

The background features a complex geometric pattern of concentric circles and arrows. The outermost circle is a solid dark blue ring with a dashed center. Inside it is a solid light blue ring with a dashed center. Numerous small white arrows point clockwise around these rings. In the upper left, there is a large solid dark blue circle with a dashed center, containing a smaller solid light blue circle with a dashed center. Several arrows point clockwise around this central circle. The overall effect is one of motion and data visualization.

# BATTLE OF NEIGHBORHOODS - TORONTO

SHOHRA AFAQUE

## Recommending correct neighborhood to open a restaurant

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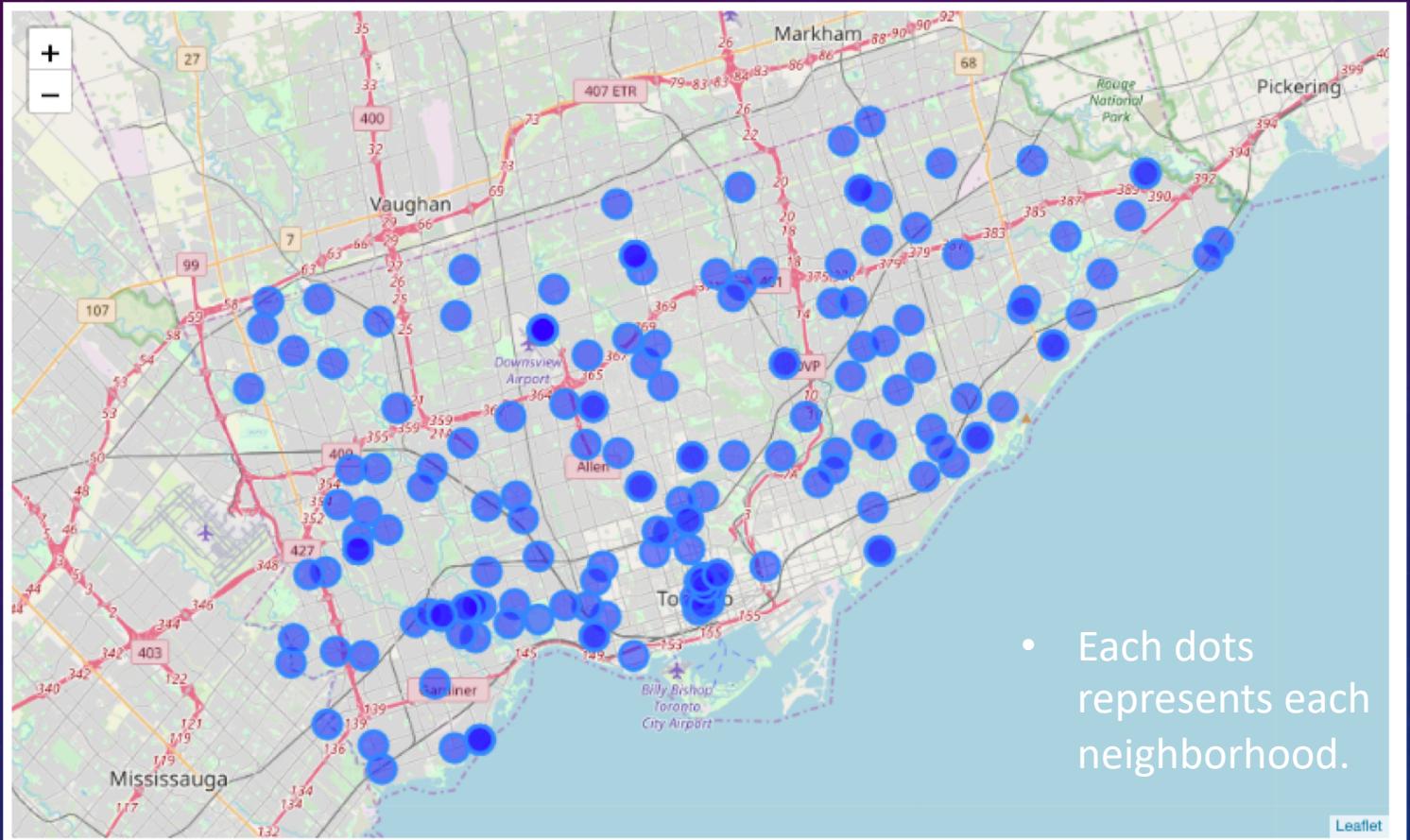
- Since opening a restaurant is huge investment of money & time. Choosing a locality should be backed by strong argument and real time data.
- For each locality we can gather the data of existing restaurants and do some analysis.
- A cluster can be formed of similar restaurants within each locality, then we can determine the need of a restaurant based on this clustering

## Data acquisition and cleaning

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- List of Postal Codes & Neighbourhoods can be gathered from Wikipedia. Here is [list of all the neighbourhoods](#).
- Geopy library in python can be used to get the latitude and longitude information for each neighborhood.
- Top 100 restaurants nearby to each neighborhood within 3000 meters can be fetched with Foursquare API.
- Foursquare API is free and has a limit of 1000 API hit each day, this is enough to get the required data.

