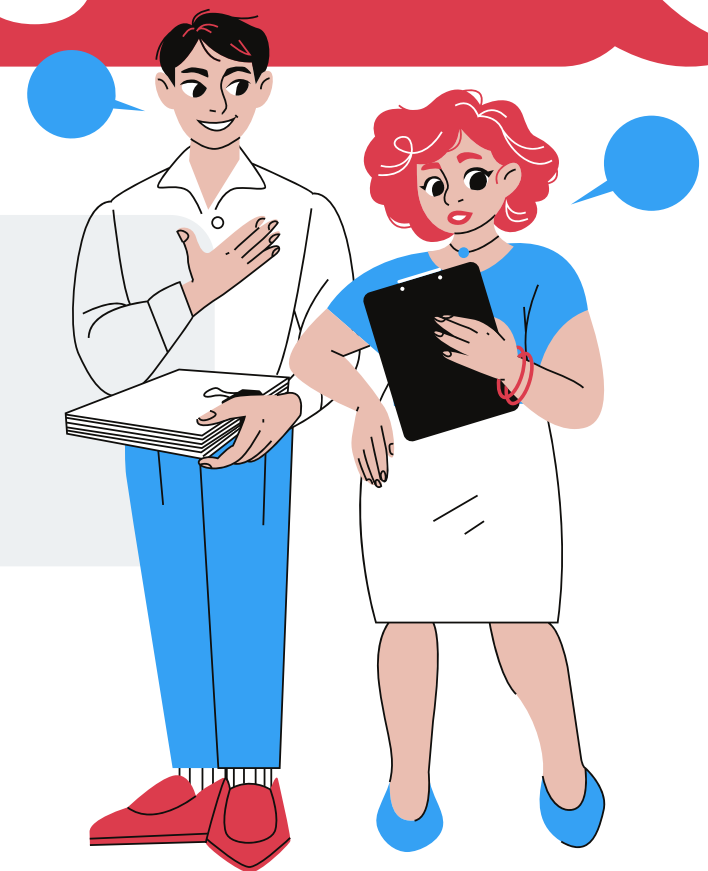


# The Battle of Neighborhoods

your search for the best location to open your store is easier



# Introduction

In this project we will try to find an optimal location for a store. Specifically, this report will be targeted to stakeholders interested in opening an store in Toronto, Canada.

Here we will try finding if someone wants to open a new store in the city which location is best suited for it keeping in mind the competitors and which income group of people will be attracted most to it based on **the population of the neighbourhood**.

Since there are lots of stores in Toronto, we will try to detect **locations that are not already crowded with stores**. We would also prefer locations as close to city center as possible, assuming that first two conditions are met.

We will use our data science powers to generate a few most promising neighborhoods based on this criteria. Advantages of each area will then be clearly expressed so that best possible final location can be chosen by stakeholders.

# Data

Based on definition of our problem, factors that will influence our decision are:

- All existing restaurants in the neighborhood (any type of restaurant)
- Age group of people with their income
- Distance of neighborhood from city center

We decided to use regularly spaced grid of locations, centered around city center, to define our neighborhoods.

Following data sources will be needed to extract/generate the required information:

- centers of candidate areas will be generated algorithmically and approximate addresses of centers of those areas will be obtained using [https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)
- number of restaurants and their type and location in every neighborhood will be obtained using Foursquare API

# Methodology

The main moto of this project is to find best location to open a new store in Toronto, Canada based on competition in different locality and their population.

So, to do this I have used 2 different data sets available as mentioned above. Those 2 data set contains Locality information of Toronto, different age group of people in the people, population.

To solve the problem I am going to use "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. The results of the K-means clustering algorithm are:

The centroids of the K clusters, which can be used to label new data Labels for the training data (each data point is assigned to a single cluster)

# Methodology

Also, I will be utilizing different maps in-order to give a clear vision to the target audience.

Steps we took for the analysis:

- Collected required \*\*data: location and type (category) of every store within our lat and lng. We have also the type of stores in particular locality.
- Explored the '**store density**' across different areas of Toronto – we will use **K- mean** to identify a few promising areas close to center with low number of stores and their type.
- Explored the most promising areas and within those create **clusters of locations that meet some basic requirements** established in discussion with stakeholders: we will take into consideration locations with **less stores in radius of 500 meters**, We will present map of all such locations but also create clusters (using k-means clustering) of those locations to explore neighborhood.

# Analysis

## **Data identification, capturing and cleaning.**

Search & Identify the relevant data source and capture it, here we are using wikipedia to get data about Toronto, Canada. Then we remove all the redundant value(data cleaning). Then we combine neighborhood similar Bronx. Now the data is clean and ready to use.

