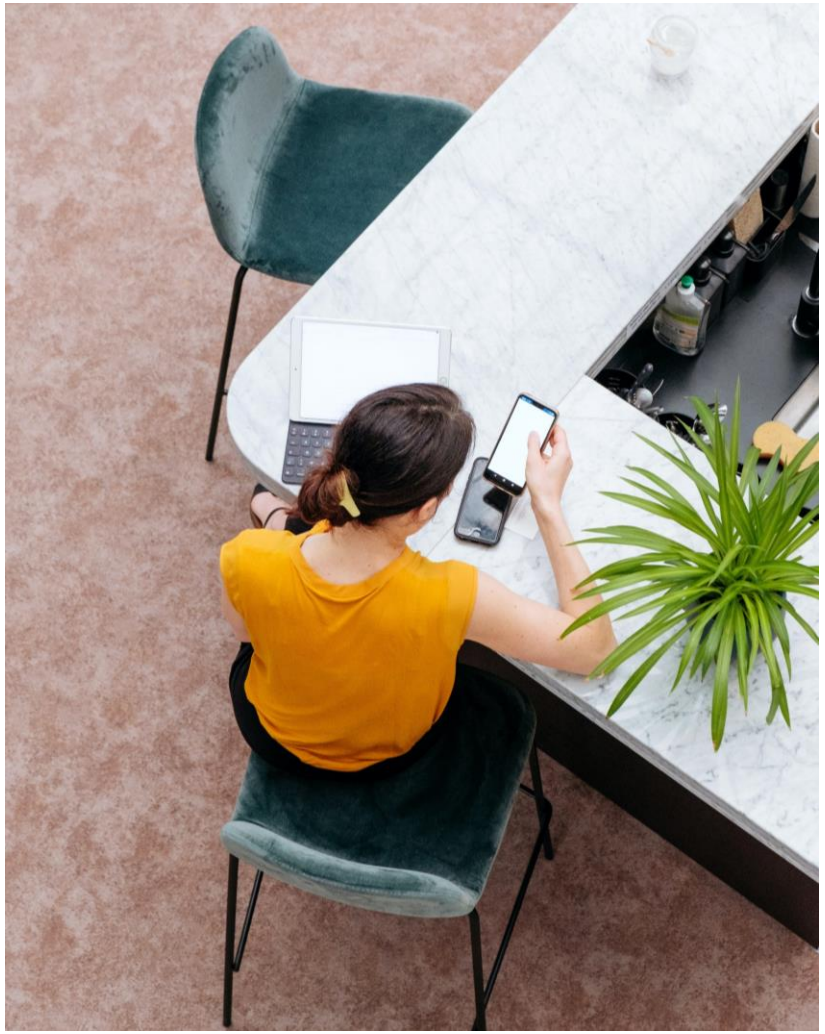
Data Science
Capstone

IBM Applied Data Science

Jesus Trejo

May 5th, 2021



Introduction

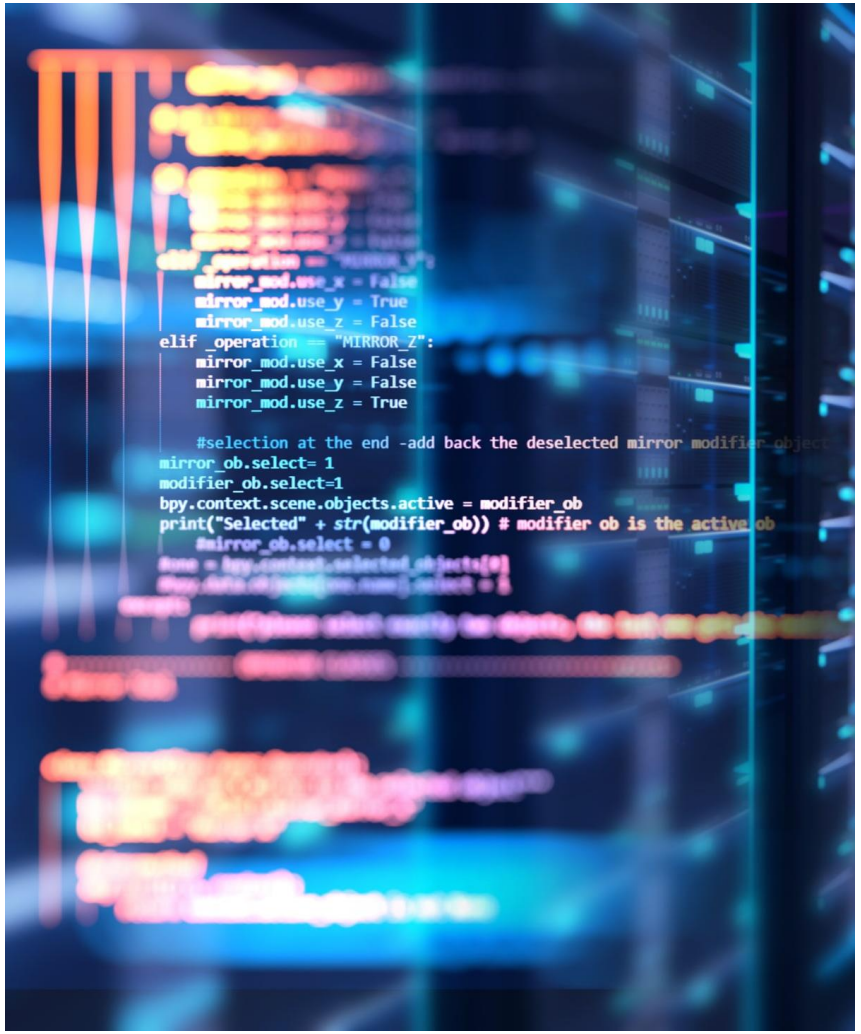
The goal of this project it's to help people explore facilities around neighborhoods to make smart and efficient decision on selecting a good place to live. It can be applied to many different situations such as: exploring the nightlife of a city, buy a house depending on the near facilities that surround the property, look for hotels near good restaurants when you travel, etc..

This project aims analyse the features for a people interested in living at this area to search the best neighborhood as a comparative analysis between neighborhoods. The features can include housing price, school ratings, crime rates, road connectivity, weather conditions, good management for emergency, water resources both freash and waste water and excrement conveyed in sewers and recreational facilities.

Business problem

For this project we are going to work with the following scenario: As an entrepreneur, one of my dreams is to open a craft brewery and since we are going to work with Toronto' data, I'm going to simulate where to open this business. There are several more factors when it comes to opening a business, but this project will help to gather data and get a starting point to locate a good spot.

The location will be Toronto. One of the most diverse and multicultural areas in Canada. Although immigration has become a hot topic over the past few years with more governments seeking more restrictions on immigrants and refugees, the general trend of immigration into Canada has been one of on the rise.



