Introduction/Business Problem:

- Location and Premises
    - Location
    - Building type
    - Target Market
    - Cost

- Your Target Students
    - Age of Students
    - Interests of Students

- Who are your competitors
    - Any other Tutorial points in the area

Data Section:

Data Sources:

- Data Link: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
- Data of School Zones: https://open.toronto.ca/dataset/school-locations-all-types/
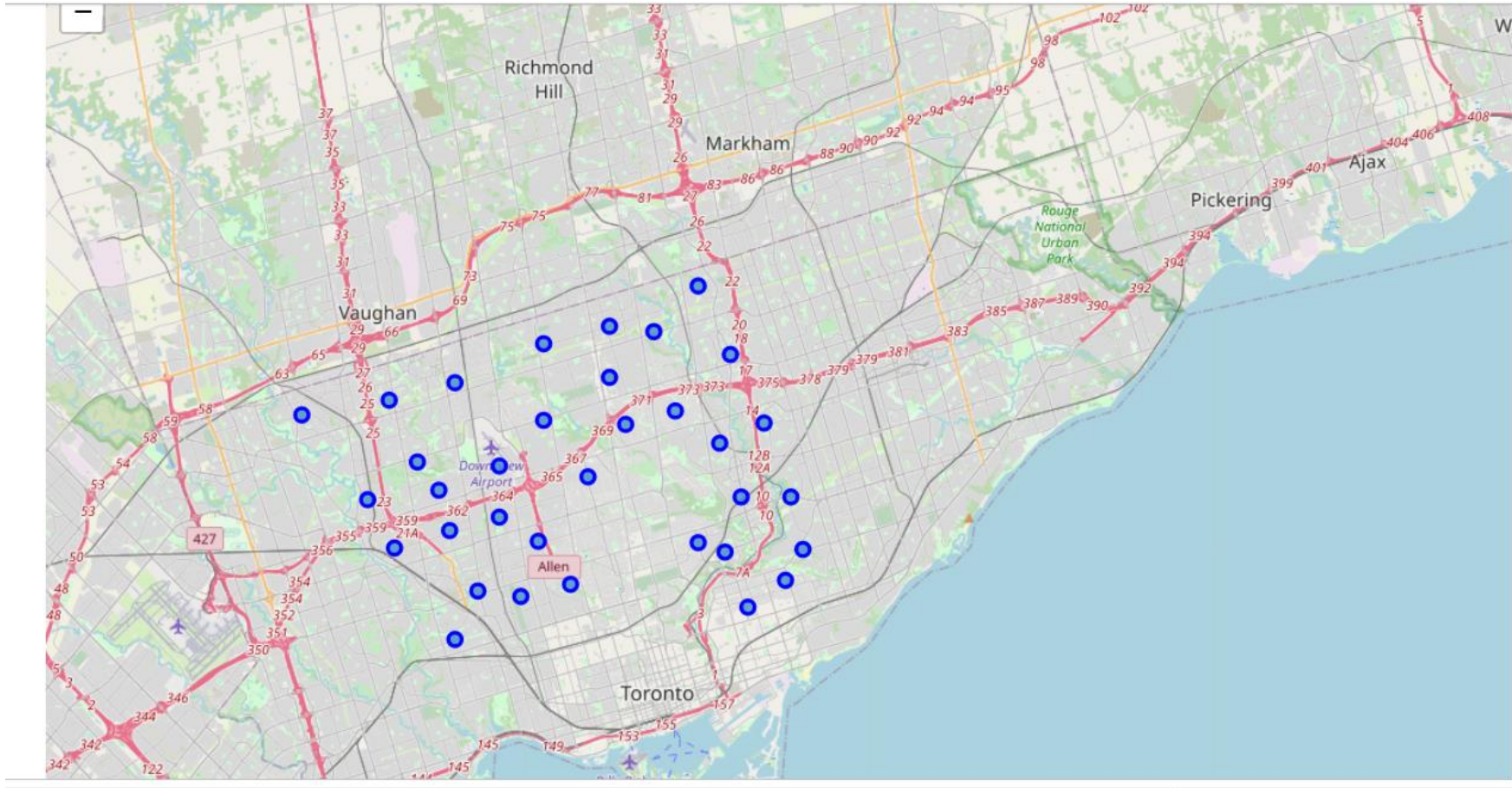- Foursquare API Data:

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

Libraries Which are Used to Develop the Project:

- Pandas: For creating and manipulating dataframes.
- 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.