## **Combining different data source and sorting neighborhood based on Longitude and latitude**

Now, we will combine neighborhood dataset with postal address and dataset with Latitude & Longitude and save them in separate data frame. The resultant data frame will contain details about Postal code, Borough, Neighborhood, Latitude & Longitude. Then visualize it using folium map.

# Analysis

## Explore the Toronto's neighborhoods

Firstly, we explored all the neighborhoods in the city of Toronto, using the Latitude & Longitude data, using Foresquare API to get the Restaurant venues available in Toronto. Explore the unique categories in the neighborhood. Filter the Venues details for all possible 'Restaurants'. Find each neighborhood along with the top most common venues. Identify the top 10 venues for each neighborhood.

## Clustering

With an assumption of 5 clusters, use K-Cluster algorithm to come up with 5 different clusters in Toronto with similar set of Venues. Explore each cluster and determine the discriminating venue categories that distinguish each cluster. Identify the clusters & Boroughs/Neighborhoods with Maximum number restaurants and their types.



# Results

## Cluster 1

	Sborough	Cluster Labels	1st Popular Venue	2nd Popular Venue	3rd Popular Venue	4th Popular Venue	5th Popular Venue	6th Popular Venue	7th Popular Venue	8th Popular Venue	9th Popular Venue	10th Popular Venue
0	Downtown Toronto	0	Coffee Shop	Café	Restaurant	Hotel	Pizza Place	Italian Restaurant	Steakhouse	History Museum	Sporting Goods Shop	Park
1	Downtown Toronto	0	Coffee Shop	Thai Restaurant	Pharmacy	Grocery Store	Food Truck	Moving Target	Beer Store	Electronics Store	Sushi Restaurant	Restaurant
2	Downtown Toronto	0	Coffee Shop	Clothing Store	Cosmetics Shop	Fast Food Restaurant	Café	Middle Eastern Restaurant	Diner	Tea Room	Bookstore	Place
4	Downtown Toronto	0	Coffee Shop	Pizza Place	Grocery Store	Café	Beer Store	Bakery	Bank	Restaurant	Library	Breakfast Spot
6	Downtown Toronto	0	Coffee Shop	Café	Restaurant	Italian Restaurant	Grocery Store	Pizza Place	Cocktail Bar	Diner	Cosmetics Shop	Bakery
9	Downtown Toronto	0	Coffee Shop	Restaurant	Hotel	Café	Italian Restaurant	Gastropub	American Restaurant	Gym	Japanese Restaurant	Del / Soda
12	Downtown Toronto	0	Coffee Shop	Café	Restaurant	Hotel	Pizza Place	Italian Restaurant	Steakhouse	History Museum	Sporting Goods Shop	Park
14	Downtown Toronto	0	Playground	Farm	Scenic Lookout	American Restaurant	Beer Garden	Beach	Egyptian Restaurant	Electronics Store	Ethiopian Restaurant	Event Space
16	West Toronto	0	Bar	Coffee Shop	Café	Restaurant	Cocktail Bar	Bakery	Thai Restaurant	Portuguese Restaurant	French Restaurant	Korean Restaurant
17	West Toronto	0	Clothing Store	Coffee Shop	Cosmetics Shop	Restaurant	Place	Tea Room	Fast Food Restaurant	Lingerie Store	Pizza Place	Theater
19	East Toronto	0	Vietnamese Restaurant	Bakery	Chinese Restaurant	Bar	Light Rail Station	Baseball Field	Fast Food Restaurant	Asian Restaurant	Gym / Fitness Center	Trail
20	Downtown Toronto	0	Coffee Shop	Café	Hotel	Restaurant	American Restaurant	Del / Soda	Bakery	Gastropub	Steakhouse	Gym
21	Downtown Toronto	0	Coffee Shop	Café	Hotel	American Restaurant	Restaurant	Del / Soda	Italian Restaurant	Gastropub	Bar	Bakery
22	West Toronto	0	Bar	Park	Vietnamese Restaurant	South American Restaurant	Gastropub	Bakery	Korean Restaurant	Olive Bar	Grocery Store	Café
23	West Toronto	0	Soccer Stadium	Theme Park	Place	Lounge	Athletics & Sports	Coffee Shop	Art & Crafts Store	Café	Bakery	Bar
24	West Toronto	0	Tibetan Restaurant	Bar	Café	Pharmacy	Diner	Restaurant	Indian Restaurant	Liquor Store	North Indian Restaurant	Donut Shop
26	Central Toronto	0	Bakery	Coffee Shop	Italian Restaurant	Sushi Restaurant	Bank	Pub	Cosmetics Shop	Tea Room	Burger Joint	Asian Restaurant
29	Central Toronto	0	Coffee Shop	Italian Restaurant	Fast Food Restaurant	Yoga Studio	Sporting Goods Shop	Gym	Mexican Restaurant	Movie Theater	Diner	Restaurant
37	Central Toronto	0	Sandwich Place	Dessert Shop	Coffee Shop	Sushi Restaurant	Pizza Place	Thai Restaurant	Café	Italian Restaurant	Fried Chicken Joint	Seafood Restaurant
41	West Toronto	0	Skating Rink	Places Studio	Dance Studio	Park	Yoga Studio	Paleo Restaurant	Egyptian Restaurant	Electronics Store	Ethiopian Restaurant	Event Space
43	Central Toronto	0	Italian Restaurant	Café	Sushi Restaurant	Pizza Place	Coffee Shop	Spa	Bistro	Bar	Juice Bar	Furniture / Home Store
45	Downtown Toronto	0	Coffee Shop	Café	Japanese Restaurant	Chinese Restaurant	Art Gallery	Art & Crafts Store	Record Shop	Sporting Goods Shop	Tea Room	Sandwich Place
46	Downtown Toronto	0	Café	Vegetarian / Vegan Restaurant	Bar	Bakery	Vietnamese Restaurant	Mexican Restaurant	Coffee Shop	Donut Shop	Burger Joint	Dumpling Restaurant
54	Downtown Toronto	0	Coffee Shop	Restaurant	Italian Restaurant	Hotel	French Restaurant	Sandwich Place	Beer Bar	Spa	Sushi Restaurant	Steakhouse
56	Downtown Toronto	0	Park	Bike Trail	Playground	Building	Farm	Egyptian Restaurant	Electronics Store	Ethiopian Restaurant	Event Space	Paleo Restaurant
58	Downtown Toronto	0	Coffee Shop	Pizza Place	Grocery Store	Café	Beer Store	Bakery	Bank	Restaurant	Library	Breakfast Spot
60	Downtown Toronto	0	Chinese Restaurant	Coffee Shop	Sporting Goods Shop	Pizza Place	Bubble Tea Shop	Burger Joint	Fast Food Restaurant	Gas Station	Bank	Breakfast Spot
61	Downtown Toronto	0	Coffee Shop	Japanese Restaurant	Gay Bar	Sushi Restaurant	Café	Restaurant	Burger Joint	Gym	Mens Store	Mediterranean Restaurant



