ABSTRACT
To come up with the location for the Café/Coffee house where the business will be successful and there is opportunity for expansion further.

 by Alisha Shaik

# A CAFÉ IN TORONTO

# TABLE OF CONTENTS

# 1.Introduction/Business Problem

A multinational chain of coffeehouses is looking for a right location in Toronto, Canada, where they can kickstart their services like Café's, Coffee Houses, etc and further expand. As a Data Scientist, depending on the various venues in the neighbourhoods of Toronto, we have to come up with the location for the Café/Coffee house where the business will be successful and there is opportunity for expansion further.

# 2. Data

## 2.1 Data Requirements

For this particular problem, the data we need is geographical locations of various popular venues in the neighbourhoods of Toronto, Canada. The venues are of different types, for example, Café's, Restaurants, Bars, Pizza places, Pharmacies, Pubs, Bagel Shops, etc. Geographical location values are nothing but, the latitude and longitude values. We can get these values from Foursquare API. Depending on this data, the scope for a launch of a Café's/Coffee House in a right location is determined.

## 2.2. Data Collection

- List of postal codes of Canada
- Get Geospatial Coordinates of postal codes in Canada
- Get Geolocations of different venues of the area which we are interested in Canada i.e Toronto

## 2.3. Data Understanding

| Data | Description | Acquisition |
|---|---|---|
| Postal Code | Postal Codes of Canada | https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M |
| Borough | A town or district which is an administrative unit. | https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M |
| Neighbourhood | Neighbourhoods near to the area of interest | https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M |
| Latitude | Latitude Co-ordinates of neighbourhoods | Foursquare API |
| Longitude | Longitude Co-ordinates of neighbourhoods | Foursquare API |

| Venue | Names of various Venues | Foursquare API |
|---|---|---|
| Venue Latitude | Latitude Co-ordinates of Venues | Foursquare API |
| Venue Longitude | Longitude Co-ordinates of Venues | Foursquare API |
| Venue Category | Categories of Venues | Foursquare API |
| Top 10 Most common Venues | Top 10 most common venues categories splited in 10 columns | Foursquare API |

# 3. Methodology

## 3.1. Methods Used

- Exploratory Data Analysis (Statistics)
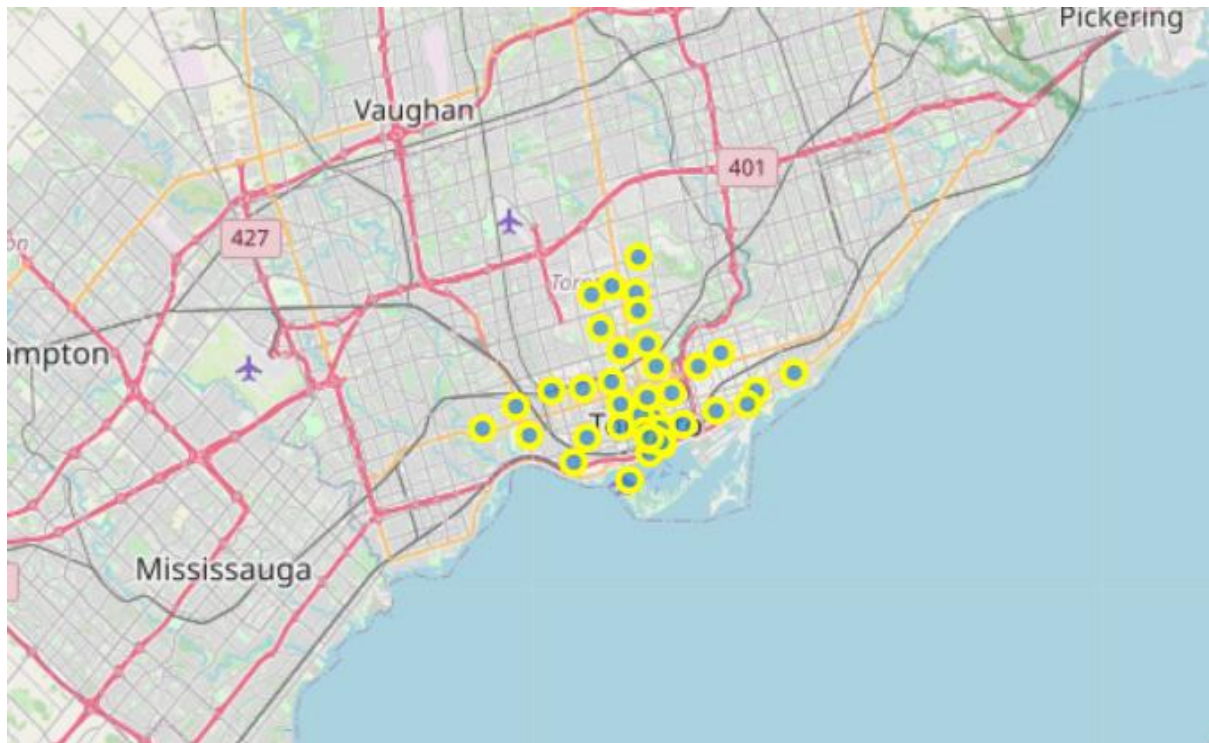- Clustering

