Choosing the Ideal Etobicoke Neighborhood to Open a New Pizza Place

1. Introduction: Business Problem

Toronto is a multicultural city with diverse neighbourhoods. No matter what type of cuisine you are craving you can likely find it in Toronto. Some neighbourhoods are even known for their prominent ethnic food and are in fact labelled as Koreatown, Chinatown, Greektown or Little Italy. With this multicultural population comes a diverse culinary landscape that offers food from all over the world. You can even easily find specialty food shops that carry unique ingredients. Since not everyone shares the same diet or has the same taste, you can find a restaurant that caters to something for every dietary concern. However, the sheer diversity of Toronto's food scene makes it difficult to navigate or even survive successfully. Opening a successful business is difficult with stiff competition from other businesses. This makes the location of your new establishment key to a successful business. When looking to open a business it is important to research the location and find out more about the neighborhood and other businesses are in the area.

Toronto covers an area of 630 square kilometres made up of large boroughs such as Downtown Toronto, York, East York, North York, Scarborough, Etobicoke. Throughout the city these boroughs are further divided into small and large neighbourhoods. If you were a businessman/woman looking to find the best location to open a pizza restaurant what location would you choose? Practically everyone loves a good slice of pizza. It's loved by adults and kids. Etobicoke has a large European population from countries such as Italy, Poland, and Ukraine. If you wanted to open a pizza joint in Etobicoke what neighbourhood would offer the best location with minimal competition but and excellent foot traffic.

To find a solution to this problem we will leverage the Foursquare location data to create a map and table of all the businesses in the different neighbourhoods of Etobicoke. Using this data, I can narrow down and estimate the best location to open a successful pizza place. This information would be useful to potential entrepreneurs or chefs interested in opening a restaurant, specifically a pizza place in a neighborhood within Etobicoke.

2. Data Acquisition and Cleaning

In order to segment the neighborhoods and explore them, I used a dataset for Toronto that contains all the boroughs and the neighborhoods that exist in each borough. I found this data on Wikipedia (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M). To retrieve the latitude and longitude coordinates of each neighborhood I used this link to a csv file that has the geographical coordinates of each postal code: http://cocl.us/Geospatial_data.

I scraped and transformed the dataset to clean it. For instance, I removed rows that had missing information. I also grouped all the neighborhoods that belong to the same borough and have the same postal code and geographical coordinates. I then created a new datarame to focus the data solely on Etobicoke neighborhoods as shown below in Table 1.

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M9A	Etobicoke	Islington Avenue	43.667856	-79.532242
1	M9B	Etobicoke	Cloverdale,Islington,Martin Grove,Princess Gar...	43.650943	-79.554724
2	M9C	Etobicoke	Bloordale Gardens,Eringate,Markland Wood,Old B...	43.643515	-79.577201
3	M9P	Etobicoke	Westmount	43.696319	-79.532242
4	M9R	Etobicoke	Kingsview Village,Martin Grove Gardens,Richvie...	43.688905	-79.554724