# Results

## Cluster 2

	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	1	Clothing Store	Coffee Shop	Cosmetics Shop	Fast Food Restaurant	Restaurant	Hotel	Lingerie Store	Middle Eastern Restaurant	Tea Room	Theater
6	Downtown Toronto	1	Coffee Shop	Café	Restaurant	Hotel	Bakery	Beer Bar	Japanese Restaurant	Gym	Gastropub	Seafood Restaurant
7	Downtown Toronto	1	Korean Restaurant	Coffee Shop	Indian Restaurant	Cocktail Bar	Café	Japanese Restaurant	Karaoke Bar	Dessert Shop	Sandwich Place	Grocery Store
15	Downtown Toronto	1	Coffee Shop	Café	Deli / Bodega	Restaurant	Hotel	Bakery	Italian Restaurant	Breakfast Spot	Steakhouse	Gym
25	East Toronto	1	Beach	Bar	Breakfast Spot	Japanese Restaurant	Tea Room	Coffee Shop	Pub	Thai Restaurant	Park	Salon / Barbershop
26	East Toronto	1	Indian Restaurant	Café	Halal Restaurant	Grocery Store	Snack Place	Pakistani Restaurant	Sandwich Place	Restaurant	Egyptian Restaurant	Discount Store
27	Downtown Toronto	1	Coffee Shop	Hotel	Café	Restaurant	American Restaurant	Steakhouse	Japanese Restaurant	Italian Restaurant	Bakery	Gastropub
31	Central Toronto	1	Playground	Bank	Park	Mediterranean Restaurant	Yoga Studio	Farm	Electronics Store	Ethiopian Restaurant	Event Space	Falafel Restaurant
33	Central Toronto	1	Pizza Place	Coffee Shop	Park	Thai Restaurant	Bistro	Grocery Store	Ice Cream Shop	Indian Restaurant	Falafel Restaurant	Fried Chicken Joint
34	Central Toronto	1	Café	Boutique	Coffee Shop	Restaurant	Italian Restaurant	French Restaurant	Sushi Restaurant	Spa	Hotel	Women's Store
38	Downtown Toronto	1	Café	Restaurant	Coffee Shop	Japanese Restaurant	Bookstore	Bakery	Museum	Bar	Beer Store	French Restaurant
53	Downtown Toronto	1	Coffee Shop	Café	Restaurant	Hotel	Pizza Place	Italian Restaurant	Steakhouse	History Museum	Sporting Goods Shop	Park
59	Downtown Toronto	1	Coffee Shop	Café	Hotel	Restaurant	Steakhouse	Burger Joint	Bar	Seafood Restaurant	Asian Restaurant	Gastropub