## 3.2. Analysis

- Get the postal codes, boroughs, neighbourhoods of Canada from the Wikipedia 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'
- From this wiki link we are transferring this data to dataframe for better understanding using BeautifulSoup library available in python.
- Next we collected the latitude and longitude locations of Postal codes of Canada, which is csv file named as 'Geospatial_Coordinates.csv' and read these coordinates into an another dataframe.
- We joined the two dataframes on postal code into a single dataframe.
- The data set has various boroughs like 'North York', 'Downtown Toronto', "Queen's Park", 'Etobicoke', 'Scarborough', 'East York', 'York', 'East Toronto', 'West Toronto', 'East York/East Toronto', 'Central Toronto', 'Mississauga', 'Downtown Toronto Stn A', 'Etobicoke Northwest', 'East Toronto Business'.

```
In [15]: mergedData['Borough'].unique()

Out[15]: array(['North York', 'Downtown Toronto', "Queen's Park", 'Etobicoke',
                'Scarborough', 'East York', 'York', 'East Toronto', 'West Toronto',
                'East York/East Toronto', 'Central Toronto', 'Mississauga',
                'Downtown Toronto Stn A', 'Etobicoke Northwest',
                'East Toronto Business'], dtype=object)
```

- Since, we are only interested in the Toronto region, we filtered out the areas which has Toronto in its borough name and named it as toronto_df dataframe
- After analysis we figured out that toronto_df dataframe has 7 boroughs and 39 neighbourhoods.
- We, visualized the same using geopy.geocoders library on a map as shown below.

- Using Foursqaure API, we got details abouts nearby venues like names, latitudes, longitudes, Venue Categories etc as shown below.

```
Regent Park, Harbourfront
Garden District, Ryerson
St. James Town
The Beaches
Berczy Park
Central Bay Street
Christie
Richmond, Adelaide, King
Dufferin, Dovercourt Village
The Danforth  East
Harbourfront East, Union Station, Toronto Islands
Little Portugal, Trinity
The Danforth West, Riverdale
Toronto Dominion Centre, Design Exchange
Brockton, Parkdale Village, Exhibition Place
India Bazaar, The Beaches West
Commerce Court, Victoria Hotel
Studio District
Lawrence Park
Roselawn
Davisville North
Forest Hill North & West
High Park, The Junction South
North Toronto West
The Annex, North Midtown, Yorkville
Parkdale, Roncesvalles
Davisville
University of Toronto, Harbord
Runnymede, Swansea
Moore Park, Summerhill East
Kensington Market, Chinatown, Grange Park
Summerhill West, Rathnelly, South Hill, Forest Hill SE, Deer Park
CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst Quay, South Niagara, Island airport
Rosedale
Enclave of M5E
St. James Town, Cabbagetown
First Canadian Place, Underground city
Church and Wellesley
Enclave of M4L
```

| | Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 0 | Regent Park, Harbourfront | 43.65426 | -79.360636 | Roselle Desserts | 43.653447 | -79.362017 | Bakery |
| 1 | Regent Park, Harbourfront | 43.65426 | -79.360636 | Tandem Coffee | 43.653559 | -79.361809 | Coffee Shop |
| 2 | Regent Park, Harbourfront | 43.65426 | -79.360636 | Cooper Koo Family YMCA | 43.653249 | -79.358008 | Distribution Center |
| 3 | Regent Park, Harbourfront | 43.65426 | -79.360636 | Body Blitz Spa East | 43.654735 | -79.359874 | Spa |
| 4 | Regent Park, Harbourfront | 43.65426 | -79.360636 | Impact Kitchen | 43.656369 | -79.356980 | Restaurant |

