

# Capstone Project: The Battle of Neighbourhoods

**IBM Data Science Professional Certificate**

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# Background

- Toronto, with 2,731,571 population in 2016, is the capital of Ontario Province, the most populous city in Canada, and the fourth largest populous city in North America.
- Toronto contains a geographical area previously administered by different municipalities.
- These municipalities have each created a unique history and identity over the years.

# Problem Definition and Interest

- In this project, we want to explore the neighborhoods in Toronto and group them into similar and dissimilar clusters.
- This study can be interesting for those who want to live temporary or for a long period in Toronto including new residents, tourists, and people who want to change their neighborhood.
- This project will help them to know every area in Toronto and choose their new and favorite neighborhood.

# Data Sources

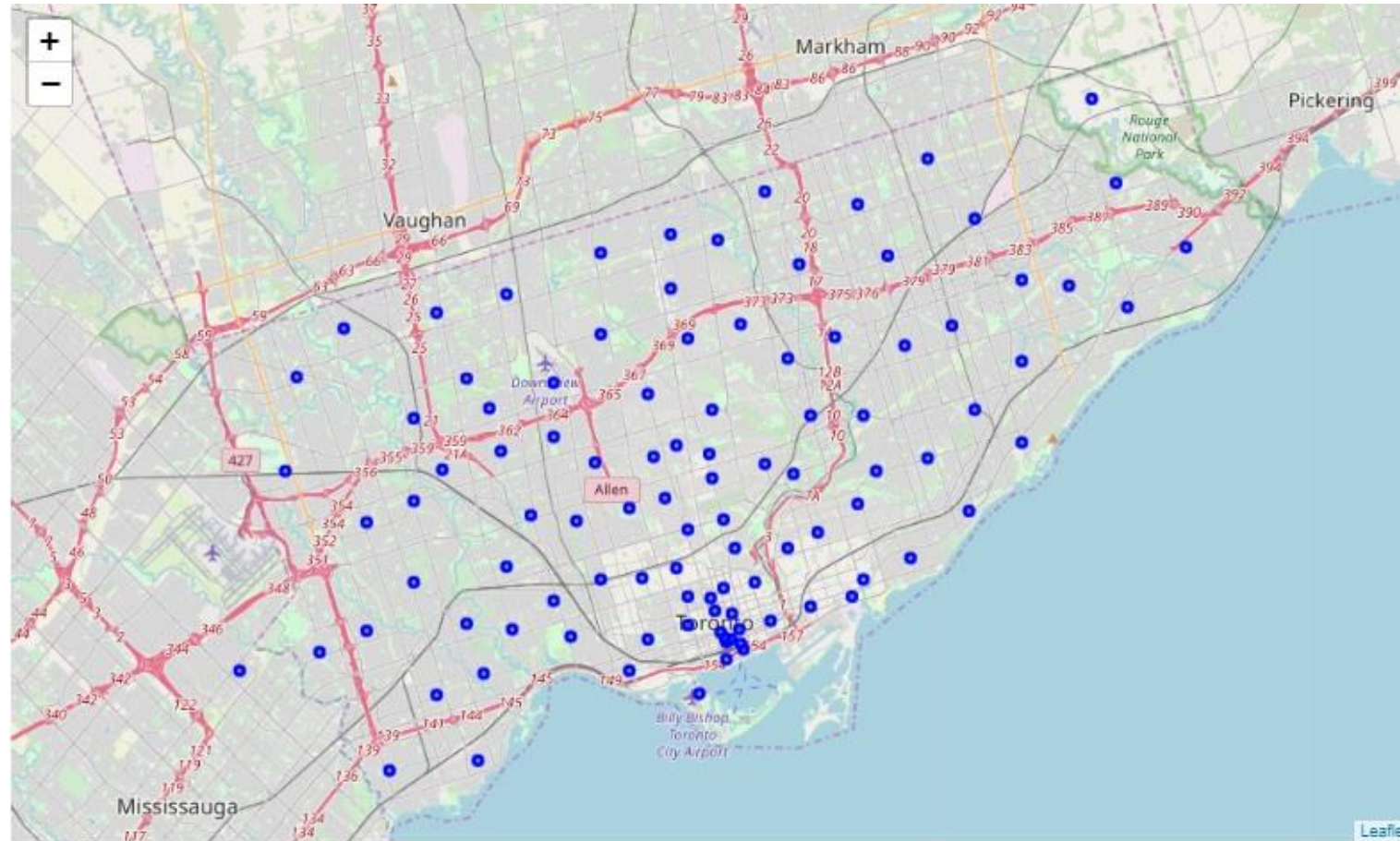
- Information about neighborhoods in Toronto:  
[https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)
- The geographical coordinates of different neighborhoods:  
[http://cocl.us/Geospatial\\_data](http://cocl.us/Geospatial_data)
- Finally, we request the venue data for each neighborhood from the Foursquare API.

