Capstone Project

Final Report: The Battle of Neighborhoods Finding a Better Place in Scarborough, Toronto

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1. Introduction:

The purpose of this Capstone Project is to help people in exploring better facilities around their neighborhood. It will help people making smart and efficient decision on selecting great neighborhood out of numbers of other neighborhoods in Scarborough, Toronto.

Lots of people are migrating to various states of Canada and needed lots of research for good housing prices and reputation schools for their children. This project is for those people who are looking for better neighborhoods. For ease of accessing to Cafe, School, Super market, medical shops, grocery shops, mall, theatre, hospital, likeminded people, etc.

This Capstone Project aim to create an analysis of features for a people migrating to Scarborough to search a best neighborhood as a comparative analysis between neighborhoods. The features include median housing price and better school according to ratings, crime rates of that particular area, road connectivity, weather conditions, good management for emergency, water resources both fresh and waste water and excrement conveyed in sewers and recreational facilities.

It will help people to get awareness of the area and neighborhood before moving to a new city, state, country or place for their work or to start a new fresh life.

2. Data Section

- **Data Link:**

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

Will use Scarborough dataset which we scrapped from Wikipedia on Week 3. Dataset consisting of latitude and longitude, zip codes.

- Foursquare API Data:

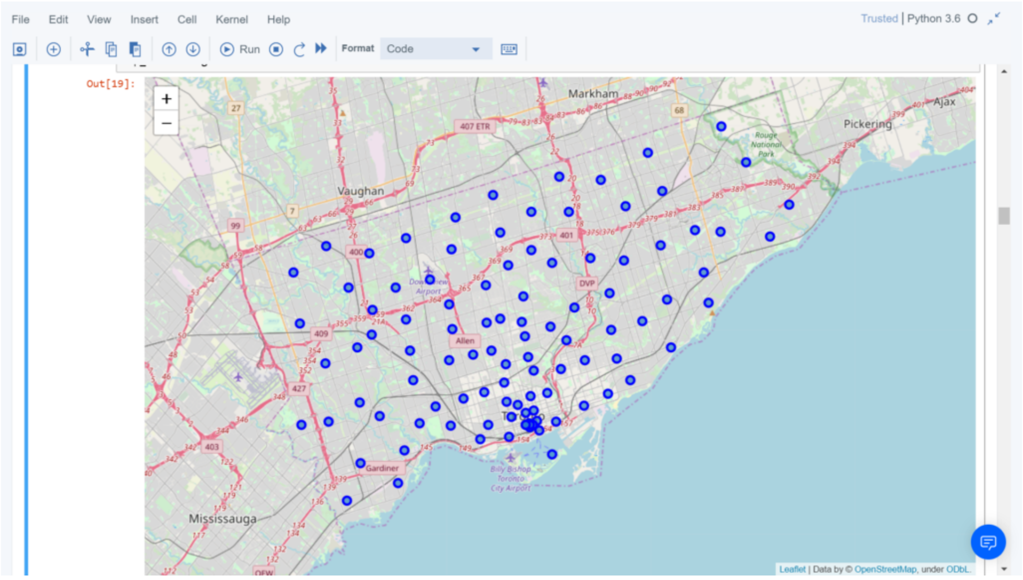
We will need data about different venues in different neighborhoods of that specific borough. In order to gain that information, we will use “Foursquare” locational information. Foursquare is a location data provider with information about all manner of venues and events within an area of interest. Such information includes venue names, locations, menus and even photos. As such, the foursquare location platform will be used as the sole data source since all the stated required information can be obtained through the API.

After finding the list of neighborhoods, we then connect to the Foursquare API to gather information about venues inside each and every neighborhood. For each neighborhood, we have chosen the radius to be 100 meters.

