BATTLE OF NEIGHBORHOODS

By Amit Gupta

INTRODUCTION

The main aim of the project is to see which location is ideal to open a new restaurant in the city of Toronto. We have to keep in mind about various things such as competitors, population of the city and economical matters.

BUSINESS PROBLEM

Toronto is the provincial capital of Ontario and the most populous city in Canada, with a population of 2,731,571 in 2016. Current to 2016, the Toronto census metropolitan area (CMA), of which the majority is within the Greater Toronto Area (GTA), held a population of 5,928,040, making it Canada's most populous CMA. Toronto is the fastest growing city in North America. and is the anchor of an urban agglomeration, known as the Golden Horseshoe in Southern Ontario, located on the northwestern shore of Lake Ontario.

Target Audience: New business owners who want to open a new restaurant in the city of Toronto.

We need to recommend a good locality for new business owners and stakeholders to open a new restaurant.

DATA

For the analysis and the project, I will be using the data from **Wikipedia**. The Wikipedia page consists a **List of postal code of Canada: M.** This is a list of postal codes in Canada where the first letter is M. Postal codes beginning with M are located within the city of Toronto in the province of Ontario. Only the first three characters are listed, corresponding to the Forward Sortation Area. City of Toronto Neighbourhood Profiles use this Census data to provide a portrait of the demographic, social and economic characteristics of the people and households in each City of Toronto neighbourhood. Here is the link for the same:

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

DATA

We will also be using **Foursquare data** to get information about restaurants in Toronto. For this we will be fetching the data using the foursquare api for which we will be needing the following details:

1) Client Id

2) Client Secret Key

3) Version

4) Latitude

5) Longitude

6) Radius

7) Limit

METHODOLOGY

The main aim of this project is to find the best location to open a new restaurant for new business owners and stakeholders. For this project, we have used "K-means clustering algorithm". K-means clustering is a type of unsupervised learning, which is used when you have unlabeled data (i.e., data without defined categories or groups). The goal of this algorithm is to find groups in the data, with the number of groups represented by the variable K. The algorithm works iteratively to assign each data point to one of K groups based on the features that are provided. Data points are clustered based on feature similarity.

ANALYSIS

For the analysis, we will be performing the following steps:

1. Data capturing and cleaning
2. Combining different data sets and getting latitude and longitude
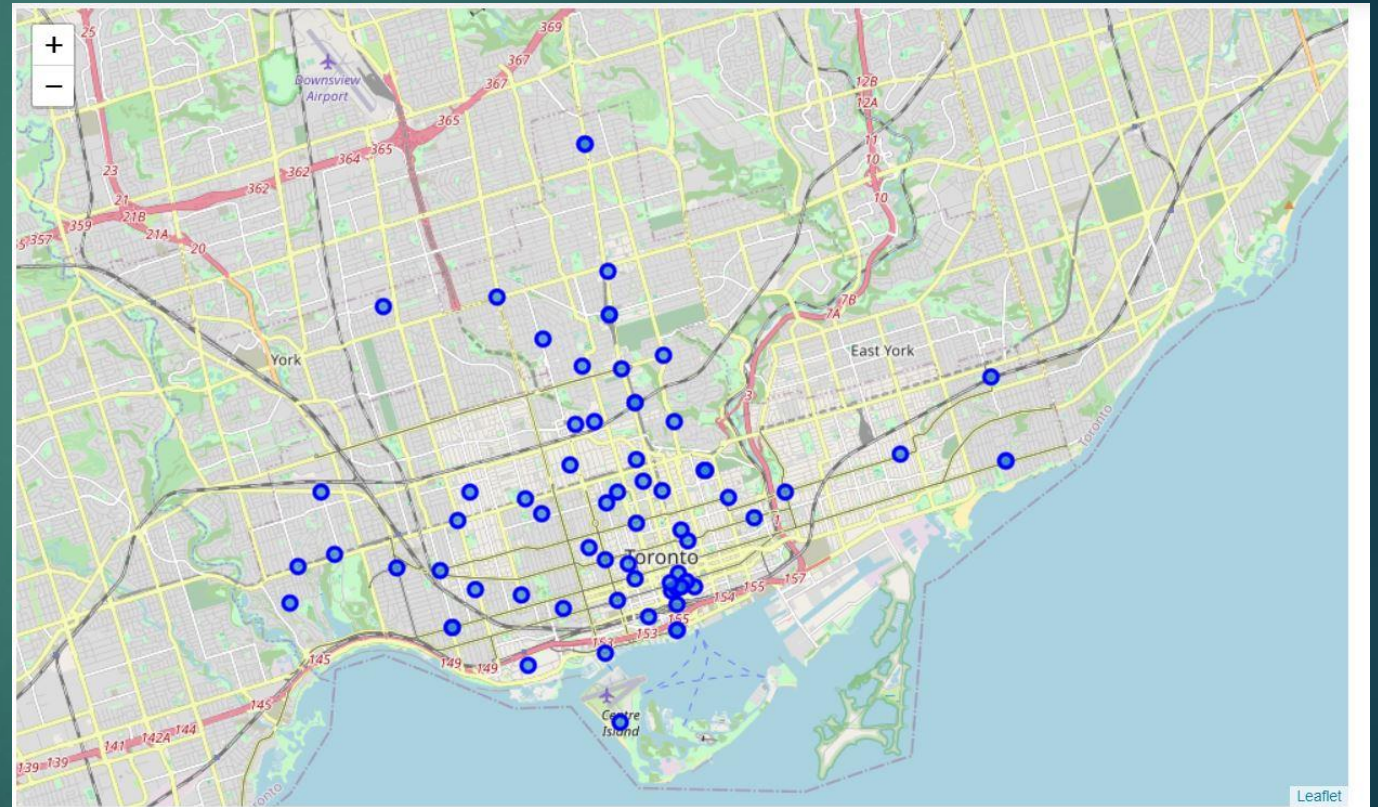3. Explore the neighborhoods
4. Clustering