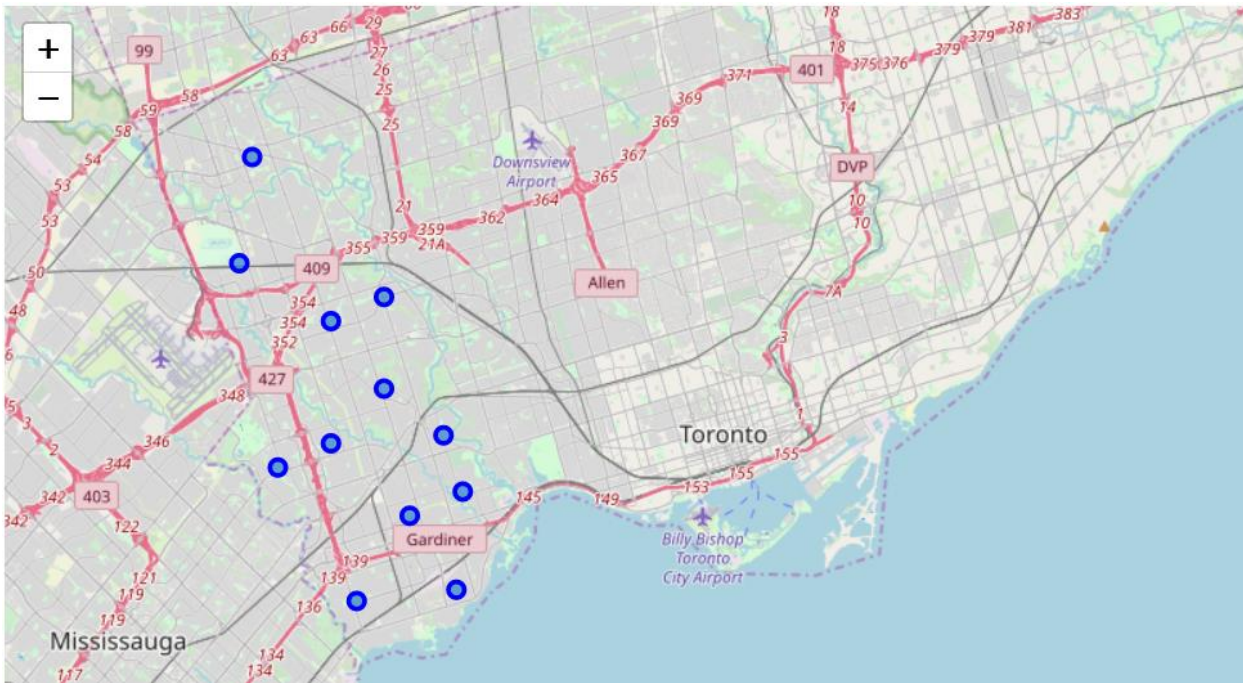Table 1. Etobicoke Neighborhood Details

In total, from the dataframe I was able to group Etobicoke neighborhoods in to 12 grouped neighborhoods listed below:
1. Islington Avenue
2. Cloverdale,Islington,Martin Grove,Princess Gardens,West Deane Park
3. Bloordale Gardens,Eringate,Markland Wood,Old Burnhamthorpe
4. Westmount
5. Kingsview Village,Martin Grove Gardens,Richview Gardens,St. Phillips
6. Humber Bay Shores,Mimico South,New Toronto
7. Albion Gardens,Beaumond Heights,Humbergate,Jamestown,Mount Olive,Silverstone,South Steeles,Thistletown
8. Alderwood,Long Branch
9. Northwest
10. The Kingsway,Montgomery Road,Old Mill North
11. Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea
12. Kingsway Park South West,Mimico NW,The Queensway West,Royal York South West,South of Bloor

I then used Foursquare API to explore and get a list of all the venues within the latitude and the longitude coordinates of each neighborhood in Etobicoke. Using the Foursquare API explore function allowed me to determine what neighborhoods have a pizza place and what neighborhoods do not. It also gave me insight to other types of business in the same neighbourhood- whether they are retail/ food or other types of businesses.

3. Methodology & Analysis

I used Python folium library to visualize geographic details of Etobicoke and its neighborhoods. I created a map of Toronto with Etobicoke neighborhoods superimposed on top. As shown in Figure 1, each blue circle in the map below represents one of the 12 grouped neighborhoods in Etobicoke.

Figure 1. Map of Etobicoke Neighborhoods shown as blue circles in Toronto.