- After analysing, we found out that there are 191 unique venue categories.
- Using onehot encoding technique, we gave weightage for various venues in each neighbourhood as shown below.

| | Neighborhood | Yoga Studio | Adult Boutique | Airport | Airport Food Court | Airport Gate | Airport Lounge | Airport Service | Airport Terminal | American Restaurant | ... | Theater | Theme Restaurant | Tibetan Restaurant | Toy / Game Store | Trail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Berczy Park | 0.000000 | 0.000000 | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.000000 | ... | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| 1 | Brockton, Parkdale Village, Exhibition Place | 0.000000 | 0.000000 | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.000000 | ... | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| 2 | CN Tower, King and Spadina, Railway Lands, Har... | 0.000000 | 0.000000 | 0.0625 | 0.0625 | 0.0625 | 0.125 | 0.1875 | 0.0625 | 0.000000 | ... | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| 3 | Central Bay Street | 0.033333 | 0.000000 | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.000000 | ... | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| 4 | Christie | 0.000000 | 0.000000 | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.000000 | ... | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| 5 | Church and Wellesley | 0.000000 | 0.033333 | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.000000 | ... | 0.000000 | 0.033333 | 0.000000 | 0.000000 | 0.0000 |

- Depending on these values, top 5 and top 10 most common venue categories is determined.

```
----Berczy Park----
                venue  freq
0  Seafood Restaurant  0.07
1      Farmers Market  0.07
2            Beer Bar  0.07
3        Cocktail Bar  0.07
4         Coffee Shop  0.07
```

| | 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 | Berczy Park | Coffee Shop | Cocktail Bar | Seafood Restaurant | Beer Bar | Farmers Market | Museum | Creperie | Breakfast Spot | Restaurant | Jazz Club |
| 1 | Brockton, Parkdale Village, Exhibition Place | Café | Breakfast Spot | Coffee Shop | Performing Arts Venue | Office | Furniture / Home Store | Stadium | Bakery | Intersection | Italian Restaurant |
| 2 | CN Tower, King and Spadina, Railway Lands, Har... | Airport Service | Airport Lounge | Boat or Ferry | Airport Terminal | Rental Car Location | Sculpture Garden | Harbor / Marina | Coffee Shop | Bar | Airport Gate |
| 3 | Central Bay Street | Coffee Shop | Italian Restaurant | Café | Sushi Restaurant | Comic Shop | Park | Modern European Restaurant | Miscellaneous Shop | Middle Eastern Restaurant | Poke Place |
| 4 | Christie | Grocery Store | Café | Park | Coffee Shop | Candy Store | Italian Restaurant | Baby Store | Restaurant | Nightclub | Cosmetics Shop |

## 3.3. Clustering

- Here, we have used kMeans Clustering Machine learning Algorithm for finding the clusters in Toronto for different venues.
- We have divided the region and venues into 5 clusters (k=5) with top 10 venues.
- Also, we have added a new column named '**Cluster Labels**' to identify and retrieve data related to specific clusters as depicted below.