# Toronto city neighborhood visualization:



## Top restaurants of each neighborhoods

- Once we have the coordinates of each neighborhoods using Geopy library. The coordinates can be passed to Foursquare API to get top restaurants category in each neighborhoods .

In [30]: 1 neighborhoods\_venues\_sorted

Out[30]:

	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	Chinese Restaurant	Vietnamese Restaurant	Bakery	Caribbean Restaurant	Hotpot Restaurant	Dumpling Restaurant	Restaurant	Sandwich Place	Mexican Restaurant	Pizza Place
1	Agincourt North	Chinese Restaurant	Fast Food Restaurant	BBQ Joint	Sandwich Place	Noodle House	Indian Restaurant	Fried Chicken Joint	Cantonese Restaurant	Food Court	Restaurant
2	Albion Gardens	Fast Food Restaurant	Indian Restaurant	Café	Sandwich Place	Chinese Restaurant	Pizza Place	Bakery	Italian Restaurant	Japanese Restaurant	Restaurant
3	Alderwood	Fast Food Restaurant	Pizza Place	Sandwich Place	Burger Joint	Burrito Place	South American Restaurant	Sushi Restaurant	Breakfast Spot	Food Court	Restaurant
4	Bathurst Manor	Pizza Place	Sandwich Place	Restaurant	Middle Eastern Restaurant	Fast Food Restaurant	Sushi Restaurant	Japanese Restaurant	Café	Breakfast Spot	Chinese Restaurant
5	Bedford Park	Pizza Place	Asian Restaurant	Restaurant	Bakery	Thai Restaurant	Café	Middle Eastern Restaurant	Sushi Restaurant	Korean Restaurant	Seafood Restaurant

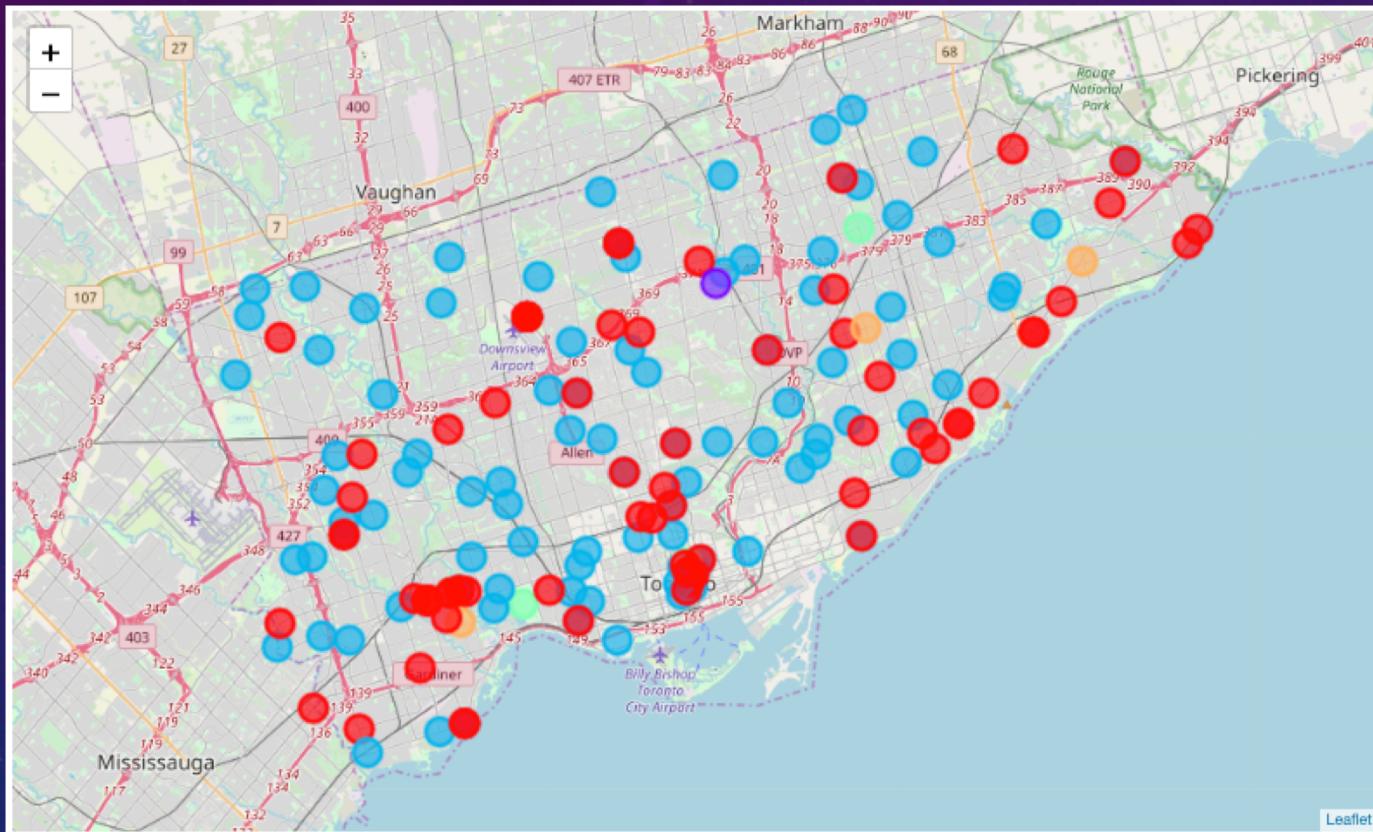
## Encoding the categories of the restaurants