I then utilized the Foursquare API to explore the neighborhoods. I set the limit to 100 venues and a radius of 600 meters for each neighborhood group. Foursquare API returned a list of venue names, venue categories, latitude and longitude information. Among the 12 grouped neighborhoods in Etobicoke a total of 110 venues was returned. Out of these 110 venues 81 are unique venues and 54 are unique venue categories. The bar plot below (Figure 2) shows the breakdown of the total number of venues among all the 12 neighborhoods.
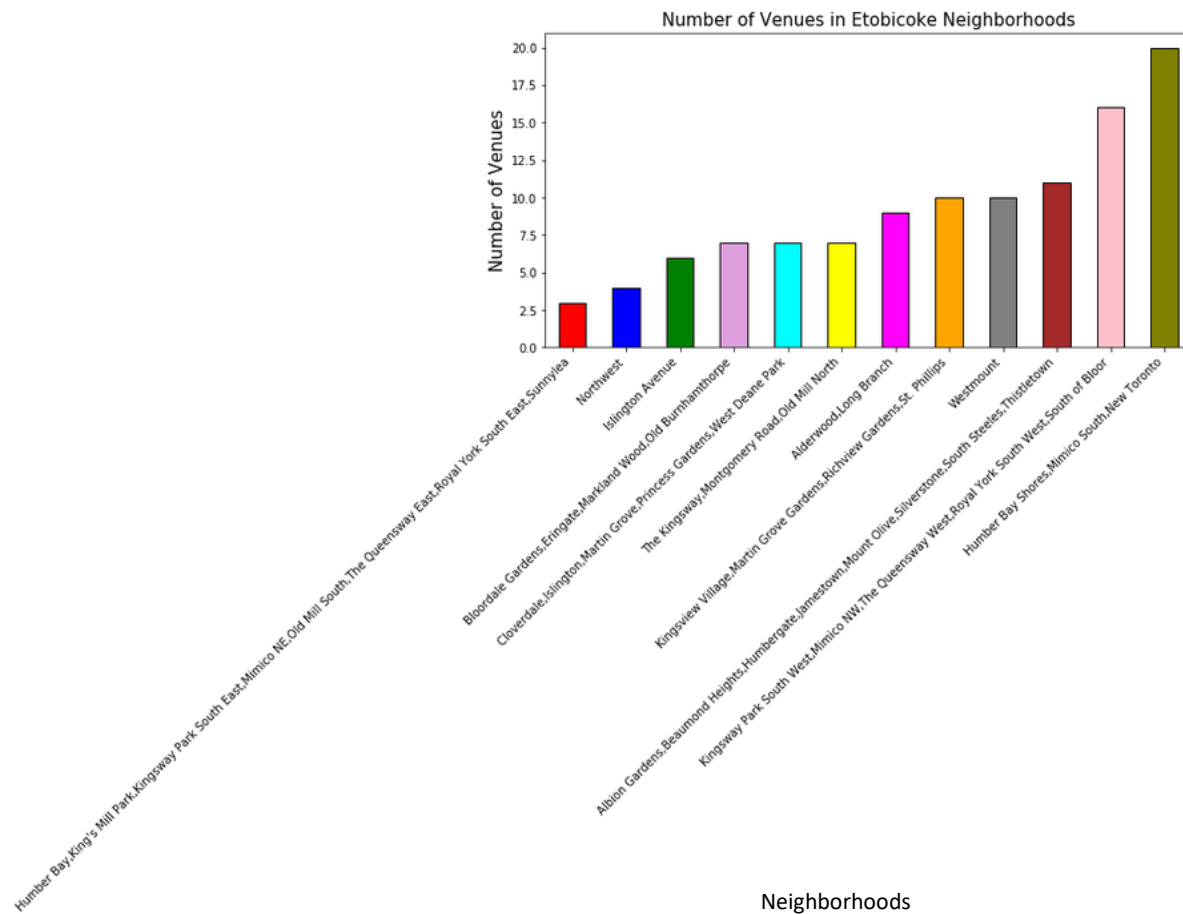
Figure 2. Bar Graph showing the number of venues in Etobicoke neighborhoods.

As we can see from Figure 2, Etobicoke neighborhoods vary greatly as to the number of venues retrieved by Foursquare. Using this basic information about the neighborhoods, I performed basic explanatory data analysis and derived some additional information from the raw data. First, I needed to determine which neighborhood venues were categorized as pizza places? Which neighborhoods had 1 or more venue category labeled as pizza place?

