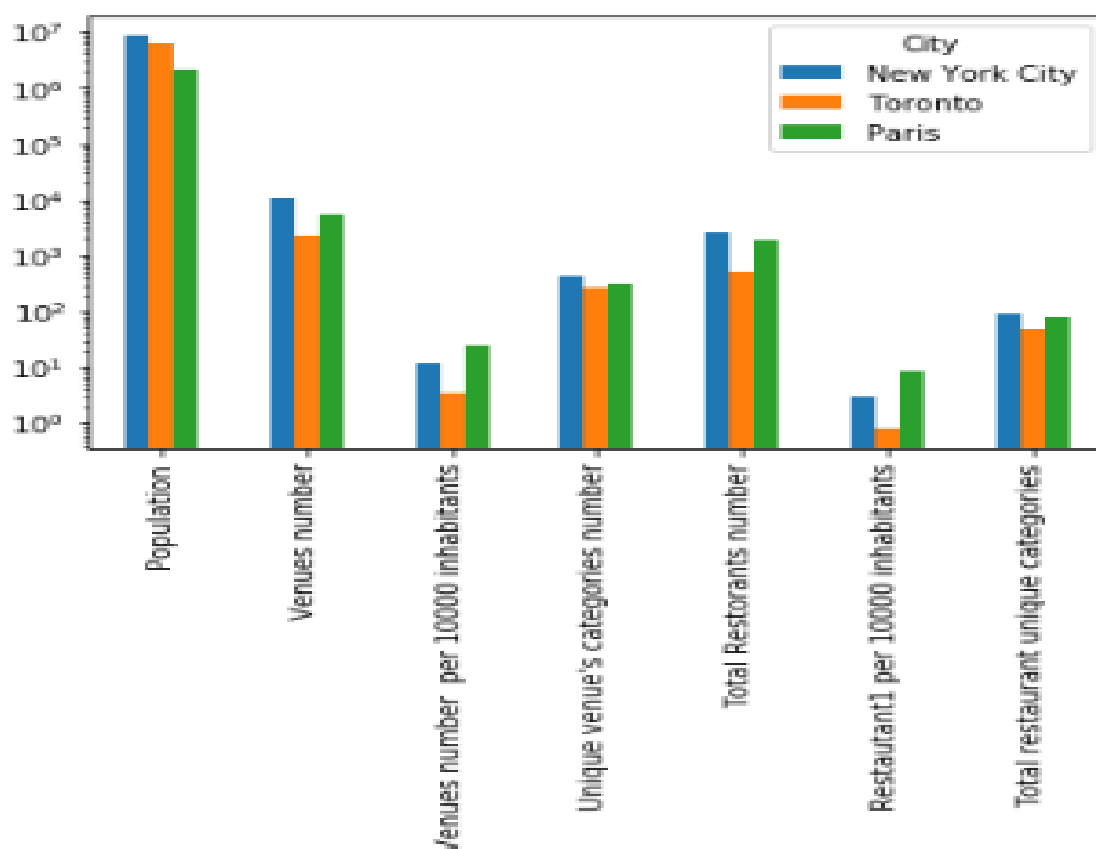
	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
1	Archives	French Restaurant	Japanese Restaurant	Italian Restaurant	Falafel Restaurant	Restaurant	Moroccan Restaurant	Israeli Restaurant	Thai Restaurant	Tapas Restaurant	Korean Restaurant
2	Arnal	French Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Tapas Restaurant	Seafood Restaurant	Southwestern French Restaurant	Brazilian Restaurant	Restaurant	Thai Restaurant	Szechuan Restaurant
5	Balignolles	French Restaurant	Italian Restaurant	Japanese Restaurant	Chinese Restaurant	Turkish Restaurant	Restaurant	Indian Restaurant	Seafood Restaurant	Fast Food Restaurant	Mediterranean Restaurant
7	Belleville	French Restaurant	Japanese Restaurant	Thai Restaurant	Italian Restaurant	Indian Restaurant	Restaurant	Vietnamese Restaurant	Chinese Restaurant	Turkish Restaurant	African Restaurant
10	Chailot	French Restaurant	Italian Restaurant	Indian Restaurant	Japanese Restaurant	Chinese Restaurant	Cantonese Restaurant	Lebanese Restaurant	Mediterranean Restaurant	Molecular Gastronomy Restaurant	Seafood Restaurant
11	Champs-Élysées	French Restaurant	Italian Restaurant	Japanese Restaurant	Chinese Restaurant	Seafood Restaurant	Thai Restaurant	Tapas Restaurant	Peruvian Restaurant	Falafel Restaurant	Eastern European Restaurant
13	Chaussée-d'Antin	French Restaurant	Italian Restaurant	Vietnamese Restaurant	Indian Restaurant	Taiwanese Restaurant	Seafood Restaurant	Chinese Restaurant	Asian Restaurant	Eastern European Restaurant	African Restaurant
14	Clichy-la-Tour	French Restaurant	Italian Restaurant	Restaurant	Seafood Restaurant	Indian Restaurant	Mediterranean Restaurant	Middle Eastern Restaurant	Fast Food Restaurant	Japanese Restaurant	Vietnamese Restaurant
15	Combai	French Restaurant	Restaurant	Italian Restaurant	Moroccan Restaurant	Thai Restaurant	Latin American Restaurant	Japanese Restaurant	Hawaiian Restaurant	Greek Restaurant	Gluten-free Restaurant
16	Croix-Rouge	French Restaurant	Sushi Restaurant	Italian Restaurant	Korean Restaurant	Restaurant	Moroccan Restaurant	Ethiopian Restaurant	Ramen Restaurant	Japanese Restaurant	Thai Restaurant
20	Europe	French Restaurant	Thai Restaurant	Italian Restaurant	Lebanese Restaurant	Chinese Restaurant	Modern European Restaurant	Middle Eastern Restaurant	Sushi Restaurant	Banquet Restaurant	Mediterranean Restaurant
21	Faubourg-Montmartre	French Restaurant	Thai Restaurant	Chinese Restaurant	Indian Restaurant	Eastern European Restaurant	Restaurant	Italian Restaurant	Vegetarian / Vegan Restaurant	Corisian Restaurant	New American Restaurant
22	Faubourg-du-Roule	French Restaurant	Italian Restaurant	Asian Restaurant	Japanese Restaurant	Scandinavian Restaurant	Seafood Restaurant	Belgian Restaurant	Indian Restaurant	Indonesian Restaurant	Falafel Restaurant
23	Folie-Méricourt	French Restaurant	Restaurant	Asian Restaurant	Korean Restaurant	Japanese Restaurant	African Restaurant	Vegetarian / Vegan Restaurant	Middle Eastern Restaurant	Portuguese Restaurant	Ethiopian Restaurant
27	Grandes-Carrières	French Restaurant	Restaurant	Italian Restaurant	Greek Restaurant	American Restaurant	Thai Restaurant	Tapas Restaurant	Arepas Restaurant	Indian Restaurant	Asian Restaurant
28	Grenelle	French Restaurant	Japanese Restaurant	Restaurant	Indian Restaurant	Banquet Restaurant	Moroccan Restaurant	Vietnamese Restaurant	Fondue Restaurant	Empanada Restaurant	English Restaurant
29	Gros-Cailhou	French Restaurant	Italian Restaurant	Vietnamese Restaurant	Chinese Restaurant	Basque Restaurant	Japanese Restaurant	New American Restaurant	Spanish Restaurant	Greek Restaurant	Southwestern French Restaurant
30	Halles	French Restaurant	Lebanese Restaurant	Italian Restaurant	Chinese Restaurant	Restaurant	Ramen Restaurant	Vegetarian / Vegan Restaurant	Peruvian Restaurant	African Restaurant	Japanese Restaurant
31	Hôtel-Saint-Louis	French Restaurant	Italian Restaurant	Asian Restaurant	Japanese Restaurant	Thai Restaurant	Restaurant	Cambodian Restaurant	Indonesian Restaurant	Southern / Soul Food Restaurant	Korean Restaurant
34	Javel	French Restaurant	Sushi Restaurant	Asian Restaurant	Japanese Restaurant	Moroccan Restaurant	Spanish Restaurant	Restaurant	Vietnamese Restaurant	Lebanese Restaurant	Greek Restaurant
36	Madeline	French Restaurant	Asian Restaurant	Vietnamese Restaurant	Mediterranean Restaurant	Modern European Restaurant	Corisian Restaurant	Russian Restaurant	Italian Restaurant	Thai Restaurant	Argentinian Restaurant