- The categories of the restaurants are then encoded using one-hot encoding.
- These encoded categories can be used to train the clustering model to detect a clustering patterns

	Neighborhood	Afghan Restaurant	African Restaurant	American Restaurant	Argentinian Restaurant	Asian Restaurant	BBQ Joint	Bagel Shop	Bakery	Belgian Restaurant	...	Tapas Restaurant	Thai Restaurant	Theme Restaurant
0	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
1	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
2	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
3	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
4	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
5	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
6	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
7	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
8	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1
9	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	1

# K-Mean Clustering

- These one-hot encoding data is fed to K-Mean clustering model with K=5.
- Below is the output visualization of the clusters generated by the model.



# Examining the clusters

Neighborhood	Relative_Location	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 Ven	
2	Parkwoods	North York, Toronto	43.758800	-79.320197	2	Pizza Place	Fast Food Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Japanese Restaurant	Sandwich Place	Restaurant	Seafood Restaurant
3	Victoria Village	North York, Toronto	43.732658	-79.311189	2	Sandwich Place	Fast Food Restaurant	Middle Eastern Restaurant	Japanese Restaurant	Burger Joint	Italian Restaurant	Restaurant	American Restaurant
6	Lawrence Heights	North York, Toronto	43.722778	-79.450933	2	Fast Food Restaurant	Sandwich Place	Italian Restaurant	Pizza Place	Vietnamese Restaurant	Restaurant	American Restaurant	Cafe
7	Lawrence Manor	North York, Toronto	43.722079	-79.437507	2	Italian Restaurant	Sushi Restaurant	Bakery	Japanese Restaurant	Burger Joint	Cafe	Middle Eastern Restaurant	Steakhouse
10	Islington Avenue	Etobicoke, Toronto	43.678207	-79.538269	2	Pizza Place	Cafe	Sandwich Place	Restaurant	Bakery	Chinese Restaurant	Diner	Asian Restaurant

- Cluster 1

2	Parkwoods	North York, Toronto	43.758800	-79.320197	2	Pizza Place	Fast Food Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Japanese Restaurant	Sandwich Place	Restaurant	Seafood Restaurant
3	Victoria Village	North York, Toronto	43.732658	-79.311189	2	Sandwich Place	Fast Food Restaurant	Middle Eastern Restaurant	Japanese Restaurant	Burger Joint	Italian Restaurant	Restaurant	American Restaurant
6	Lawrence Heights	North York, Toronto	43.722778	-79.450933	2	Fast Food Restaurant	Sandwich Place	Italian Restaurant	Pizza Place	Vietnamese Restaurant	Restaurant	American Restaurant	Cafe
7	Lawrence Manor	North York, Toronto	43.722079	-79.437507	2	Italian Restaurant	Sushi Restaurant	Bakery	Japanese Restaurant	Burger Joint	Cafe	Middle Eastern Restaurant	Steakhouse
10	Islington Avenue	Etobicoke, Toronto	43.678207	-79.538269	2	Pizza Place	Cafe	Sandwich Place	Restaurant	Bakery	Chinese Restaurant	Diner	Asian Restaurant