# Results

## Cluster 3

	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
49	Central Toronto	2	Coffee Shop	Sandwich Place	History Museum	Pizza Place	Café	Jewish Restaurant	Cosmetics Shop	Park	Pub	Cheese Shop

# Results

## Cluster 4

	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
5	East Toronto	3	Beach	Bar	Breakfast Spot	Japanese Restaurant	Tea Room	Coffee Shop	Pub	Thai Restaurant	Park	Salon / Barbershop
10	Downtown Toronto	3	Coffee Shop	Hotel	Restaurant	Diner	Gastropub	Cosmetics Shop	Cocktail Bar	Clothing Store	Italian Restaurant	Pizza Place
11	West Toronto	3	Café	Restaurant	Pizza Place	Bar	Park	Bus Line	Coffee Shop	Falafel Restaurant	Electronics Store	Ethiopian Restaurant
12	West Toronto	3	Bar	Bakery	Coffee Shop	Café	Cocktail Bar	Sandwich Place	Clothing Store	Beer Bar	Beer Store	Mexican Restaurant
30	Central Toronto	3	Sandwich Place	Dessert Shop	Coffee Shop	Sushi Restaurant	Pizza Place	Thai Restaurant	Café	Italian Restaurant	Fried Chicken Joint	Seafood Restaurant
35	West Toronto	3	Tibetan Restaurant	Bar	Café	Pharmacy	Diner	Restaurant	Indian Restaurant	Liquor Store	North Indian Restaurant	Donut Shop
36	West Toronto	3	Bookstore	Gourmet Shop	Breakfast Spot	Restaurant	Coffee Shop	Gift Shop	Café	Gastropub	Bank	Movie Theater
39	Downtown Toronto	3	Café	Bookstore	Park	Japanese Restaurant	Yoga Studio	College Gym	Museum	French Restaurant	Noodle House	Chinese Restaurant
42	Central Toronto	3	Playground	Gym	Tennis Court	Park	Yoga Studio	Event Space	Eastern European Restaurant	Egyptian Restaurant	Electronics Store	Ethiopian Restaurant
44	Downtown Toronto	3	Café	Vegetarian / Vegan Restaurant	Chinese Restaurant	Bar	Vietnamese Restaurant	Dumpling Restaurant	Mexican Restaurant	Coffee Shop	Bakery	Dessert Shop
47	Central Toronto	3	Coffee Shop	Italian Restaurant	Café	Sushi Restaurant	Pub	Sandwich Place	Bagel Shop	Restaurant	Gym	Grocery Store
48	Central Toronto	3	Mexican Restaurant	French Restaurant	Italian Restaurant	Park	Pizza Place	Mediterranean Restaurant	Electronics Store	BBQ Joint	Liquor Store	Coffee Shop
50	Central Toronto	3	Italian Restaurant	Café	Sushi Restaurant	Pizza Place	Coffee Shop	Spa	Bistro	Bar	Juice Bar	Furniture / Home Store
51	Downtown Toronto	3	Hotel	Coffee Shop	Pizza Place	Italian Restaurant	Aquarium	Gym	Scenic Lookout	Baseball Stadium	Bar	Concert Hall
52	Downtown Toronto	3	Coffee Shop	Café	Park	Garden	Pub	Grocery Store	Ramen Restaurant	Japanese Restaurant	Sculpture Garden	Tunnel
55	Downtown Toronto	3	Park	Coffee Shop	Historic Site	Restaurant	Bakery	Bar	Brewery	Asian Restaurant	Spa	Italian Restaurant
57	Downtown Toronto	3	Restaurant	Café	Coffee Shop	Pub	Bakery	Gastropub	Diner	Japanese Restaurant	Italian Restaurant	Pizza Place



# Results

## Cluster 5

	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
18	East Toronto	4	Grocery Store	Pharmacy	Coffee Shop	Bus Line	Doctor's Office	Optical Shop	Sandwich Place	Caribbean Restaurant	Café	Skating Rink
32	West Toronto	4	Baseball Field	Dog Run	Zoo	Garden	Other Great Outdoors	Park	Scenic Lookout	Skating Rink	Café	Pool
40	West Toronto	4	Pizza Place	Rental Car Location	Coffee Shop	Pharmacy	Grocery Store	Café	Fried Chicken Joint	Sandwich Place	Bar	Thai Restaurant

# Conclusion

Purpose of this project was to identify areas in Toronto with low number of restaurants in order to aid stakeholders in narrowing down the search for optimal location for 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 (containing greatest number of potential locations) and addresses of those zone centers were created to be used as starting points for final exploration by stakeholders.

Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.