# Feature Selection

- After all the merging and cleaning data, we consider the following table (there are 103 rows and five columns).

	Postalcode	Borough	Neighbourhood	Latitude	Longitude
0	M1B	Scarborough	Rouge, Malvern	43.806686	-79.194353
1	M1C	Scarborough	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497
2	M1E	Scarborough	Guildwood, Morningside, West Hill	43.763573	-79.188711
3	M1G	Scarborough	Woburn	43.770992	-79.216917
4	M1H	Scarborough	Cedarbrae	43.773136	-79.239476

# Toronto Neighborhoods on the Map



# Using Foursquare API to Explore each Neighborhood

	Neighbourhood	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	Adelaide, King, Richmond	Coffee Shop	Steakhouse	Café	Asian Restaurant	Gastropub	Salad Place	Bar	Sushi Restaurant	Pizza Place	Seafood Restaurant
1	Agincourt	Lounge	Breakfast Spot	Latin American Restaurant	Clothing Store	Dim Sum Restaurant	Farmers Market	Falafel Restaurant	Event Space	Ethiopian Restaurant	Electronics Store
2	Agincourt North, L'Amoreaux East, Milliken, St...	Arts & Crafts Store	Yoga Studio	Dessert Shop	Farmers Market	Falafel Restaurant	Event Space	Ethiopian Restaurant	Electronics Store	Dumpling Restaurant	Donut Shop
3	Albion Gardens, Beaumont Heights, Humbergate, ...	Pizza Place	Video Store	Sandwich Place	Fried Chicken Joint	Yoga Studio	Department Store	Event Space	Ethiopian Restaurant	Electronics Store	Dumpling Restaurant
4	Alderwood, Long Branch	Dance Studio	Gym	Coffee Shop	Skating Rink	Pharmacy	Pizza Place	Pub	Sandwich Place	Diner	Department Store