The data retrieved from Foursquare contained information of venues within a specified distance of the longitude and latitude of the postcodes. The information obtained per venue as follows:

1. Neighborhood
2. Neighborhood Latitude
3. Neighborhood Longitude
4. Venue
5. Name of the venue e.g. the name of a store or restaurant
6. Venue Latitude
7. Venue Longitude
8. Venue Category

- **Map of Scarborough**

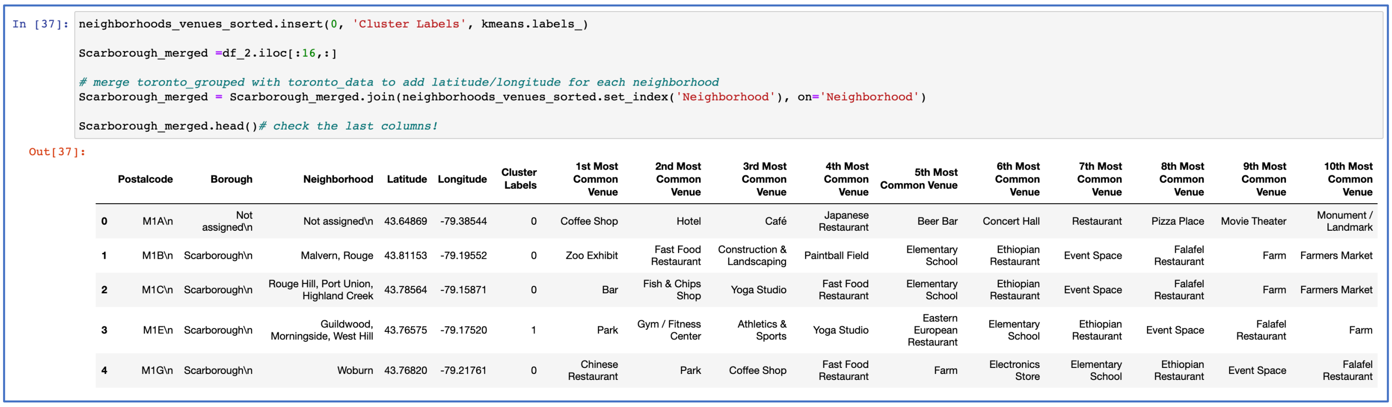


3. Methodology Section

- Clustering Approach:

To compare the similarities of two cities, we decided to explore neighborhoods, segment them, and group them into clusters to find similar neighborhoods in a big city like New York and Toronto. To be able to do that, we need to cluster data which is a form of unsupervised machine learning: k-means clustering algorithm.

- **Using K-Means Clustering Approach** | Most Common Venue

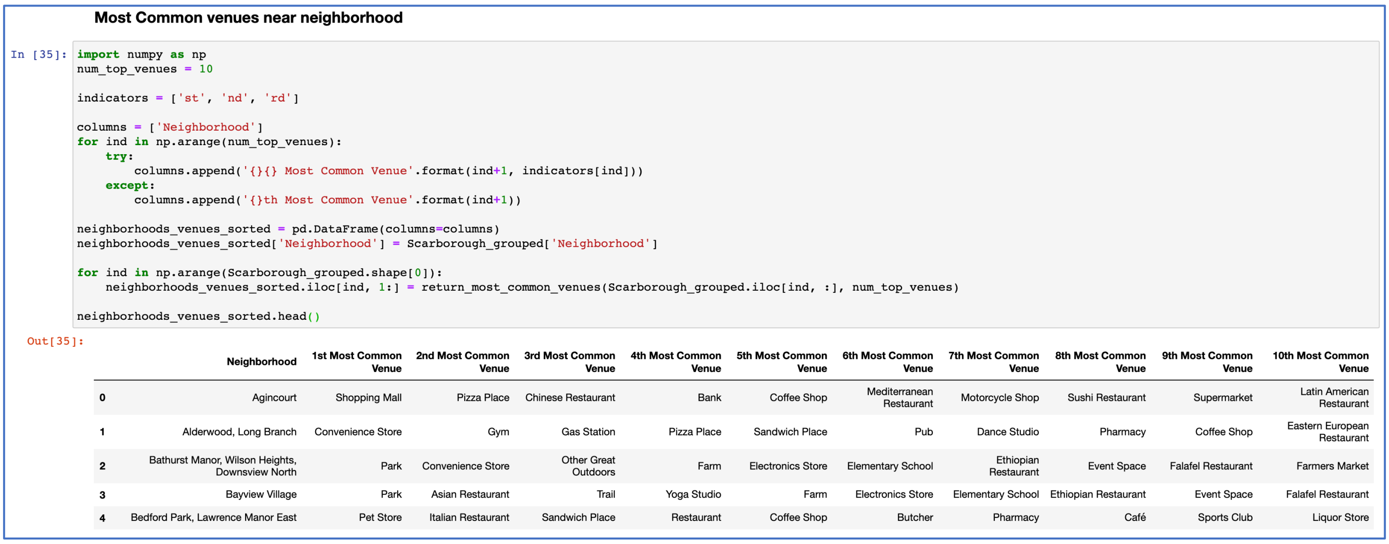


```
In [37]: neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

         Scarborough_merged =df_2.iloc[:16,:]

         # merge toronto_grouped with toronto_data to add latitude/longitude for each neighborhood
         Scarborough_merged = Scarborough_merged.join(neighborhoods_venues_sorted.set_index('Neighborhood'), on='Neighborhood')

         Scarborough_merged.head()# check the last columns!
```