- Cluster 2

# Examining the clusters (contd.)

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
2 Parkwoods	Pizza Place	Fast Food Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Japanese Restaurant	Sandwich Place	Restaurant	Seafood Restaurant	Burger Joint	Sushi Restaurant
3 Victoria Village	Sandwich Place	Fast Food Restaurant	Middle Eastern Restaurant	Japanese Restaurant	Burger Joint	Italian Restaurant	Restaurant	American Restaurant	Pizza Place	Chinese Restaurant
6 Lawrence Heights	Fast Food Restaurant	Sandwich Place	Italian Restaurant	Pizza Place	Vietnamese Restaurant	Restaurant	American Restaurant	Café	Bagel Shop	Bakery
7 Lawrence Manor	Italian Restaurant	Sushi Restaurant	Bakery	Japanese Restaurant	Burger Joint	Café	Middle Eastern Restaurant	Steakhouse	Gastropub	Sandwich Place
10 Islington Avenue	Pizza Place	Café	Sandwich Place	Restaurant	Bakery	Chinese Restaurant	Diner	Asian Restaurant	Japanese Restaurant	Breakfast Spot
11 Rouge	Fast Food Restaurant	Pizza Place	Fried Chicken	Breakfast Spot	Sandwich Place	Burger Joint	Bakery	Restaurant	Mediterranean Restaurant	Chinese Restaurant

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
85 Union Station	Italian Restaurant	Xinjiang Restaurant	Food Court	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant
159 High Park	Sushi Restaurant	Deli / Bodega	Italian Restaurant	Food Court	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant
193 Tam O'Shanter	Deli / Bodega	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant

- Cluster 3

- Cluster 4

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
44 West Hill	Restaurant	Pizza Place	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant
165 Wexford	Pizza Place	Xinjiang Restaurant	Food	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant
266 Humber Bay	Pizza Place	Café	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant

- Cluster 5

## Examining the clusters (contd.)

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
2 Parkwoods	Pizza Place	Fast Food Restaurant	Middle Eastern Restaurant	Chinese Restaurant	Japanese Restaurant	Sandwich Place	Restaurant	Seafood Restaurant	Burger Joint	Sushi Restaurant
3 Victoria Village	Sandwich Place	Fast Food Restaurant	Middle Eastern Restaurant	Japanese Restaurant	Burger Joint	Italian Restaurant	Restaurant	American Restaurant	Pizza Place	Chinese Restaurant
6 Lawrence Heights	Fast Food Restaurant	Sandwich Place	Italian Restaurant	Pizza Place	Vietnamese Restaurant	Restaurant	American Restaurant	Café	Bagel Shop	Bakery
7 Lawrence Manor	Italian Restaurant	Sushi Restaurant	Bakery	Japanese Restaurant	Burger Joint	Café	Middle Eastern Restaurant	Steakhouse	Gastropub	Sandwich Place
10 Islington Avenue	Pizza Place	Café	Sandwich Place	Restaurant	Bakery	Chinese Restaurant	Diner	Asian Restaurant	Japanese Restaurant	Breakfast Spot
11 Rouge	Fast Food Restaurant	Pizza Place	Fried Chicken	Breakfast Spot	Sandwich Place	Burger Joint	Bakery	Restaurant	Mediterranean Restaurant	Chinese Restaurant

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
85 Union Station	Italian Restaurant	Xinjiang Restaurant	Food Court	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant
159 High Park	Sushi Restaurant	Deli / Bodega	Italian Restaurant	Food Court	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant
193 Tam O'Shanter	Deli / Bodega	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant

- Cluster 3

- Cluster 4

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
44 West Hill	Restaurant	Pizza Place	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant
165 Wexford	Pizza Place	Xinjiang Restaurant	Food	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant
266 Humber Bay	Pizza Place	Café	Xinjiang Restaurant	Diner	Donut Shop	Dumpling Restaurant	Eastern European Restaurant	Egyptian Restaurant	Empanada Restaurant	Ethiopian Restaurant

- Cluster 5

## Conclusion and future directions

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1. From the geographical presentation of the clusters we can say that there is a scope to open a new Indian restaurant in West Hill from 5th Cluster.
2. From the results we can suggest that opening a new Japanese Cuisine restaurant in North York, Toronto from 1st cluster will be beneficial, because mostly Italian cuisine restaurants are present.
3. It can also be suggested that opening a restaurant near East York, Toronto has low profile there is high competition and highly crowded in all the cuisine.
4. It can also be explored further with careful consideration of neighborhoods at East and South sides of Toronto.