### Cluster 1

| | Borough | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Downtown Toronto | 0 | Café | Ramen Restaurant | Clothing Store | Electronics Store | Japanese Restaurant | Bookstore | Sandwich Place | Diner | Burger Joint | Burrito Place |
| 19 | East Toronto | 0 | Trail | Pub | Health Food Store | Wine Bar | Cuban Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store | Diner |
| 36 | Downtown Toronto | 0 | Park | Plaza | Café | Hotel | Chinese Restaurant | Dessert Shop | IT Services | Bar | Basketball Stadium | Skating Rink |
| 37 | West Toronto | 0 | Bar | Asian Restaurant | Men's Store | Vietnamese Restaurant | Wine Bar | French Restaurant | New American Restaurant | Korean Restaurant | Japanese Restaurant | Italian Restaurant |
| 41 | East Toronto | 0 | Greek Restaurant | Italian Restaurant | Coffee Shop | Ice Cream Shop | Yoga Studio | Pizza Place | Bookstore | Juice Bar | Restaurant | Dessert Shop |
| 47 | East Toronto | 0 | Pizza Place | Park | Fish & Chips Shop | Sandwich Place | Italian Restaurant | Intersection | Burrito Place | Restaurant | Ice Cream Shop | Liquor Store |
| 67 | Central Toronto | 0 | Park | Gym / Fitness Center | Breakfast Spot | Sandwich Place | Department Store | Food & Drink Shop | Hotel | Gym | Comic Shop | Dog Run |
| 68 | Central Toronto | 0 | Bus Line | Jewelry Store | Trail | Sushi Restaurant | Deli / Bodega | Eastern European Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store |
| 69 | West Toronto | 0 | Mexican Restaurant | Café | Thai Restaurant | Arts & Crafts Store | Discount Store | Bookstore | Diner | Italian Restaurant | Cajun / Creole Restaurant | Fast Food Restaurant |
| 73 | Central Toronto | 0 | Coffee Shop | Clothing Store | Fast Food Restaurant | Park | Chinese Restaurant | Cosmetics Shop | Café | Mexican Restaurant | Rental Car Location | Restaurant |
| 79 | Central Toronto | 0 | Dessert Shop | Pizza Place | Coffee Shop | Italian Restaurant | Café | Sandwich Place | Sushi Restaurant | Gym | Park | Brewery |
| 81 | West Toronto | 0 | Café | Italian Restaurant | Coffee Shop | Sushi Restaurant | Pub | Pizza Place | Indie Movie Theater | Bank | Bar | Dessert Shop |
| 87 | Downtown Toronto | 0 | Airport Service | Airport Lounge | Boat or Ferry | Airport Terminal | Rental Car Location | Sculpture Garden | Harbor / Marina | Coffee Shop | Bar | Airport Gate |
| 99 | Downtown Toronto | 0 | Park | Dance Studio | Ethiopian Restaurant | Escape Room | Café | Pub | Ice Cream Shop | Beer Bar | Ramen Restaurant | Juice Bar |
| 100 | East Toronto Business | 0 | Auto Workshop | Pizza Place | Brewery | Burrito Place | Butcher | Farmers Market | Fast Food Restaurant | Restaurant | Light Rail Station | Skate Park |

### Cluster 2

| | Borough | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | Central Toronto | 1 | Playground | Wine Bar | Dance Studio | Eastern European Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store | Diner | Dessert Shop |

# Cluster 3

| | Borough | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 62 | Central Toronto | 2 | Garden | Home Service | Wine Bar | Dance Studio | Eastern European Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store | Diner |