Out[37]:

	Postalcode	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	M1A\n	Not assigned\n	Not assigned\n	43.64869	-79.38544	0	Coffee Shop	Hotel	Café	Japanese Restaurant	Beer Bar	Concert Hall	Restaurant	Pizza Place	Movie Theater	Monument / Landmark
1	M1B\n	Scarborough\n	Malvern, Rouge	43.81153	-79.19552	0	Zoo Exhibit	Fast Food Restaurant	Construction & Landscaping	Paintball Field	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant	Farm	Farmers Market
2	M1C\n	Scarborough\n	Rouge Hill, Port Union, Highland Creek	43.78564	-79.15871	0	Bar	Fish & Chips Shop	Yoga Studio	Fast Food Restaurant	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant	Farm	Farmers Market
3	M1E\n	Scarborough\n	Guildwood, Morningside, West Hill	43.76575	-79.17520	1	Park	Gym / Fitness Center	Athletics & Sports	Yoga Studio	Eastern European Restaurant	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant	Farm
4	M1G\n	Scarborough\n	Woburn	43.76820	-79.21761	0	Chinese Restaurant	Park	Coffee Shop	Fast Food Restaurant	Farm	Electronics Store	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant

- **Most Common Venues near Neighborhood** | Using Clustering



Most Common venues near neighborhood

```
In [35]: import numpy as np
         num_top_venues = 10

         indicators = ['st', 'nd', 'rd']

         columns = ['Neighborhood']
         for ind in np.arange(num_top_venues):
             try:
                 columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
             except:
                 columns.append('{}th Most Common Venue'.format(ind+1))

         neighborhoods_venues_sorted = pd.DataFrame(columns=columns)
         neighborhoods_venues_sorted['Neighborhood'] = Scarborough_grouped['Neighborhood']

         for ind in np.arange(Scarborough_grouped.shape[0]):
             neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(Scarborough_grouped.iloc[ind, :], num_top_venues)

         neighborhoods_venues_sorted.head()
```

Out[35]:

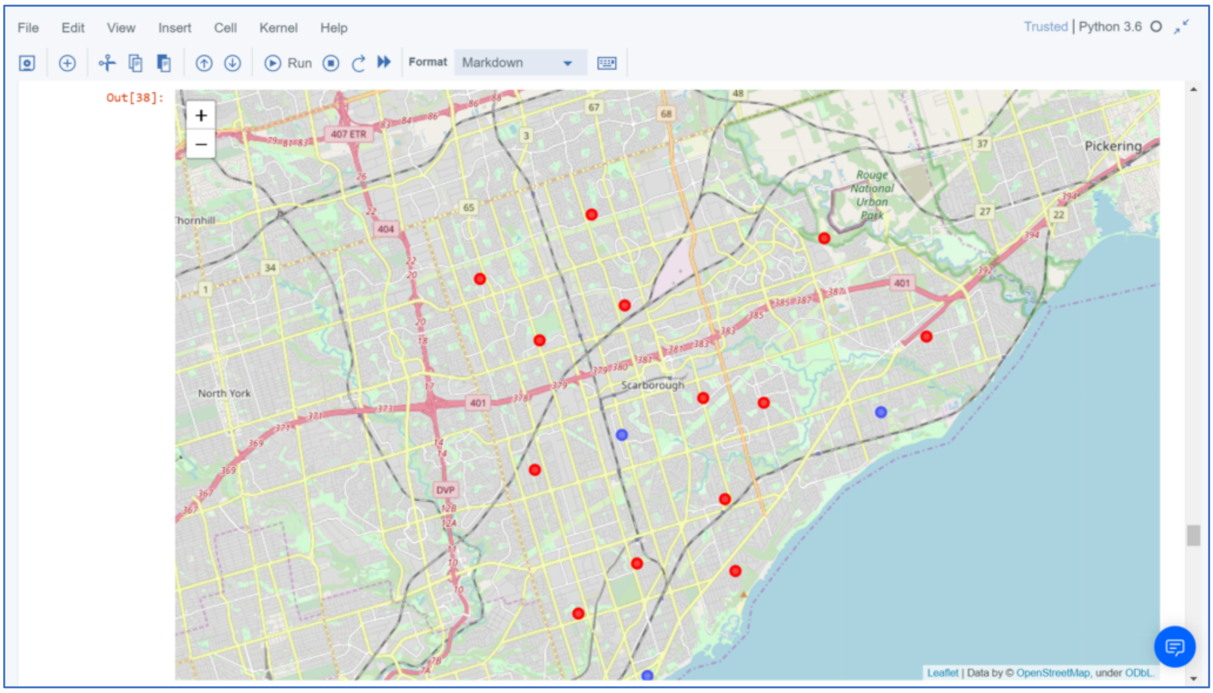
	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Agincourt	Shopping Mall	Pizza Place	Chinese Restaurant	Bank	Coffee Shop	Mediterranean Restaurant	Motorcycle Shop	Sushi Restaurant	Supermarket	Latin American Restaurant
1	Alderwood, Long Branch	Convenience Store	Gym	Gas Station	Pizza Place	Sandwich Place	Pub	Dance Studio	Pharmacy	Coffee Shop	Eastern European Restaurant
2	Bathurst Manor, Wilson Heights, Downsview North	Park	Convenience Store	Other Great Outdoors	Farm	Electronics Store	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant	Farmers Market
3	Bayview Village	Park	Asian Restaurant	Trail	Yoga Studio	Farm	Electronics Store	Elementary School	Ethiopian Restaurant	Event Space	Falafel Restaurant
4	Bedford Park, Lawrence Manor East	Pet Store	Italian Restaurant	Sandwich Place	Restaurant	Coffee Shop	Butcher	Pharmacy	Café	Sports Club	Liquor Store