Map of York, NY, EY

K-Means Clustering Approach

```
[247]:   # set number of clusters
         kclusters = 5

         dt_grouped_clustering = dt_grouped.drop('Neighborhoods', 1)

         # run k-means clustering
         kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(dt_grouped_clustering)

         # check cluster labels generated for each row in the dataframe
         kmeans.labels_
```

```
[247]:   array([0, 0, 0, 3, 0, 0, 3, 1, 0, 3, 0, 4, 2, 3, 0, 0, 3, 0, 0, 3, 0, 0,
                 0, 1, 0, 0, 3, 1], dtype=int32)
```

```
[248]:   #Let's create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

         # add clustering labels
         neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

         dt_merged = to_geo

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

         #neighborhoods_venues_sorted = neighborhoods_venues_sorted.drop(columns = ['Cluster Labels'])

         #neighborhoods_venues_sorted.head()

         dt_merged = dt_merged.dropna()

         #dt_merged# check the last columns!
```
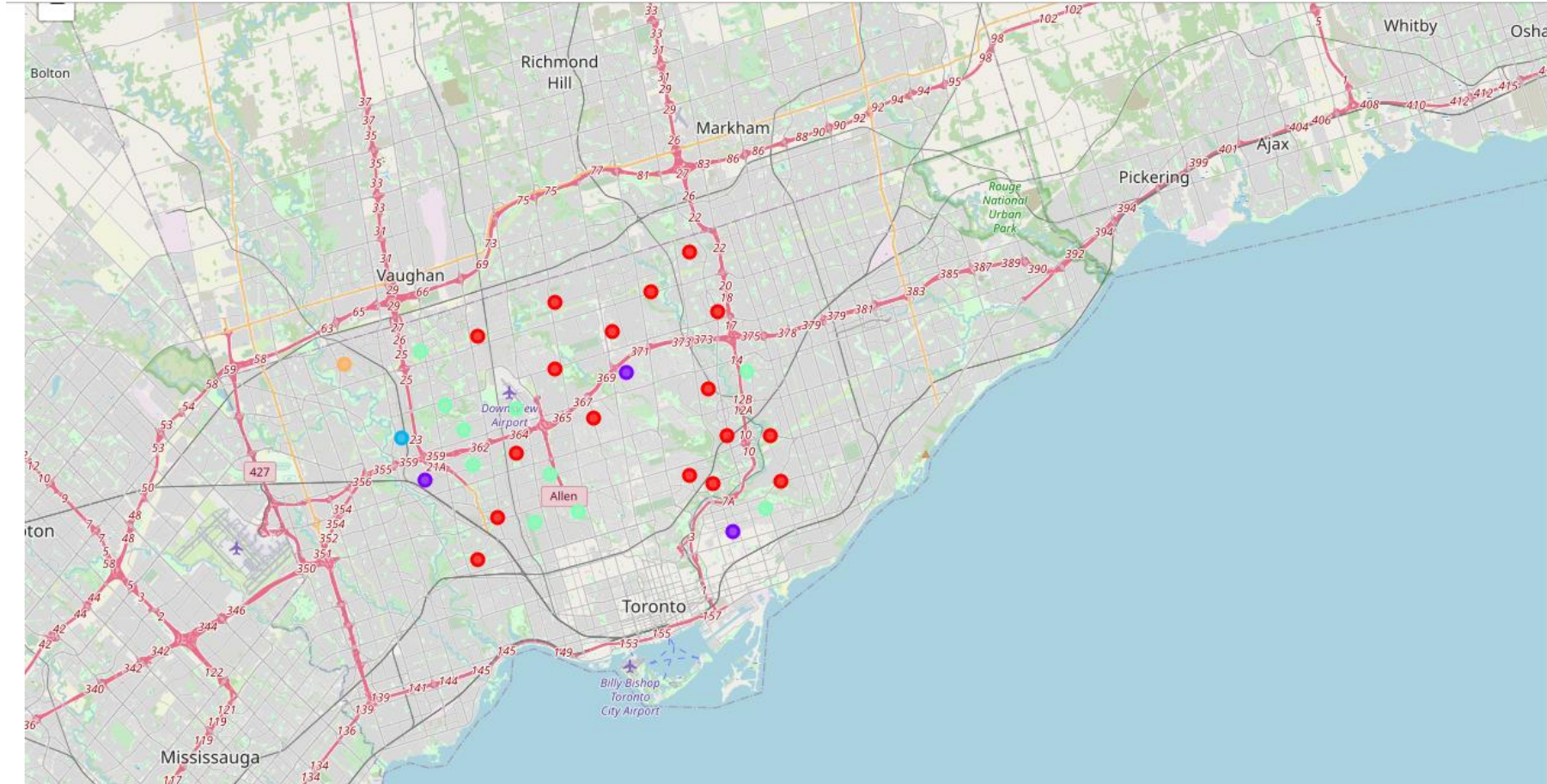
K-Means Clustering Approach