# Cluster 4

| | Borough | 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 | Downtown Toronto | 3 | Coffee Shop | Park | Bakery | Breakfast Spot | Theater | Yoga Studio | Dessert Shop | Spa | Restaurant | Farmers Market |
| 15 | Downtown Toronto | 3 | Café | Gastropub | Coffee Shop | Japanese Restaurant | Farmers Market | Cocktail Bar | BBQ Joint | Park | Cosmetics Shop | Middle Eastern Restaurant |
| 20 | Downtown Toronto | 3 | Coffee Shop | Cocktail Bar | Seafood Restaurant | Beer Bar | Farmers Market | Museum | Creperie | Breakfast Spot | Restaurant | Jazz Club |
| 24 | Downtown Toronto | 3 | Coffee Shop | Italian Restaurant | Café | Sushi Restaurant | Comic Shop | Park | Modern European Restaurant | Miscellaneous Shop | Middle Eastern Restaurant | Poke Place |
| 25 | Downtown Toronto | 3 | Grocery Store | Café | Park | Coffee Shop | Candy Store | Italian Restaurant | Baby Store | Restaurant | Nightclub | Cosmetics Shop |
| 30 | Downtown Toronto | 3 | Coffee Shop | Café | Seafood Restaurant | Monument / Landmark | Sushi Restaurant | Salon / Barbershop | Hotel | Smoke Shop | Plaza | Bakery |
| 31 | West Toronto | 3 | Bakery | Pharmacy | Pet Store | Café | Bank | Bar | Portuguese Restaurant | Middle Eastern Restaurant | Supermarket | Grocery Store |
| 42 | Downtown Toronto | 3 | Café | Coffee Shop | Restaurant | Bakery | Japanese Restaurant | Sandwich Place | Gym / Fitness Center | Hotel | Pub | Deli / Bodega |
| 43 | West Toronto | 3 | Café | Breakfast Spot | Coffee Shop | Performing Arts Venue | Office | Furniture / Home Store | Stadium | Bakery | Intersection | Italian Restaurant |
| 48 | Downtown Toronto | 3 | Café | Gastropub | Restaurant | Coffee Shop | Japanese Restaurant | American Restaurant | Hotel | Gluten-free Restaurant | Steakhouse | Seafood Restaurant |
| 54 | East Toronto | 3 | Coffee Shop | American Restaurant | Café | Bakery | Park | Middle Eastern Restaurant | Pet Store | Clothing Store | Cheese Shop | Stationery Store |
| 74 | Central Toronto | 3 | Sandwich Place | Café | Coffee Shop | Donut Shop | Middle Eastern Restaurant | Liquor Store | Burger Joint | Indian Restaurant | BBQ Joint | Pub |
| 75 | West Toronto | 3 | Gift Shop | Breakfast Spot | Bar | Italian Restaurant | Eastern European Restaurant | Dog Run | Dessert Shop | Cuban Restaurant | Movie Theater | Restaurant |
| 80 | Downtown Toronto | 3 | Café | Sandwich Place | Bookstore | Japanese Restaurant | Bar | Bakery | Yoga Studio | Sushi Restaurant | College Gym | College Arts Building |
| 84 | Downtown Toronto | 3 | Café | Caribbean Restaurant | Vietnamese Restaurant | Bakery | Wine Bar | Bar | Beer Bar | Belgian Restaurant | Italian Restaurant | Jazz Club |
| 86 | Central Toronto | 3 | Coffee Shop | Pub | Fried Chicken Joint | Sushi Restaurant | Bagel Shop | Bank | Restaurant | Pizza Place | American Restaurant | Liquor Store |
| 92 | Downtown Toronto Stn A | 3 | Café | Seafood Restaurant | Farmers Market | Cocktail Bar | Beer Bar | Creperie | Bakery | Japanese Restaurant | Jazz Club | Gastropub |
| 96 | Downtown Toronto | 3 | Italian Restaurant | Restaurant | Café | Bakery | Park | Diner | Japanese Restaurant | Indian Restaurant | Beer Store | Butcher |
| 97 | Downtown Toronto | 3 | Café | Coffee Shop | Restaurant | Seafood Restaurant | Hotel | Gluten-free Restaurant | Gym | Japanese Restaurant | Pub | Speakeasy |

**Cluster 5**

| | Borough | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | East York/East Toronto | 4 | Park | Convenience Store | Metro Station | Wine Bar | Deli / Bodega | Eastern European Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store |
| 61 | Central Toronto | 4 | Bus Line | Park | Swim School | Wine Bar | Eastern European Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store | Diner |
| 91 | Downtown Toronto | 4 | Park | Playground | Trail | Wine Bar | Cuban Restaurant | Donut Shop | Dog Run | Distribution Center | Discount Store | Diner |

# 4. Results and Discussion

On Observing the above clusters, we can say that Cluster 1 comprises most of the Central, east and west Toronto and has most common business-like Restaurants, Bars, Pizza place etc. But there are no much cafes in these areas. On the Other hand, Cluster 4 has most of Downtown Toronto and has lots of Café 's, Coffee Houses, restaurants, bars, pubs, etc but this area is mostly dominated by Café 's and Coffee Houses. Cluster 2, 3 and 5 are mostly recreational areas like parks, gardens, playgrounds and doesn't have enough Café 's /Coffee Houses.

# 5. Conclusion

Depending on all the analysis and observations, we conclude that Clusters 1,2,3 and 5, which comprises most of Central, East and West Toronto is the right place to start a Café as the frequency of Café 's is very less, hence, the competition will be low, also these areas have multicuisine restaurants, pubs, bars etc. which states that these areas are the most happening places in the city. Starting a Café here would attract the crowd, resulting in the success of the café and areas which have venues like parks, gardens etc has lot of crowd visiting them and opening a café near to these venues would be a huge success.

On the other hand, Cluster 4 which is mostly Downtown Toronto is the least likely place to start a café, as this area has already huge number of cafés and coffee houses. Starting a Café here will result in huge competition from existing shops and sales will not be good.

# 6. References

- List of postal codes of Canada: M Wikipedia link-
  https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
- Foursquare - https://foursquare.com/developers/apps
- Jupyter notebook-
  https://github.com/alishashaik1259/Myrepo/blob/main/Capstone%20Project%20on%20determining%20location%20for%20a%20Cafe.ipynb