Data and Workflow

We are going to use the dataset we scrapped from wikipedia that consist of latitude, longitude and zip codes. This data set can be found here:

https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

Using credentials of Foursquare API features of near-by places of the neighborhoods would be mined. Due to http request limitations the number of places per neighborhood parameter would reasonably be set to 100 and the radius parameter would be set to 1000.

Using a clustering approach we can compare the similarities of neighborhoods, to explore, segment them, and group them into clusters to find similar neighborhoods in Toronto. To be able to do that, we need to cluster data using k-means clustering algorithm.

Scrapping the Wikipedia webpage we get an initial data set, that after the cleaning and preparation we can merge it with the coordinates zip codes of the neighborhoods.

This step its important so we can add later the foursquare venues data and proceed to build the clusters.

	Borough	Postcode	Neighborhood	Latitude	Longitude
0	Central Toronto	M4N	Lawrence Park	43.728020	-79.388790
1	Central Toronto	M4P	Davisville North	43.712751	-79.390197
2	Central Toronto	M4R	North Toronto West	43.715383	-79.405678
3	Central Toronto	M4S	Davisville	43.704324	-79.388790
4	Central Toronto	M4T	Moore Park, Summerhill East	43.689574	-79.383160

In order to get data about this particular location (Toronto), we are using Foursquare API. This platform it's a location data provider where we can gather information of all manner of venues and events within our area of interest. The API returns a JSON file that we can convert into a dataframe.