10 most common veneus

248]:

	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	M6C	York	Humewood-Cedarvale	43.693781	-79.428191	3.0	Park	Hockey Arena	Trail	Field	Yoga Studio	Department Store	Discount Store	Diner	Dim Sum Restaurant	Dessert Shop
1	M6E	York	Caledonia-Fairbanks	43.689026	-79.453512	3.0	Park	Women's Store	Pool	Yoga Studio	Dog Run	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega
2	M6M	York	Del Ray, Mount Dennis, Keelsdale and Silverthorn	43.691116	-79.476013	0.0	Turkish Restaurant	Sandwich Place	Bar	Discount Store	Yoga Studio	Dog Run	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice
3	M6N	York	Runnymede, The Junction North	43.673185	-79.487262	0.0	Grocery Store	Convenience Store	Breakfast Spot	Pizza Place	Yoga Studio	Dog Run	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega
4	M9N	York	Weston	43.706876	-79.518188	1.0	Convenience Store	Park	Yoga Studio	Golf Course	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store	Dessert Shop
5	M2H	North York	Hillcrest Village	43.803762	-79.363452	0.0	Golf Course	Dog Run	Pool	Mediterranean Restaurant	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
6	M2J	North York	Fairview, Henry Farm, Oriole	43.778517	-79.346556	0.0	Clothing Store	Coffee Shop	Fast Food Restaurant	Restaurant	Japanese Restaurant	Cosmetics Shop	Convenience Store	Tea Room	Electronics Store	Bank
7	M2K	North York	Bayview Village	43.786947	-79.385975	0.0	Chinese Restaurant	Café	Bank	Japanese Restaurant	Yoga Studio	Electronics Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
10	M2N	North York	Willowdale, Willowdale East	43.770120	-79.408493	0.0	Ramen Restaurant	Restaurant	Sandwich Place	Pizza Place	Coffee Shop	Café	Sushi Restaurant	Shopping Mall	Steakhouse	Bubble Tea Shop

Map of Clusters in York, NY, EY

Cluster 1 - Grocery & Restaurant

```
[252]: dt_merged.loc[dt_merged['Cluster Labels'] == 0, dt_merged.columns[[2] + list(range(5, dt_merged.shape[1]))]]
```

[252]:

	Neighborhood	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	Del Ray, Mount Dennis, Keelsdale and Silverthorn	0	Turkish Restaurant	Sandwich Place	Bar	Discount Store	Yoga Studio	Dog Run	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice
3	Runnymede, The Junction North	0	Grocery Store	Convenience Store	Breakfast Spot	Pizza Place	Yoga Studio	Dog Run	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega
5	Hillcrest Village	0	Golf Course	Dog Run	Pool	Mediterranean Restaurant	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
6	Fairview, Henry Farm, Oriole	0	Clothing Store	Coffee Shop	Fast Food Restaurant	Restaurant	Japanese Restaurant	Cosmetics Shop	Convenience Store	Tea Room	Electronics Store	Bank
7	Bayview Village	0	Chinese Restaurant	Café	Bank	Japanese Restaurant	Yoga Studio	Electronics Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
10	Willowdale, Willowdale East	0	Ramen Restaurant	Restaurant	Sandwich Place	Pizza Place	Coffee Shop	Café	Sushi Restaurant	Shopping Mall	Steakhouse	Bubble Tea Shop
12	Willowdale, Willowdale West	0	Coffee Shop	Bank	Discount Store	Pizza Place	Pharmacy	Grocery Store	Fried Chicken Joint	Gas Station	Comfort Food Restaurant	Construction & Landscaping
14	Don Mills	0	Restaurant	Coffee Shop	Japanese Restaurant	Asian Restaurant	Gym	Beer Store	Caribbean Restaurant	Dim Sum Restaurant	Italian Restaurant	Discount Store
15	Don Mills	0	Restaurant	Coffee Shop	Japanese Restaurant	Asian Restaurant	Gym	Beer Store	Caribbean Restaurant	Dim Sum Restaurant	Italian Restaurant	Discount Store
16	Bathurst Manor, Wilson Heights, Downsview North	0	Coffee Shop	Bank	Pharmacy	Supermarket	Fried Chicken Joint	Pizza Place	Deli / Bodega	Restaurant	Sandwich Place	Bridal Shop
17	Northwood Park, York University	0	Coffee Shop	Caribbean Restaurant	Miscellaneous Shop	Metro Station	Bar	Massage Studio	Falafel Restaurant	Distribution Center	Cosmetics Shop	Curling Ice
22	Victoria Village	0	Coffee Shop	Pizza Place	Portuguese Restaurant	French Restaurant	Hockey Arena	Intersection	Deli / Bodega	Dim Sum Restaurant	Dessert Shop	Department Store