I find out of the 12 Etobicoke neighborhoods, 7 of them have a pizza place. Three of the neighborhoods have two pizza places. In total Etobicoke had 10 pizza places as listed in Table 2.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Category
8	Cloverdale,Islington,Martin Grove,Princess Gar...	43.650943	-79.554724	Pizza Pizza	Pizza Place
9	Cloverdale,Islington,Martin Grove,Princess Gar...	43.650943	-79.554724	Pizza Nova	Pizza Place
16	Bloordale Gardens,Eringate,Markland Wood,Old B...	43.643515	-79.577201	Pizza Hut	Pizza Place
22	Westmount	43.696319	-79.532242	Pizza Hut	Pizza Place
25	Westmount	43.696319	-79.532242	Pizza Nova	Pizza Place
35	Kingsview Village,Martin Grove Gardens,Richvie...	43.688905	-79.554724	Pizza Pizza	Pizza Place
43	Humber Bay Shores,Mimico South,New Toronto	43.605647	-79.501321	Domino's Pizza	Pizza Place
65	Albion Gardens,Beaumond Heights,Humbergate,Jam...	43.739416	-79.588437	Pizza Pizza	Pizza Place
71	Alderwood,Long Branch	43.602414	-79.543484	Il Paesano Pizzeria & Restaurant	Pizza Place
76	Alderwood,Long Branch	43.602414	-79.543484	Pizza Pizza	Pizza Place

Table 2. Pizza places in Etobicoke neighborhoods.

That leaves 5 neighborhoods with no pizza place. These neighborhoods are:
- Islington Avenue
- Kingsway Park South West,Mimico NW,The Queensway West,Royal York South
- NorthWest
- The Kingsway,Montgomery Road,Old Mill North
- Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea

I used folium map to visualize the distribution of the pizza places in Etobicoke neighborhoods among the neighborhoods that do not have pizza venues. As show in the map below (Figure 3), red circles represent pizza places, while blue circles represent the neighborhoods without any pizza places. Foursquare returned 10 pizza places but the map below displays only 7 red circles since 3 neighborhoods in Etobicoke have 2 pizza places each as shown in the Table 2.
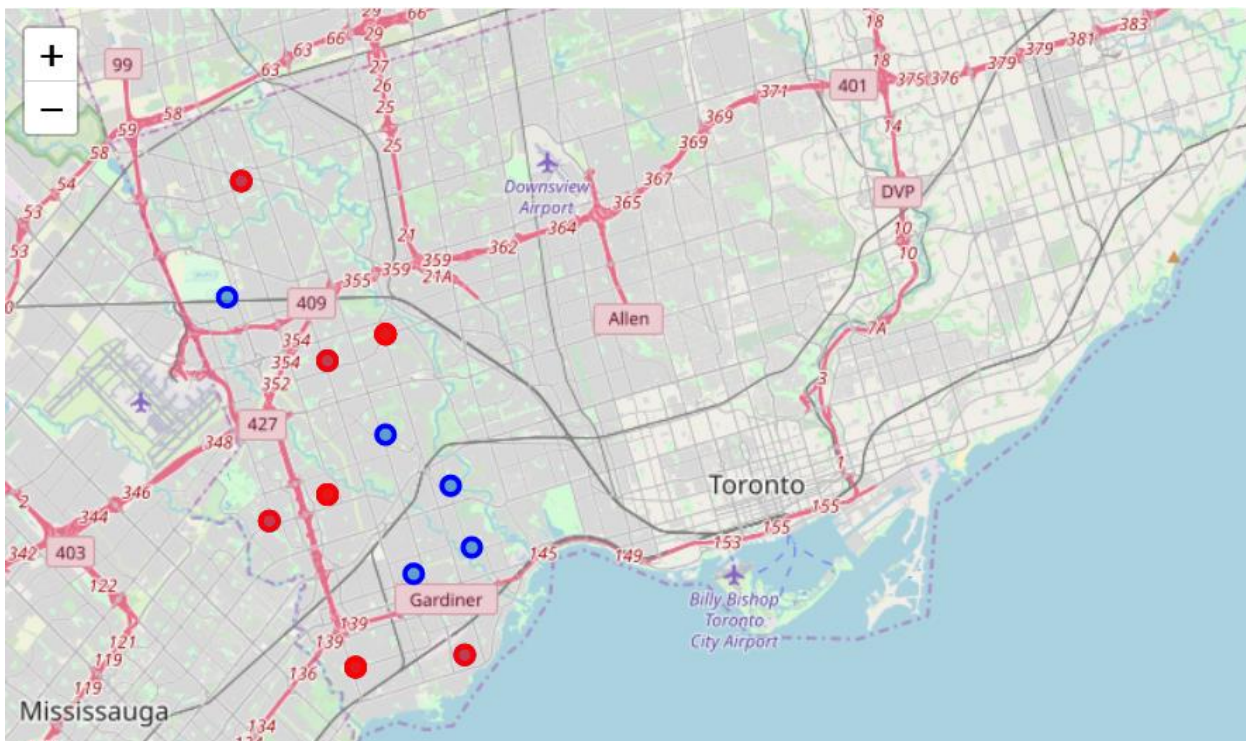
Figure 3. Etobicoke neighborhoods with pizza places (red circles) and without pizza places (blue circles).