VI .Comparative of the tree cities(Paris,Tronto,NYC)

The data collection ad processing describes in the previous section produce the following information .The analisys will be base on Population(Total number of inhabitants in the city),Venues number,Venus number per 10000 inhabitants,unique Venus,Total number of restautant,Restaurants number per10000 inhabitants,unique restaurant number as shown in the following table

Table including informations on the on the tree cities analysed

City	Population	Venues number	Venues number per 10000 inhabitants	Unique venue's categories number	Total Restorants number	Restautant1 per 10000 inhabitants	Total restaurant unique categories
NYC	8398748	10255	12,2	429	2580	3	92
Toronto	6196731	2213	3,57	276	503	0,8	48
Paris	2148271	5482	25	305	1866	8,5	79



To make things a little bit more clear, let's look at the following figure. To well understand what is in question here.

The most populated city here is NYC with 8398 748 inhabitants followed by Toronto and Paris with respectively 6,196,731 and 2148271 inhabitants.

As our interest here is particularly restaurant we have respectively 2580, 503, 1866. Thus a restaurant density (Restaurants number for 10000 inhabitant) of respectively 3 ; 0.8 and 8.5. In terms of restaurant diversity, the New York City is the best having 92 restaurant categories followed by Paris with 79 restaurants categories.

V Conclusion .

At the end of our investigation, thanks to data we collected using data processing tools and IBM cloud, the Toronto city being the less dense (0.8 restaurant for 10000 inhabitants) can be seen as the best place to invest if we take into account only this criterion thus the restaurant demand compared to the city Paris and New York City having already lots of restaurants. From the Toronto city analysis, there are 13 restaurant categories with only 1 restaurant and 7 with only two to those categories may be interesting in the sense they are few. Investing in the restaurant such as German

Comparative analysis between the three cities

Restaurant, Taiwanese Restaurant, Modern European restaurant may be a good investment.

