

# **Recommendation for Opening a Restaurant**

## **1. Introduction**

### **1.1. Background**

Central Toronto region is growing fast with many Corporate groups setting up their business in this region. With the population growing along the business, many supporting business like real estate, restaurants, sports complex, etc are growing at a faster rate.

### **1.2. Business Problem**

One of the Businessman wanted to open a Pizza restaurant in the Central Toronto Region. As this is one of the active location with many people movement around, he wanted to know which is the right location in Central Toronto Neighborhoods to open the restaurant.

### **1.3. Questions to be answered:**

- 1) Can we get the list of Neighborhoods in Central Toronto Region?
- 2) Can we find out how many restaurants in Central Toronto Region?
- 3) How many Pizza restaurants are located in each of the Neighborhood in Central Toronto?
- 4) How many Neighborhood has many restaurants but does not have any Pizza restaurant so far?
- 5) Which is the right location to open a new Pizza restaurant?

Solution to the above problem can be used by any Businessmen who want to open a Pizza restaurant in a given Neighborhood.

## 2. Data Acquisition and Cleaning

### 2.1. Data Acquisition

In order to find out the right location for opening a Pizza restaurant, we need to collect various details of restaurants in the Central Toronto region. Below data is required to be collected:

*a) List of all the Neighborhoods in the Central Toronto Region*

This can be obtained from the below Wikipedia page  
[https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)

*b) Latitude and Longitude of each Neighborhood*

This data is available in a spreadsheet form. This spreadsheet will be used as reference to get the Latitude and Longitude of each Neighborhood.

*c) List of all the restaurants and their location in each Neighborhood*

This can be obtained from the Foursquare API with the Get request on Venue with Explore option. For each neighborhood, API can be called using the Latitude and Longitude. API will return the list of venues in each Neighborhood along with their co-ordinates.

### 2.2. Data Cleaning

Neighborhood data downloaded from the website is cleaned up first by removing the 'Not assigned' Boroughs in the data. Further the data is filtered based on 'Central Toronto' only and remaining neighborhood data is removed. In addition, for any Borough, if the Neighborhood is 'Not assigned', Borough name itself assigned to that. 16 Neighborhood is obtained from this process.

	Postcode Borough		Neighbourhood
144	M4N	Central Toronto	Lawrence Park
145	M5N	Central Toronto	Roselawn
156	M4P	Central Toronto	Davisville North
157	M5P	Central Toronto	Forest Hill North
158	M5P	Central Toronto	Forest Hill West
168	M4R	Central Toronto	North Toronto West
169	M5R	Central Toronto	The Annex
170	M5R	Central Toronto	North Midtown
171	M5R	Central Toronto	Yorkville
183	M4S	Central Toronto	Davisville

196	M4T	Central Toronto	Moore Park
197	M4T	Central Toronto	Summerhill East
211	M4V	Central Toronto	Deer Park
212	M4V	Central Toronto	Forest Hill SE
213	M4V	Central Toronto	Rathnelly
214	M4V	Central Toronto	South Hill
215	M4V	Central Toronto	Summerhill West

To get the various restaurants in the Neighborhood, we need to know the Latitude and Longitude of each Neighborhood.

Geospatial co-ordinates which is read from the Spreadsheet is used to identify the Latitude and Longitude of each Neighborhood in the 'Central Toronto' region.

Finally, drop the Postcode and Borough columns and retain only Neighborhood, Latitude and Longitude.

	<b>Neighbourhood</b>	<b>Latitude</b>	<b>Longitude</b>
0	Lawrence Park	43.728020	-79.388790
1	Roselawn	43.711695	-79.416936
2	Davisville North	43.712751	-79.390197
3	Forest Hill North	43.696948	-79.411307
4	Forest Hill West	43.696948	-79.411307
5	North Toronto West	43.715383	-79.405678
6	The Annex	43.672710	-79.405678
7	North Midtown	43.672710	-79.405678
8	Yorkville	43.672710	-79.405678
9	Davisville	43.704324	-79.388790
10	Moore Park	43.689574	-79.383160
11	Summerhill East	43.689574	-79.383160
12	Deer Park	43.686412	-79.400049
13	Forest Hill SE	43.686412	-79.400049
14	Rathnelly	43.686412	-79.400049
15	South Hill	43.686412	-79.400049
16	Summerhill West	43.686412	-79.400049