	Neighborhood	Latitude	Longitude	Venue Name	Venue Latitude	Venue Longitude	Venue Category
0	Lawrence Park	43.72802	-79.38879	Lawrence Park Ravine	43.726963	-79.394382	Park
1	Lawrence Park	43.72802	-79.38879	Granite Club	43.733043	-79.381986	Gym / Fitness Center
2	Lawrence Park	43.72802	-79.38879	Tim Hortons	43.727324	-79.379563	Coffee Shop
3	Lawrence Park	43.72802	-79.38879	Glendon Bookstore	43.727024	-79.378976	Bookstore
4	Lawrence Park	43.72802	-79.38879	Glendon Forest	43.727226	-79.378413	Trail

Exploratory Data Analysis

Once we have gather, prepare and clean our data we can proceed to explore it.

There are many ways you can proceed with, but for this project I did the following:

1. Checking how many venues were returned for each neighborhood,
2. Get the unique categories for the returned venues.
3. Count each category in each neighborhood
4. Getting the top 20 venues among all neighborhoods.
5. Visualize the neighborhoods and number of boroughs per neighborhood.
6. Get the number of breweries per neighborhood.

Once you have finish exploring your data set, you will have a very good idea of what it is going on. For this particular project we are interested in opening a brewery, so based on the conclusions we get we will make a decision.

Top 20 venues

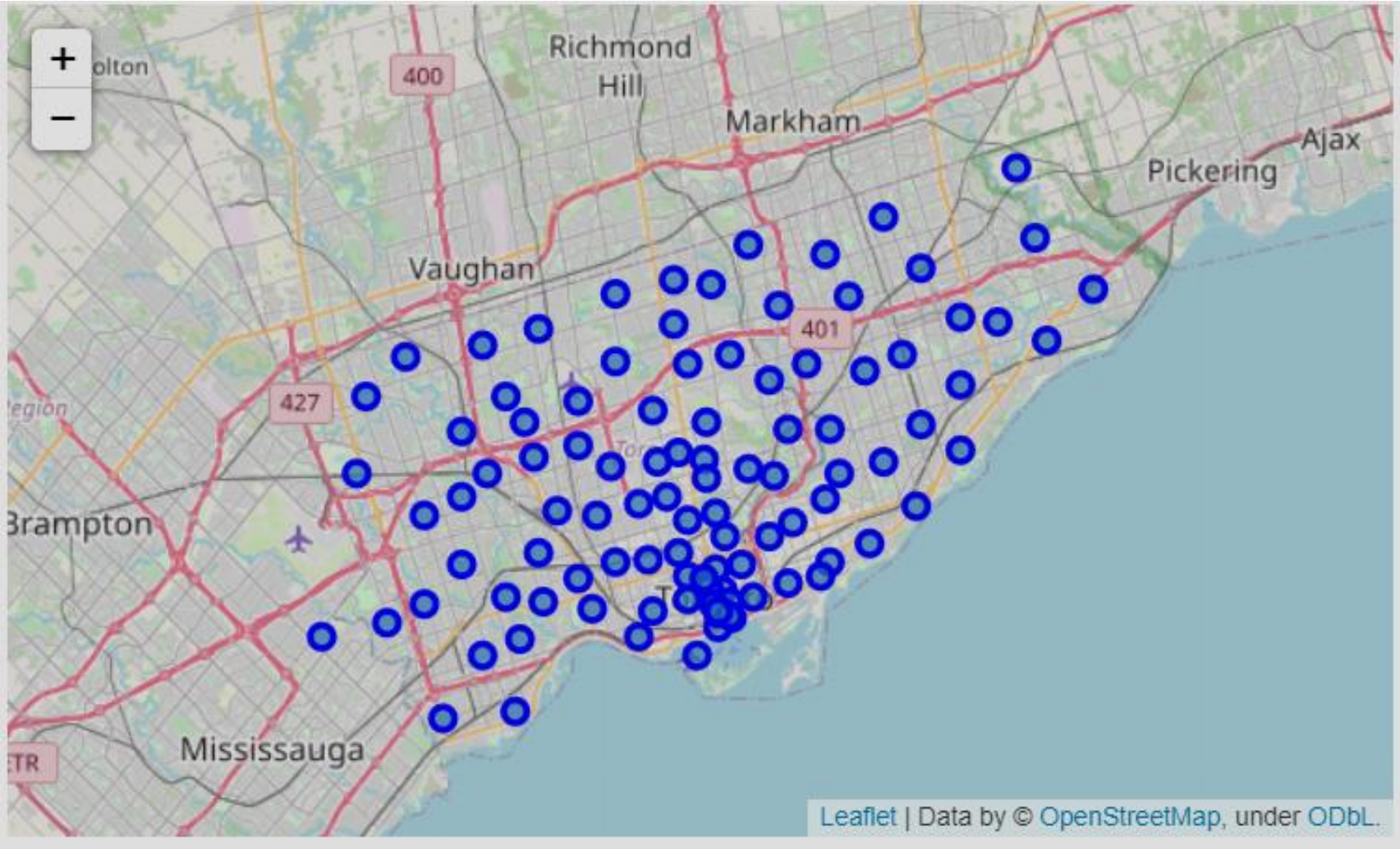
One of the very first interesting insights is that ew can gather the top 20 venues at our neighborhoods and some statistics.