DATA CAPTURING AND CLEANING

	Postal Code	Borough	Neighborhood	Latitude	Longitude
0	M5A	Downtown Toronto	Regent Park	43.660706	-79.360457
1	M5A	Downtown Toronto	Harbourfront	43.640080	-79.380150
2	M7A	Downtown Toronto	Queen's Park	43.6659659	-79.390340
3	M5B	Downtown Toronto	Garden District	43.656500	-79.377114
4	M5B	Downtown Toronto	Ryerson	43.658469	-79.378993
...	...	...	...	...	...
67	M4X	Downtown Toronto	St. James Town	43.669403	-79.372704
68	M4X	Downtown Toronto	Cabbagetown	43.664473	-79.366986
69	M5X	Downtown Toronto	First Canadian Place	43.648768	-79.381692
70	M5X	Downtown Toronto	Underground city	43.770145	-79.374863
71	M4Y	Downtown Toronto	Church and Wellesley	43.665524	-79.383801

72 rows × 5 columns

COMBINING DATASETS AND GETIING LATITUDE AND LONGITUDE

	name	categories	lat	lng
0	Harbour Square Park	Park	43.639253	-79.378395
1	Lake Ontario	Lake	43.638945	-79.379665
2	Harbourfront	Neighborhood	43.639526	-79.380688
3	Miku	Japanese Restaurant	43.641374	-79.377531
4	Natrel Pond/Rink	Skating Rink	43.638431	-79.382528
5	Harbourfront Centre	Performing Arts Venue	43.638556	-79.383190
6	Fleck Dance Theater	Dance Studio	43.638300	-79.380470
7	Pearl Harbourfront	Chinese Restaurant	43.638157	-79.380688
8	Ontario Square	Plaza	43.639378	-79.382096
9	BeaverTails	Dessert Shop	43.639736	-79.380068
10	Real Sports Apparel	Sporting Goods Shop	43.642860	-79.380184
11	Boxcar Social	Café	43.638319	-79.382463
12	Maple Leaf Square	Plaza	43.642925	-79.380892
13	Sharetea	Bubble Tea Shop	43.640176	-79.379606
14	Roundhouse Park	Park	43.641745	-79.384279
15	Longo's Maple Leaf Square	Supermarket	43.642517	-79.381393
16	Labatt Breweries of Canada	Brewery	43.638282	-79.380378
17	iQ Food Co	Salad Place	43.642851	-79.382081
18	Mos Mos	Coffee Shop	43.641640	-79.377552
19	The Power Plant	Art Gallery	43.638272	-79.381994
20	Scotiabank Arena	Basketball Stadium	43.643446	-79.379040
21	Le Germain Hotel	Hotel	43.643125	-79.380918