### 3. Exploratory Data Analysis

#### 3.1. Identify the Restaurants in each Neighborhood

Using the Foursquare API, choose all the Restaurants by passing the Latitude and Longitude of each Neighborhood and 'Food' as section. This will return all the

restaurants around the 500 meters of each Neighborhood. Venue Category will provide the type of restaurant and Venue provides the name of the restaurant as shown below.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Lawrence Park	43.728020	-79.388790	Dim Sum Deluxe	43.726953	-79.394260	Dim Sum Restaurant
1	Davisville North	43.712751	-79.390197	Homeway Restaurant & Brunch	43.712641	-79.391557	Breakfast Spot
2	Davisville North	43.712751	-79.390197	Subway	43.708378	-79.390473	Sandwich Place
3	Davisville North	43.712751	-79.390197	Ho Su Korean & Japanese Restaurant	43.710002	-79.393856	Asian Restaurant
4	Davisville North	43.712751	-79.390197	Provocative Pizza Series	43.708293	-79.389546	Pizza Place

Using this, we can determine how many Total restaurants and how many Pizza restaurant exists in each Neighborhood.

Below table also provides the total restaurants in each Neighborhood.

Neighborhood	Total Restaurants
Davisville	31
Davisville North	4
Deer Park	8
Forest Hill North	4
Forest Hill SE	8
Forest Hill West	4
Lawrence Park	1
Moore Park	2
North Midtown	16

Neighborhood	Total Restaurants
North Toronto West	8
Rathnelly	8
South Hill	8
Summerhill East	2
Summerhill West	8
The Annex	16
Yorkville	16

Below table provides how many restaurants in each category is present across all the Neighborhoods in Central Toronto.

Venue Category	Total
American Restaurant	10
Asian Restaurant	5
BBQ Joint	3
Bagel Shop	6
Breakfast Spot	1
Burger Joint	4
Café	13

<b>Venue Category</b>	<b>Total</b>
Chinese Restaurant	2
Deli / Bodega	1
Dim Sum Restaurant	1
Diner	2
Donut Shop	3
French Restaurant	3
Fried Chicken Joint	6
Greek Restaurant	1
Hot Dog Joint	2
Indian Restaurant	4
Italian Restaurant	3
Japanese Restaurant	1
Jewish Restaurant	3
Mexican Restaurant	1
Middle Eastern Restaurant	3
New American Restaurant	1
Pizza Place	14

Venue Category	Total
Restaurant	13
Sandwich Place	18
Seafood Restaurant	1
Sushi Restaurant	9
Thai Restaurant	2
Vegetarian / Vegan Restaurant	3
Vietnamese Restaurant	5

*From the above table, we see that there are totally 144 restaurants and out of which 14 Pizza Restaurant is present in Central Toronto region.*

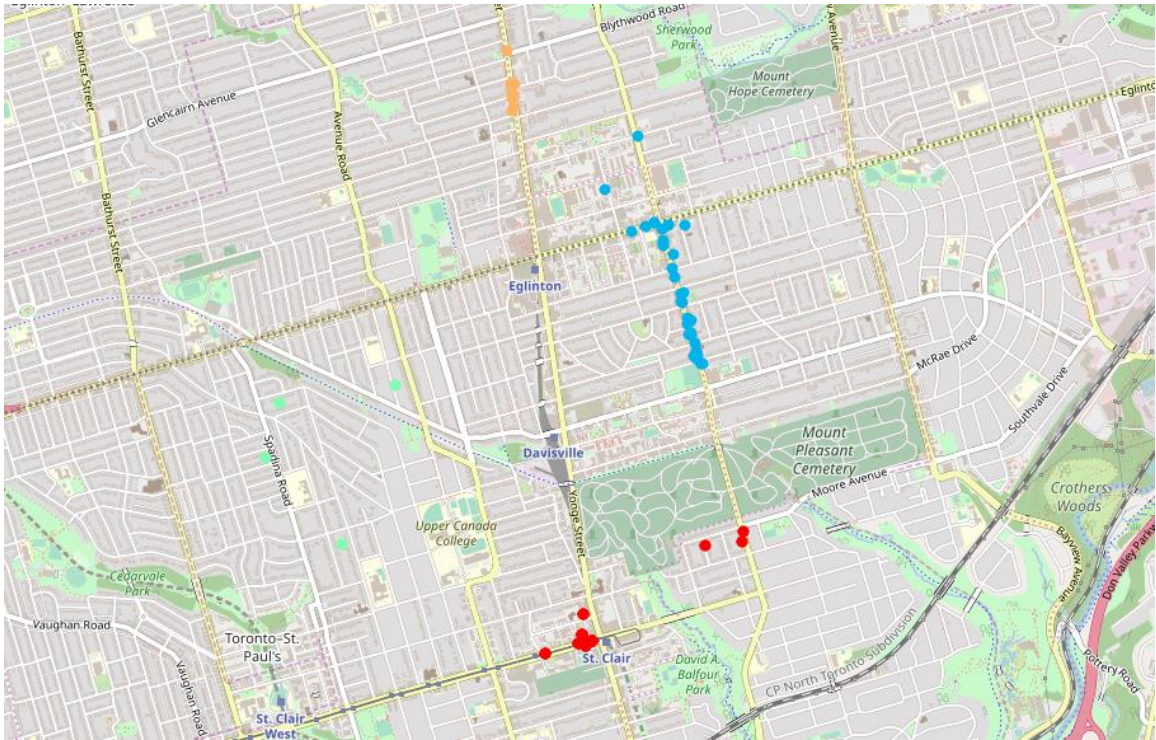
### **3.2. Cluster the Neighborhood Areas**