We can say that Canadians really love coffee and foreign food such as Korean, Greek, Italian, Indian and Chinese.

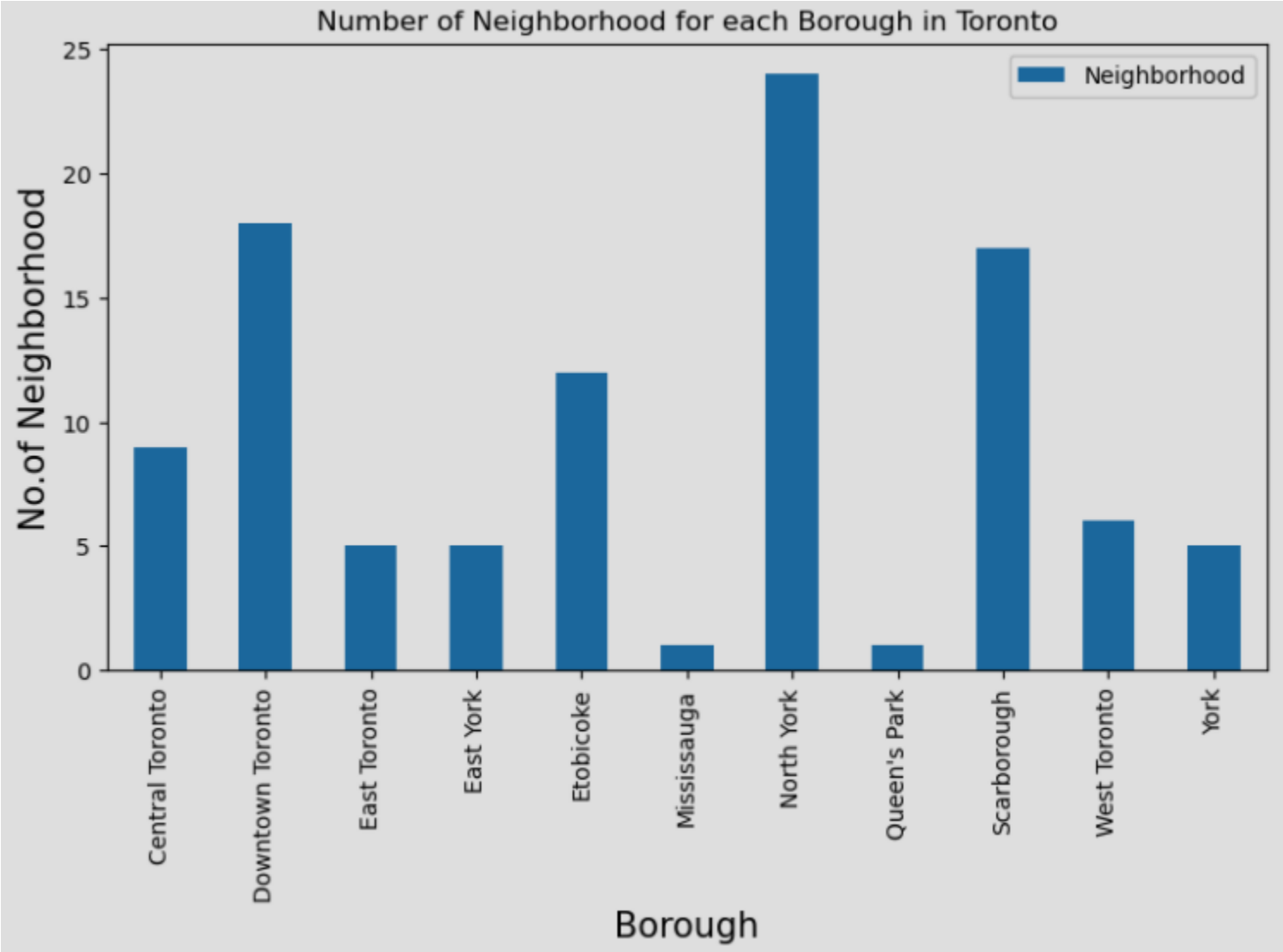
Our point of interest is the Brewery which gets the 15th place in the top.