Cluster 2 - Parks & Entertainment

```
dt_merged.loc[dt_merged['Cluster Labels'] == 1, dt_merged.columns[[2] + list(range(5, dt_merged.shape[1]))]]
```

	Neighborhood	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
4	Weston	1	Convenience Store	Park	Yoga Studio	Golf Course	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store	Dessert Shop
11	York Mills West	1	Convenience Store	Park	Yoga Studio	Golf Course	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store	Dessert Shop
33	East Toronto, Broadview North (Old East York)	1	Park	Convenience Store	Metro Station	Yoga Studio	Gift Shop	Construction & Landscaping	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store

Cluster 3: Sports & Fitness

```
[254]:  dt_merged.loc[dt_merged['Cluster Labels'] == 2, dt_merged.columns[[2] + list(range(5, dt_merged.shape[1]))]]
```

[254]:

	Neighborhood	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
28	Humberlea, Emery	2	Baseball Field	Yoga Studio	Electronics Store	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store	Dessert Shop

Cluster 4: Park

```
[255]:  dt_merged.loc[dt_merged['Cluster Labels'] == 3, dt_merged.columns[[2] + list(range(5, dt_merged.shape[1]))]]
```
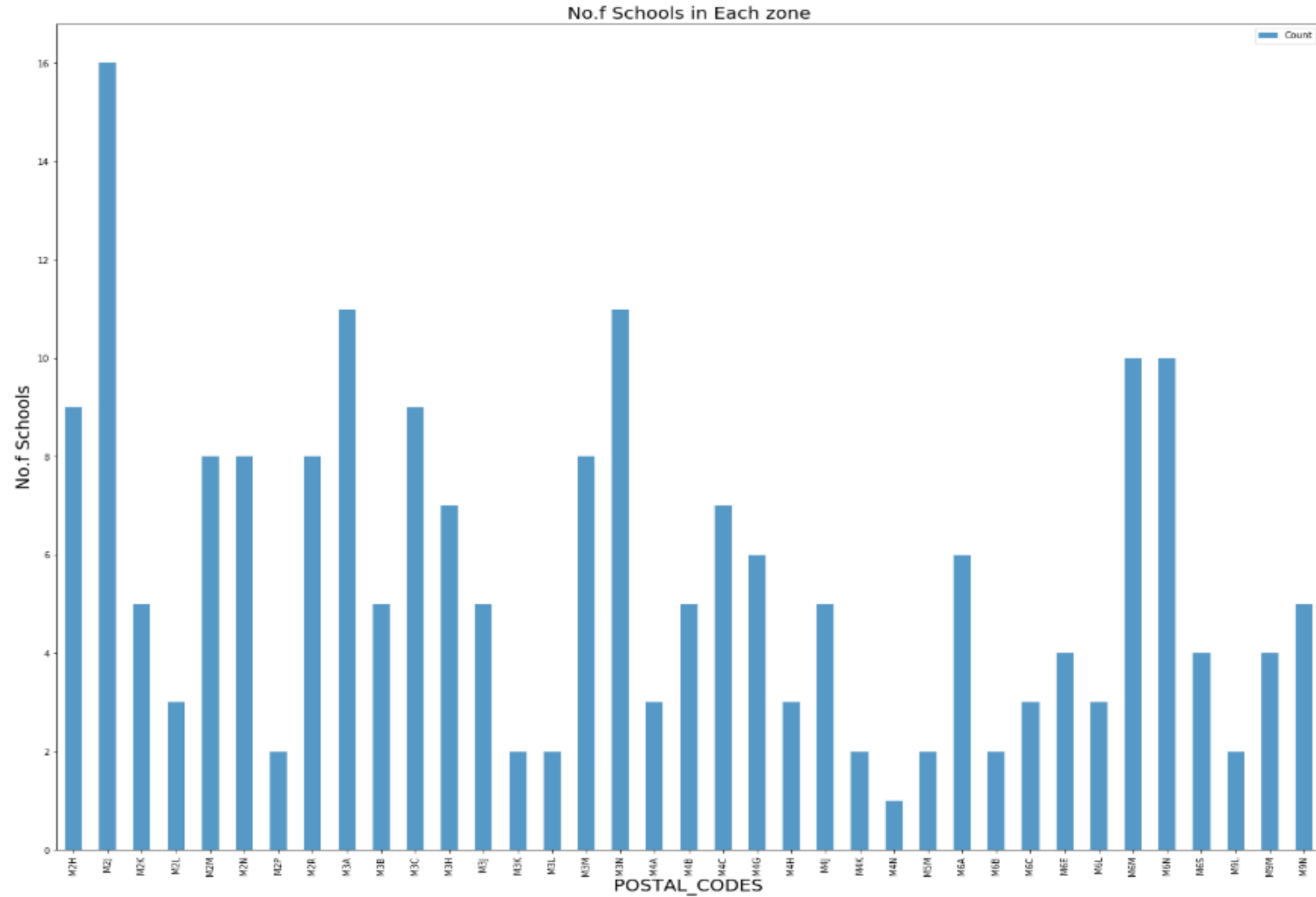
[255]:

	Neighborhood	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	Humewood-Cedarvale	3	Park	Hockey Arena	Trail	Field	Yoga Studio	Department Store	Discount Store	Diner	Dim Sum Restaurant	Dessert Shop
1	Caledonia-Fairbanks	3	Park	Women's Store	Pool	Yoga Studio	Dog Run	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega
13	Parkwoods	3	Construction & Landscaping	Park	Food & Drink Shop	Yoga Studio	Dog Run	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
18	Downsview	3	Grocery Store	Park	Gym / Fitness Center	Shopping Mall	Snack Place	Construction & Landscaping	Hotel	Baseball Field	Bank	Liquor Store
19	Downsview	3	Grocery Store	Park	Gym / Fitness Center	Shopping Mall	Snack Place	Construction & Landscaping	Hotel	Baseball Field	Bank	Liquor Store
20	Downsview	3	Grocery Store	Park	Gym / Fitness Center	Shopping Mall	Snack Place	Construction & Landscaping	Hotel	Baseball Field	Bank	Liquor Store
21	Downsview	3	Grocery Store	Park	Gym / Fitness Center	Shopping Mall	Snack Place	Construction & Landscaping	Hotel	Baseball Field	Bank	Liquor Store
25	Glencairn	3	Park	Pub	Sushi Restaurant	Japanese Restaurant	Yoga Studio	Distribution Center	Construction & Landscaping	Convenience Store	Cosmetics Shop	Curling Ice
26	North Park, Maple Leaf Park, Upwood Park	3	Construction & Landscaping	Park	Bakery	Basketball Court	Electronics Store	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store
30	Woodbine Heights	3	Pharmacy	Curling Ice	Park	Beer Store	Athletics & Sports	Bus Stop	Video Store	Skating Rink	Cosmetics Shop	Convenience Store

Cluster 5: Pizza & Shopping

```
dt_merged.loc[dt_merged['Cluster Labels'] == 4, dt_merged.columns[[2] + list(range(5, dt_merged.shape[1]))]]
```

	Neighborhood	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
27	Humber Summit	4	Pizza Place	Construction & Landscaping	Golf Course	Comfort Food Restaurant	Convenience Store	Cosmetics Shop	Curling Ice	Deli / Bodega	Department Store	Dessert Shop

No.of Schools by Clusters in each postal zone in York, NY, EY

No.f Schools in Each zone

Discussion Section

- The major purpose of this project, is to suggest a better neighborhood in a York, North York and East York of the city for the person who is planning to start a Tutorial point. Places that have good feasibility to coffee shops, small pizza, breakfast points, and feasibility to schools are much preffered. But it should not be noisy or disturbing at the sametime.

Conclusion Section

- In this Capstone project, using k-means cluster algorithm I separated the neighborhood into 10(Ten) different clusters and for 103 different lattitude and logitude from dataset, which have very-similar neighborhoods around them. Of them Zones with Parks, Coffee Shops, and Schools are considered the apt places to start a tutorial point. These will be more accessible to Students. These include Fairview, Henry Farm, Oriole, Downsview, Runnymede, The Junction North are considered as good places.

Github link to notebook:

- https://github.com/kavyap1212/Coursra_Capstone/blob/master/Battle%20of%20Neighborhoods.ipynb