EXPLORING THE NEIGHBORHOOD

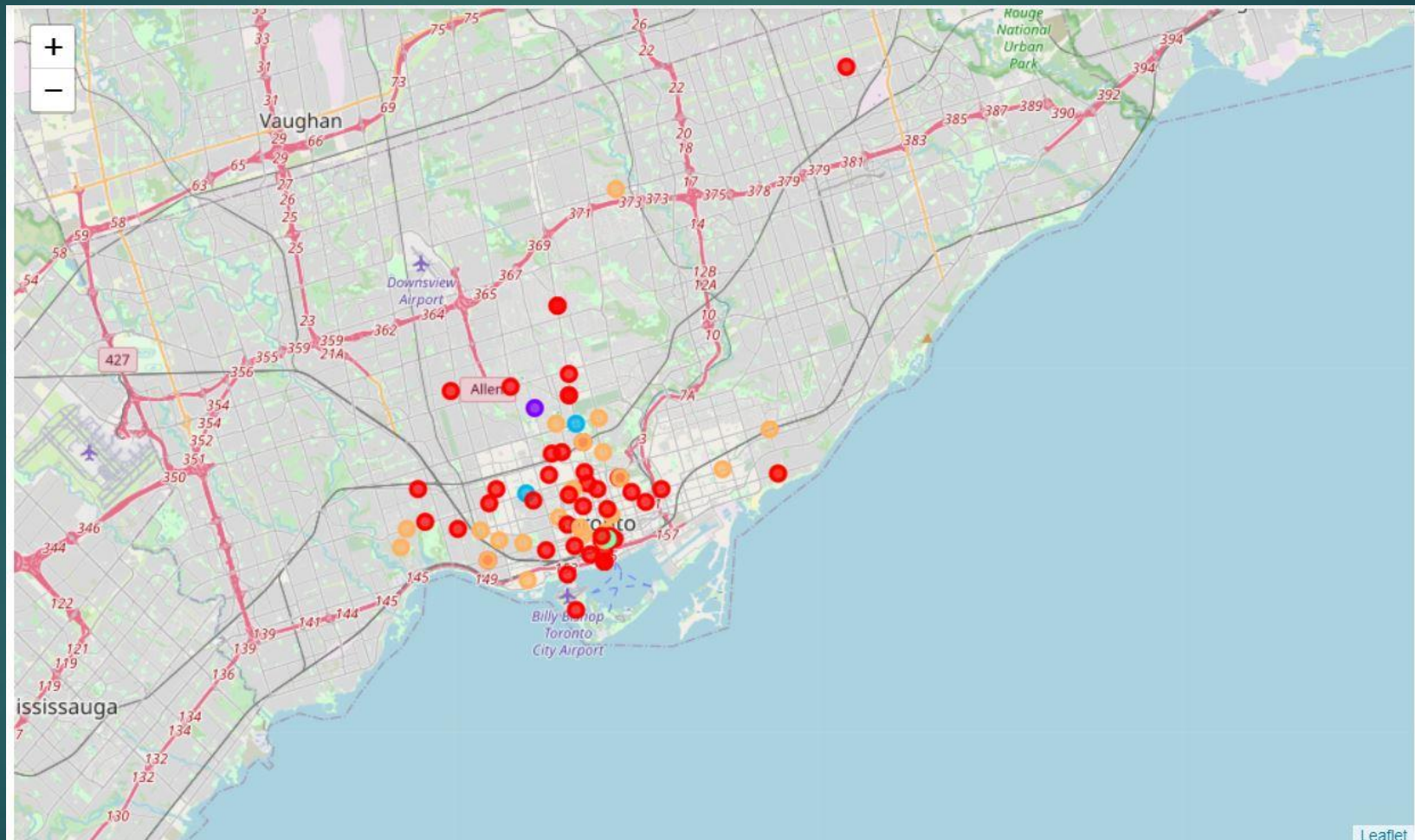|	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Regent Park	43.660706	-79.360457	Regent Park Aquatic Centre	43.660600	-79.361392	Pool
1	Regent Park	43.660706	-79.360457	Daniels Spectrum	43.660137	-79.361808	Performing Arts Venue
2	Regent Park	43.660706	-79.360457	Thai To Go	43.663418	-79.360710	Thai Restaurant
3	Regent Park	43.660706	-79.360457	Sumach Espresso	43.658135	-79.359515	Coffee Shop
4	Regent Park	43.660706	-79.360457	Paintbox Bistro	43.660050	-79.362855	Restaurant