The To further analyze the 5 neighborhoods with no venues categorized as pizza places I created a new dataframe with only the neighborhoods that do not have a pizza place. To analyze each neighborhood, I started by one-hot encoding the Venue Categories to convert the categorical variables into a form that could be provided to machine learning algorithms. Then I used this output sequence data to determine the most common venues in these 5 neighborhoods as shown below in Table 3.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Humber Bay,King's Mill Park,Kingsway Park Sout...	Baseball Field	Park	Locksmith	Wings Joint	Furniture / Home Store
1	Islington Avenue	Pharmacy	Café	Shopping Mall	Grocery Store	Bank
2	Kingsway Park South West,Mimico NW,The Queensw...	Wings Joint	Thrift / Vintage Store	Bank	Burger Joint	Burrito Place
3	Northwest	Bar	Rental Car Location	Drugstore	Furniture / Home Store	Wings Joint
4	The Kingsway,Montgomery Road,Old Mill North	Coffee Shop	Bar	Smoke Shop	Liquor Store	River

Table 3. Most common venues in the 5 Etobicoke neighborhoods without any pizza places.

As Table 3 displays, among the 5 neighborhoods there are some similarities among the venue categories. For this reason, I used K-means algorithm to cluster the neighborhoods. But first I needed to find the optimal K s value. I used the elbow method to determine the optimum number of clusters, which showed that 2 was optimum K-Means value (Figure 4).
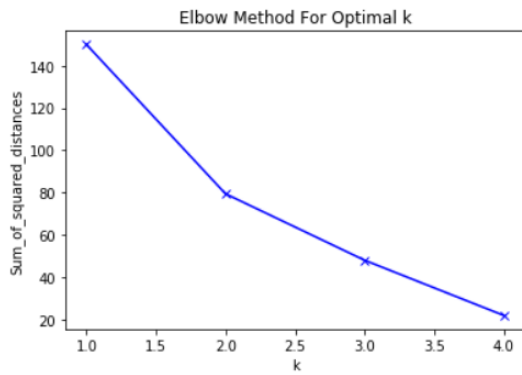
Figure 4. Elbow Method for Optimal K