Another interesting point is that there are 325 unique categories.

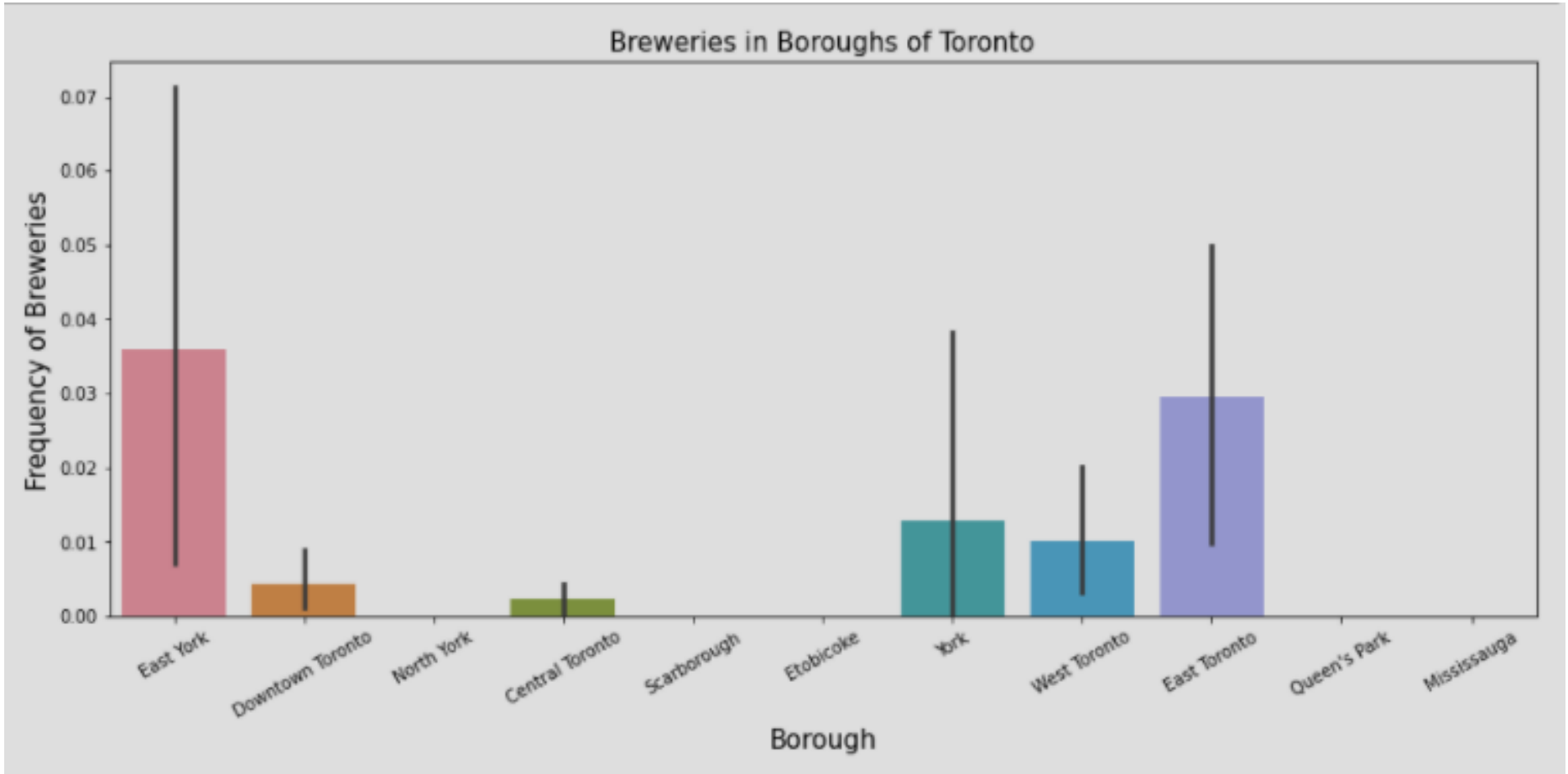
	count	mean	std	min	25%	50%	75%	max
Coffee Shop	102.0	3.715686	3.404649	0.0	1.0	2.5	5.0	15.0
Korean Restaurant	102.0	0.274510	1.470212	0.0	0.0	0.0	0.0	13.0
Greek Restaurant	102.0	0.343137	1.396566	0.0	0.0	0.0	0.0	12.0
Café	102.0	2.078431	2.809765	0.0	0.0	1.0	3.0	11.0
Italian Restaurant	102.0	1.098039	1.512390	0.0	0.0	1.0	2.0	9.0
Indian Restaurant	102.0	0.460784	0.971592	0.0	0.0	0.0	1.0	7.0
Chinese Restaurant	102.0	0.480392	1.096623	0.0	0.0	0.0	1.0	7.0
Bubble Tea Shop	102.0	0.215686	0.712372	0.0	0.0	0.0	0.0	6.0
Ramen Restaurant	102.0	0.245098	0.788987	0.0	0.0	0.0	0.0	6.0
Bar	102.0	0.500000	1.272325	0.0	0.0	0.0	0.0	6.0
Restaurant	102.0	1.421569	1.524949	0.0	0.0	1.0	2.0	6.0
Sushi Restaurant	102.0	0.784314	1.294524	0.0	0.0	0.0	1.0	6.0
Grocery Store	102.0	0.960784	1.125066	0.0	0.0	1.0	1.0	6.0
Gastropub	102.0	0.480392	0.951605	0.0	0.0	0.0	1.0	6.0
Brewery	102.0	0.343137	0.850103	0.0	0.0	0.0	0.0	5.0
Clothing Store	102.0	0.274510	0.746701	0.0	0.0	0.0	0.0	5.0
Pizza Place	102.0	1.480392	1.200086	0.0	1.0	1.0	2.0	5.0
Diner	102.0	0.392157	0.772765	0.0	0.0	0.0	1.0	5.0
Park	102.0	1.568627	1.270455	0.0	1.0	1.0	2.0	5.0
Vegetarian / Vegan Restaurant	102.0	0.441176	0.970593	0.0	0.0	0.0	0.0	5.0



In this map we can see the total of neighborhoods. It is important to get a visual before we do the clustering so we can compare them.



We can see that North York has the highest number of neighborhoods. Now we want to know hoy many breweries are in each neighborhood.