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Adelaide	100	100	100	100	100	100
Bathurst Quay	25	25	25	25	25	25
Cabbagetown	50	50	50	50	50	50
Chinatown	64	64	64	64	64	64
Deer Park	58	58	58	58	58	58
...	...	...	...	...	...	...
The Annex	46	46	46	46	46	46
The Beaches	46	46	46	46	46	46
The Danforth West	27	27	27	27	27	27
Toronto Dominion Centre	100	100	100	100	100	100
University of Toronto	30	30	30	30	30	30

71 rows × 6 columns

	Neighborhood	1st Popular Venues	2nd Popular Venues	3rd Popular Venues	4th Popular Venues	5th Popular Venues	6th Popular Venues	7th Popular Venues	8th Popular Venues	9th Popular Venues	10th Popular Venues
0	Adelaide	Café	Coffee Shop	Japanese Restaurant	Gym	Restaurant	American Restaurant	Gastropub	Seafood Restaurant	Cosmetics Shop	Bookstore
1	Bathurst Quay	Coffee Shop	Café	Park	Bank	Harbor / Marina	Garden	Caribbean Restaurant	Rental Car Location	Sculpture Garden	Grocery Store
2	Cabbagetown	Restaurant	Café	Coffee Shop	Pizza Place	Japanese Restaurant	Italian Restaurant	Diner	Pub	Gastropub	Indian Restaurant
3	Chinatown	Dessert Shop	Café	Mexican Restaurant	Vegetarian / Vegan Restaurant	Coffee Shop	Pizza Place	Park	Art Gallery	Grocery Store	Clothing Store
4	Deer Park	Coffee Shop	Italian Restaurant	Grocery Store	Pizza Place	Sushi Restaurant	Café	Restaurant	Thai Restaurant	Bank	Bagel Shop
...	...	...	...	...	...	...	...	...	...	...	...
66	The Annex	Pizza Place	Coffee Shop	Ice Cream Shop	Bistro	Thai Restaurant	Grocery Store	Indian Restaurant	Park	Bakery	Tea Room
67	The Beaches	Park	Beach	Pizza Place	Tea Room	Pub	Japanese Restaurant	Bar	Bakery	Breakfast Spot	Grocery Store
68	The Danforth West	Coffee Shop	Pharmacy	Bus Line	Pet Store	Optical Shop	Mexican Restaurant	Metro Station	Skating Rink	Fast Food Restaurant	Café
69	Toronto Dominion Centre	Coffee Shop	Hotel	Café	Restaurant	American Restaurant	Seafood Restaurant	Japanese Restaurant	Deli / Bodega	Asian Restaurant	Beer Bar
70	University of Toronto	Café	Park	Japanese Restaurant	Italian Restaurant	Bookstore	Yoga Studio	Museum	Bank	Bar	Bubble Tea Shop