As a result, I ran K-Means to cluster the 5 Etobicoke neighborhoods without a pizza place, into 2 clusters. The table below (Table 4) displays the cluster label for each neighborhood along with the 5 most common venues in each neighborhood.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Islington Avenue	43.667856	-79.532242	1	Pharmacy	Café	Shopping Mall	Grocery Store	Bank
6	Northwest	43.706748	-79.594054	1	Bar	Rental Car Location	Drugstore	Furniture / Home Store	Wings Joint
10	The Kingsway,Montgomery Road,Old Mill North	43.653654	-79.506944	1	Coffee Shop	Bar	Smoke Shop	Liquor Store	River
17	Humber Bay,King's Mill Park,Kingsway Park Sout...	43.636258	-79.498509	0	Baseball Field	Park	Locksmith	Wings Joint	Furniture / Home Store
20	Kingsway Park South West,Mimico NW,The Queensw...	43.628841	-79.520999	1	Wings Joint	Thrift / Vintage Store	Bank	Burger Joint	Burrito Place

Table 4. Cluster Label for Etobicoke neighborhoods without pizza places.

As we can see from the Table 4, four out of the five neighborhoods were clustered into 1 cluster. To visualize the resulting clusters, I mapped them. As shown in Figure 5 one group of clusters is the purple circles, the other cluster is labeled as a red circle.
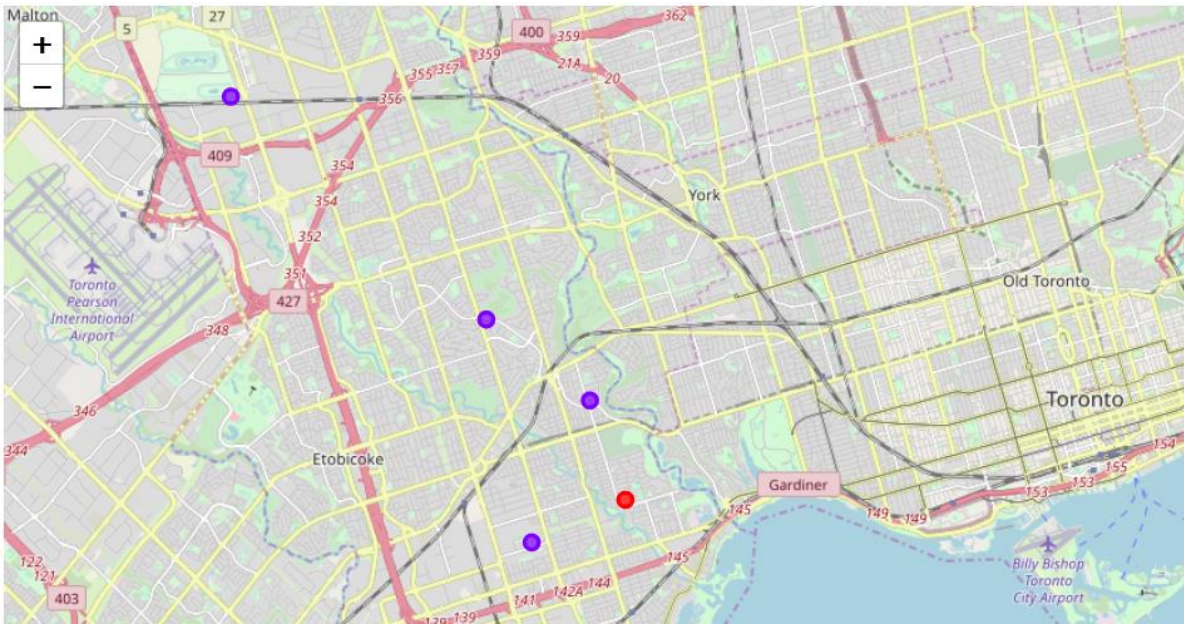
Figure 5. The 5 neighborhoods without pizza places were clustered into 2 groups.