- **Work Flow:**

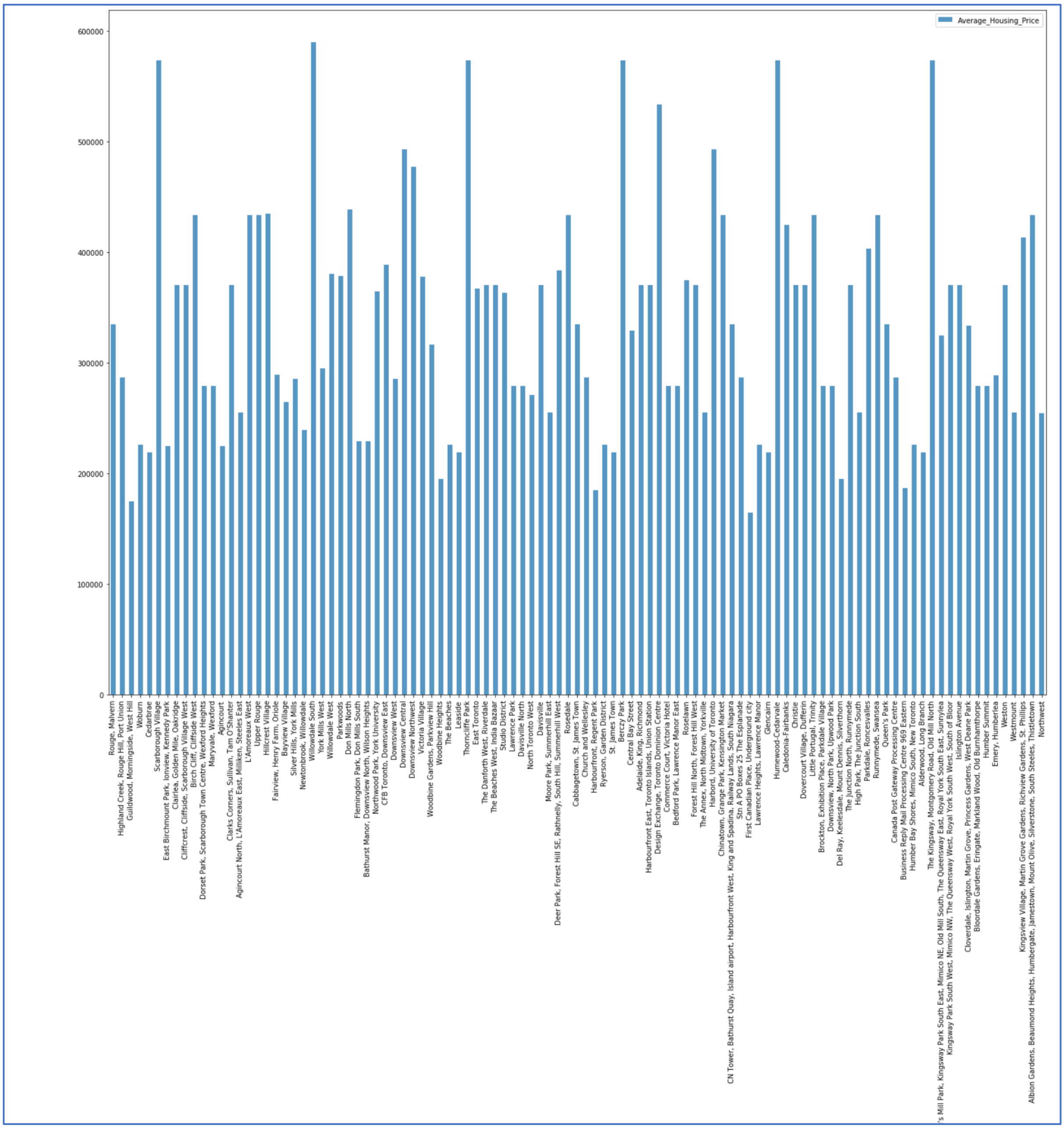
Using credentials of Foursquare API features of near-by places of the neighborhoods would be mined. Due to http request limitations the number of places per neighborhood parameter would reasonably be set to 100 and the radius parameter would be set to 500.