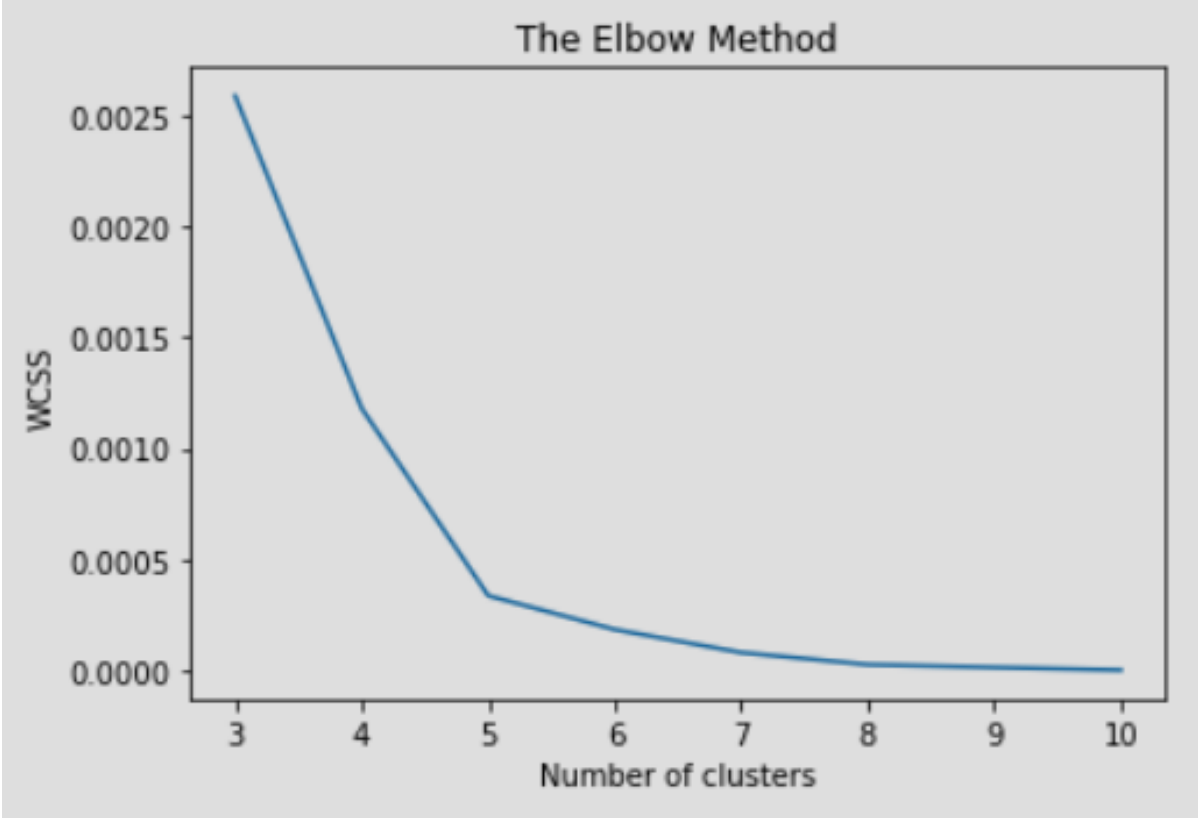


On the contrary than the last plot, we can recall that North York has the most number of neighborhoods, however as we may see in this plot, there are no breweries at this location, such as Etobicoke, Mississauga, Queen's Park and Scarborough, this may indicate that these neighborhoods are mos likely residential. On the other hand, East Toronto and East York have the most number of breweries by far than the rest.

Predictive modeling

Since we are going to use the K-means clustering algorithm, the first step is to identify the K value using the elbow method to get the optimal number of K.

This method calculates the sum of squared distances of samples to their closest cluster center for different values of K. The value of K after which there is no significant decrease in sum of squared distances is chosen.