71 rows × 11 columns

CLUSTERING

	Borough	Cluster Labels	1st Popular Venues	2nd Popular Venues	3rd Popular Venues	4th Popular Venues	5th Popular Venues	6th Popular Venues	7th Popular Venues	8th Popular Venues	9th Popular Venues	10th Popular Venues
0	Downtown Toronto	0	Coffee Shop	Thai Restaurant	Food Truck	Indian Restaurant	Beer Store	Restaurant	Auto Dealership	Grocery Store	Electronics Store	Pub
1	Downtown Toronto	0	Coffee Shop	Café	Hotel	Restaurant	Italian Restaurant	Music Venue	Plaza	Sporting Goods Shop	Sports Bar	Fried Chicken Joint
2	Downtown Toronto	0	Coffee Shop	Café	Sandwich Place	Italian Restaurant	Japanese Restaurant	Chinese Restaurant	French Restaurant	Middle Eastern Restaurant	Thai Restaurant	Bubble Tea Shop
4	Downtown Toronto	0	Coffee Shop	Clothing Store	Burger Joint	Middle Eastern Restaurant	Café	Diner	Ramen Restaurant	Japanese Restaurant	Italian Restaurant	Hotel
5	Downtown Toronto	0	Coffee Shop	Pizza Place	Café	Grocery Store	Playground	Market	Bank	Bar	Library	Beer Store
7	Downtown Toronto	0	Coffee Shop	Café	Restaurant	Japanese Restaurant	Italian Restaurant	Seafood Restaurant	Cocktail Bar	Gastropub	Hotel	Bakery

	Borough	Cluster Labels	1st Popular Venues	2nd Popular Venues	3rd Popular Venues	4th Popular Venues	5th Popular Venues	6th Popular Venues	7th Popular Venues	8th Popular Venues	9th Popular Venues	10th Popular Venues
3	Downtown Toronto	4	Clothing Store	Coffee Shop	Restaurant	Hotel	Sandwich Place	Japanese Restaurant	Bakery	Tea Room	Theater	Bookstore
6	East Toronto	4	Park	Beach	Pizza Place	Tea Room	Pub	Japanese Restaurant	Bar	Bakery	Breakfast Spot	Grocery Store
11	Downtown Toronto	4	Café	Coffee Shop	Japanese Restaurant	Gym	Restaurant	American Restaurant	Gastropub	Seafood Restaurant	Cosmetics Shop	Bookstore
18	West Toronto	4	Bar	Café	Coffee Shop	Bakery	Restaurant	Cocktail Bar	Korean Restaurant	Sandwich Place	Portuguese Restaurant	Boutique
19	West Toronto	4	Café	Coffee Shop	Park	Boutique	Restaurant	Clothing Store	Museum	Cosmetics Shop	Bookstore	Bubble Tea Shop
20	East Toronto	4	Coffee Shop	Pharmacy	Bus Line	Pet Store	Optical Shop	Mexican Restaurant	Metro Station	Skating Rink	Fast Food Restaurant	Café
23	Downtown Toronto	4	Coffee Shop	Café	Restaurant	Hotel	Gym	American Restaurant	Deli / Bodega	Seafood Restaurant	Breakfast Spot	Cocktail Bar
24	West Toronto	4	Bar	Vietnamese Restaurant	Coffee Shop	Park	Pizza Place	Jazz Club	French Restaurant	Café	Gastropub	Dive Bar
26	West Toronto	4	Theme Park	Soccer Stadium	Theme Park Ride / Attraction	Poutine Place	Coffee Shop	Arts & Crafts Store	Music Venue	Athletics & Sports	Flea Market	Lounge
27	East Toronto	4	Indian Restaurant	Café	Grocery Store	Restaurant	Pakistani Restaurant	Pizza Place	Diner	Egyptian Restaurant	Sandwich Place	Theater
31	East	4	Coffee	Vegetarian / Vegan	Clothing Store	Cosmetics	Café	Japanese	Movie	Sushi	Bar	Steakhouse

RESULT AND DISCUSSION

Our analysis shows that although there is a great number of restaurants in Toronto, there are pockets of low restaurant density fairly close to city center.We have 4 boroughs and 78 neighborhoods inside geograpical coordinate of 43.6534817, -79.3839347.

Based on our initial assumption of the cluster with maximum number of restaurants will have the best possibility to have a new restaurant due to the need in the area. Based on the resultant clusters it looks like Cluster 1 and Cluster 5 have higher number of resturants then rest of the clusters.

CONCLUSION

The main aim of this project was to help new business owners and stakeholders to find an optimal location for opening a new restaurant. By calculating restaurant density distribution from Foursquare data we have first identified general boroughs that justify further analysis, and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby restaurants. Clustering of those locations was then performed in order to create major zones of interest.

Final decision on optimal restaurant location will be made by stakeholders and new business owners based on specific characteristics of neighborhoods and locations in every recommended zone.