# Results

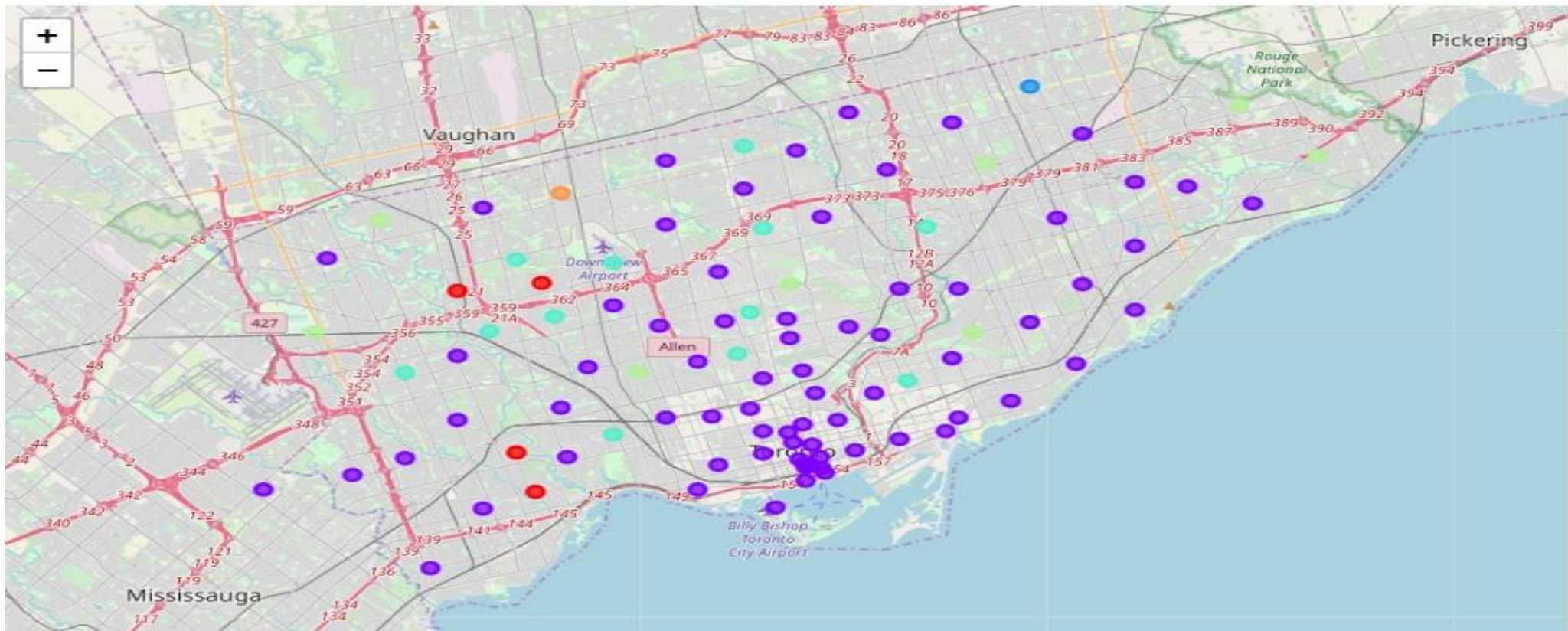
- We categorize the neighborhoods into 6 clusters (by using K-means algorithm) as follows.

	Postalcode	Borough	Neighbourhood	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
0	M1B	Scarborough	Rouge, Malvern	43.806686	-79.194353	4.0	Fast Food Restaurant	Dessert Shop	Farmers Market	Falafel Restaurant	Event Space	Ethiopian Restaurant	Electronics Store
1	M1C	Scarborough	Highland Creek, Rouge Hill, Port Union	43.784535	-79.160497	4.0	Construction & Landscaping	Bar	Yoga Studio	Dim Sum Restaurant	Farmers Market	Falafel Restaurant	Event Space
2	M1E	Scarborough	Guildwood, Morningside, West Hill	43.763573	-79.188711	1.0	Electronics Store	Spa	Mexican Restaurant	Rental Car Location	Dessert Shop	Falafel Restaurant	Event Space
3	M1G	Scarborough	Woburn	43.770992	-79.216917	1.0	Coffee Shop	Korean Restaurant	Yoga Studio	Dim Sum Restaurant	Farmers Market	Falafel Restaurant	Event Space
4	M1H	Scarborough	Cedarbrae	43.773136	-79.239476	1.0	Caribbean Restaurant	Bakery	Thai Restaurant	Athletics & Sports	Gas Station	Bank	Hakka Restaurant



# Results

- The following map visualizes the cluster of each neighborhood in Toronto by using the Folium package and Matplotlib library.



# Conclusion and Future Directions

- Developing recommendations to the people who want to live temporary or for a long period in Toronto including new residents, tourists, and people who want to change their neighborhood to choose their new area.
- Considering other algorithms to cluster neighborhoods and compare the results of different algorithms.
- Finding a way to determine the optimal number of clusters ( $k$ ) before performing the K-means algorithm.

Thank you!