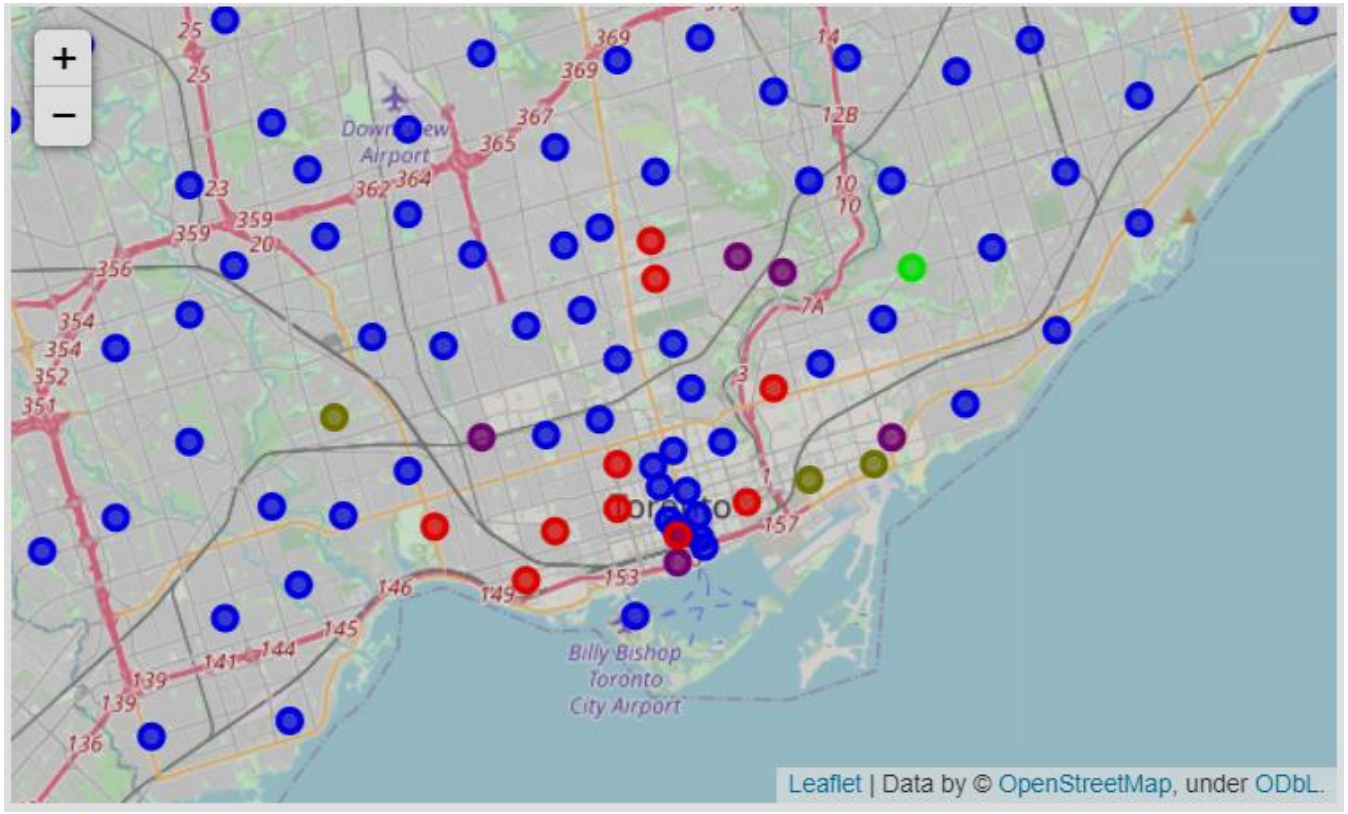
Resulting from the plot of the elbow method It seems that K=5 is the best value for our model, so we are going to proceed with this value.

Mapping clusters

Once we applied the algorithm we get a data set containing the results of each cluster. Visually we get the map of the right with the following insights:

- Cluster 0 has 1 result.
- Cluster 1 has 83 results.
- Cluster 2 has 5 results.
- Cluster 3 has 10 results.
- Cluster 4 has 3 results.

Based on this results and the exploratory data analysis we can make conclusions.



Resulting from clustering we can see cluster 0 in color green, cluster 1 in color blue, cluster 2 in color purple, cluster 3 in color red and cluster 4 in color yellow.

Conclusions

Based on the visualizations and data sets generated we can conclude that:

- North York Etobicoke, Mississauga, Queen's Park and Scarborough have no breweries at this neighborhoods, which may indicate that these neighborhoods are most likely residential and may be not the optimal place to open a business.

- On the other hand neighborhoods like East Toronto and East York have the most number of breweries which may be strong competitors for our new business. It would be better to place our business at York or West Toronto that have a more humble number of breweries, or even at Central Toronto and Downtown Toronto that have the least number of breweries.

- Clustering gives us similar results, suggesting that opening brewery will be a good idea at 2 or 4.

Thanks for your attention

I hope you, like me, have had a good experience completing these course series.