Let's cluster the Neighborhood based on the number of restaurants present closer to each other. If restaurants are close to each other, it will be easy for the people to access these restaurants based on the choice of food they like.

If more restaurants are present in an area, it reflects that there are more business around and hence the people movement in these areas will be more. So clustering the restaurants across the Neighborhood will help to identify the areas which is suitable to open a new restaurant.

Using the k-Means clustering technique, let's cluster the Central Toronto region into 5 clusters and find out how the restaurants are places in each cluster.

Once the clusters are created, let's create a map using Folium to show the clusters of restaurants. This will help visually review the restaurants in the map.



Clusters in the above map shows how the restaurants are located closely to each other in an area. Below Neighborhood are classified in the 5 clusters.

Cluster Labels	Neighborhood
0	Summerhill West
0	Rathnelly
0	Forest Hill SE
0	Deer Park
0	Summerhill East
0	Moore Park



Cluster Labels	Neighborhood
0	South Hill
1	The Annex
1	Yorkville
1	North Midtown
2	Davisville
2	Davisville North
3	Forest Hill West
3	Forest Hill North
4	North Toronto West
4	Lawrence Park

### 3.3. Analyze the Clusters

Next step is to analyze each clusters and find out how many total restaurants and Pizza restaurants are available in each cluster. This will help to determine each cluster where there is no Pizza restaurants available.



From the above bar chart, we clearly see Clusters 3 and 4 does not have any Pizza restaurants but there are other restaurants present. This helps to understand there are potential business opportunity for opening a pizza restaurant in those neighborhood.

#### 4. Result - Finalize the Neighborhood

Following are the list of neighborhood in Cluster 3 and 4 which does not have any Pizza restaurants. These are the ideal place to start the Pizza restaurants.

Cluster Labels	Neighborhood
3	Forest Hill North
3	Forest Hill West
4	Lawrence Park
4	North Toronto West

## 5. Discussion

Based on the analysis of Cluster of neighborhood, we are able to get the answer to the business problem we identified initially.

*1) Can we get the list of Neighborhoods in Central Toronto Region?*

Postcode	Borough	Neighbourhood
144	M4N	Central Toronto
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211	M4V	Central Toronto
212	M4V	Central Toronto
213	M4V	Central Toronto
214	M4V	Central Toronto
215	M4V	Central Toronto

*2) Can we find out how many restaurants in Central Toronto Region?*

144 Restaurants

*3) How many Pizza restaurants are located in each of the Neighborhood in Central Toronto?*

14 Pizza Restaurants

*4) How many Neighborhood has many restaurants but does not have any Pizza restaurant so far?*

4 Neighborhood

Cluster Labels	Neighborhood
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3	Forest Hill North
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3	Forest Hill West
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4	Lawrence Park
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4	North Toronto West
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## 5. Conclusion

Above mentioned 4 Neighborhood are the right location to open a new Pizza restaurant. These 4 locations seems to have good number of people movement as there are already few other type of restaurants present in those location. Hence the businessman can open a new Pizza restaurant in any of these 4 neighborhoods.