4. Results Section

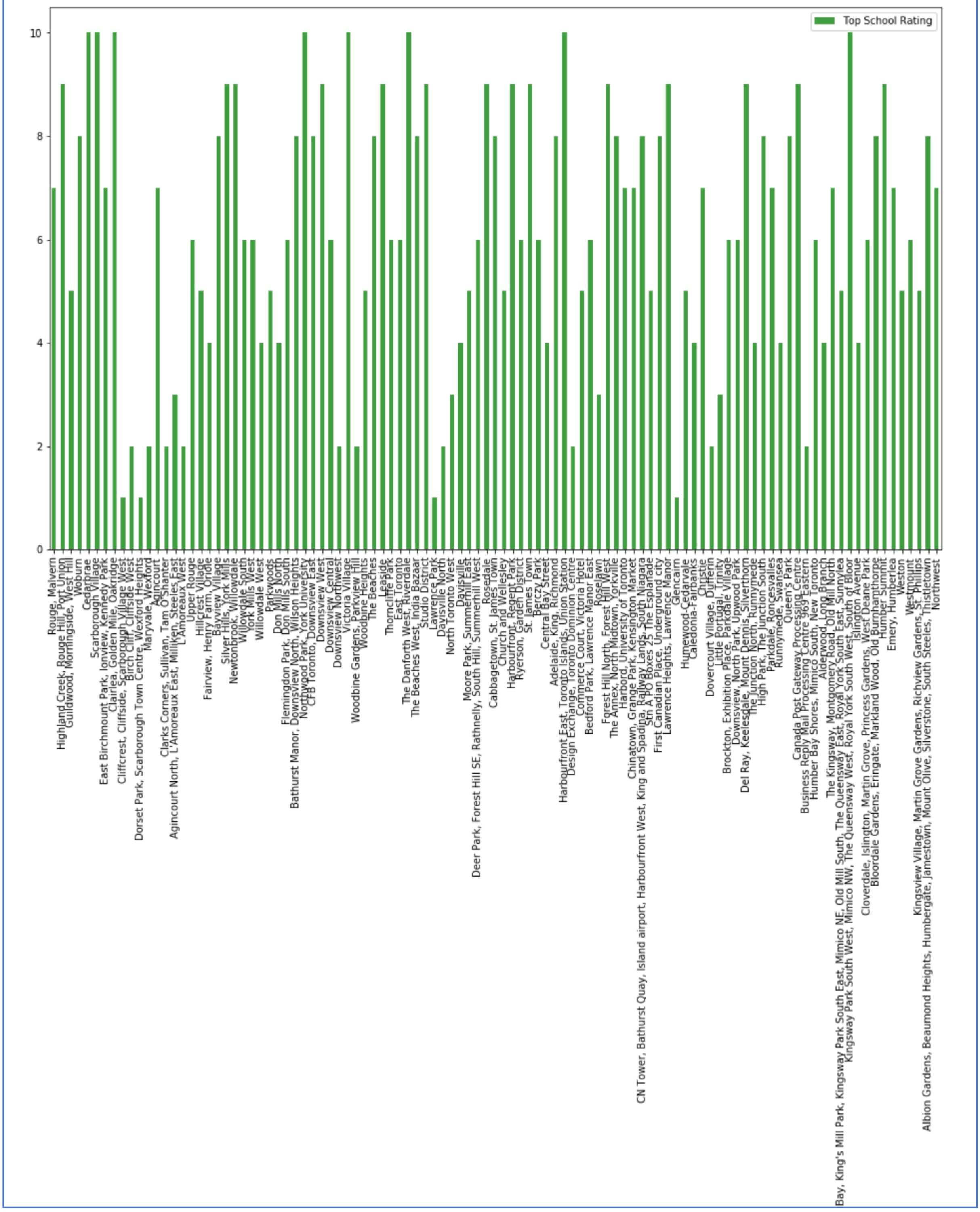
- **Map of Clusters in Scarborough**



- **Average Housing Price by Clusters in Scarborough**



- **School Ratings by Clusters in Scarborough**



- **The Location:**

Scarborough is a popular destination for new immigrants in Canada to reside. As a result, it is one of the most diverse and multicultural areas in the Greater Toronto Area, being home to various religious groups and places of worship. 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.

- **Foursquare API:**

This Capstone project have used Four-square API as its prime data gathering source as it has a database of millions of places, especially their places API which provides the ability to perform location search, location sharing and details about a business.

5. Discussion Section

- **Problem which tried to Solve:**

The major purpose of this project, is to suggest a better neighborhood in a new city for the person who are shifting there. Social presence in society in terms of likeminded people. Connectivity to the airport, bus stand, city center, markets and other daily needs things nearby.

- Sorted list of houses in terms of housing prices in a ascending or descending order
- Sorted list of schools in terms of location, fees, rating and reviews

6. Conclusion Section

In this Capstone project, using k-means cluster algorithm I separated the neighborhood into 10(Ten) different clusters and for 103 different latitude and longitude from dataset, which have very-similar neighborhoods around them. Using the charts above results presented to a particular neighborhood based on average house prices and school rating have been made.

I feel rewarded with the efforts and believe this course with all the topics covered is well worthy of appreciation. This project has shown me a practical application to resolve a real situation that has impacting personal and financial impact using Data Science tools. The mapping with Folium is a very powerful technique to consolidate information and make the analysis and decision better with confidence.

Future Works:

This Capstone project can be continued for making it more precise in terms to find best house in Scarborough. Best means on the basis of all required things (daily needs or things we need to live a better life) around and also in terms of cost effective.

Libraries Which are Used to Develop the Project:

- *Pandas: For creating and manipulating data frames.*
- *Folium: Python visualization library would be used to visualize the neighborhoods cluster distribution of using interactive leaflet map.*
- *Scikit Learn: For importing k-means clustering.*
- *JSON: Library to handle JSON files.*
- *XML: To separate data from presentation and XML stores data in plain text format.*
- *Geocoder: To retrieve Location Data.*
- *Beautiful Soup and Requests: To scrap and library to handle http requests.*
- *Matplotlib: Python Plotting Module.*

GitHub Link of Complete Project: https://github.com/nghiemndfe2011/CapstoneFinal

Thank you,
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