I examined the 2 clusters to determine what distinguishes each cluster. Four out the 5 neighborhood groups clustered into 1 have some type of eatery as one of their 3 most common venues (see Table 4). The lone neighborhood- "Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea" clustered alone and does not include an eatery as one of the 3 most common venues (see Table 4). To visualize, I mapped using folium and labeled the current pizza places in red circles, the neighborhoods without any pizza place in blue circles and the potential new pizza place in the neighborhood of "Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea" as green/yellow circle.
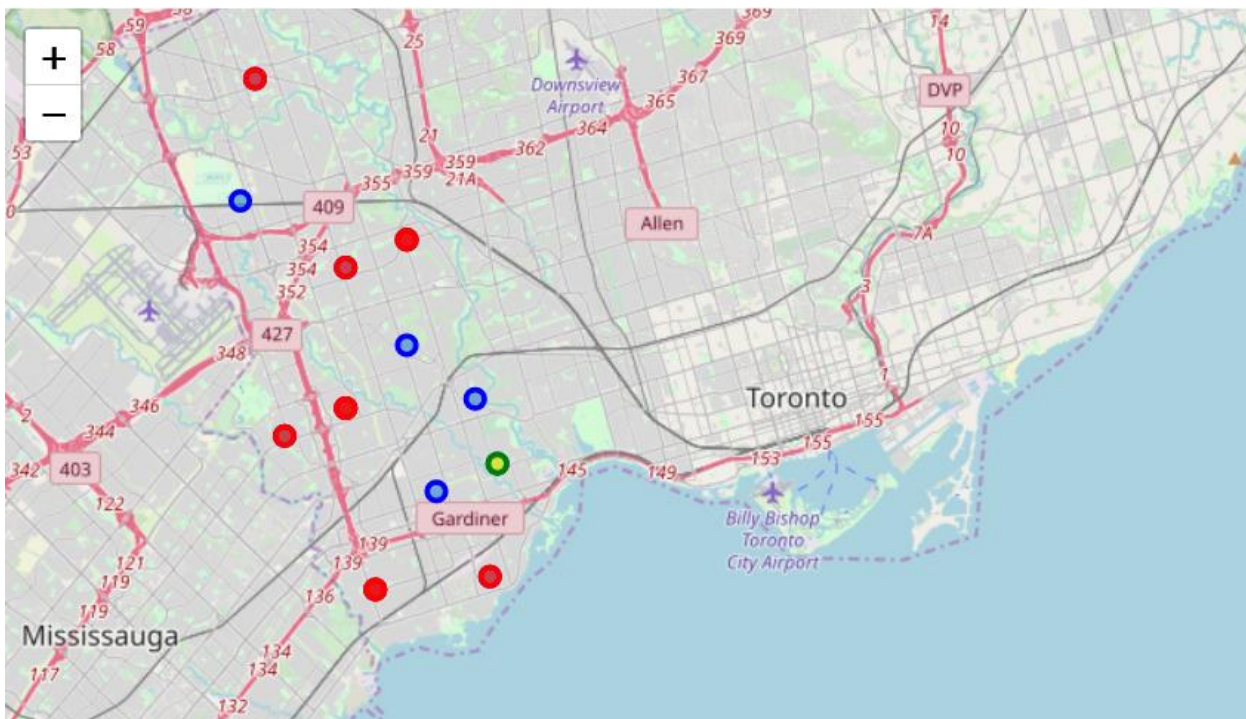
Figure 6. Pizza place venues distribution in Etobicoke neighborhoods.

4. Results & Discussion

Our analysis using Foursquare API shows the borough of Etobicoke has a total of 110 venues. out of these 110 venues 81 are unique venues and 54 are unique venue categories among the 12 grouped neighborhoods. Out of theses 12 neighborhoods, 7 of them have 10 pizza places among them. The following neighborhoods have 2 pizza places each:

- Cloverdale,Islington,Martin Grove,Princess Gardens,West Deane Park
- Westmount
- Alderwood,Long Branch

Out of 12 neighborhoods we narrowed our search to 5 neighborhoods with no venue categories labeled as pizza places. To further narrow our search, we clustered our neighborhoods using K-Means. The 5 neighborhoods were clustered into 2 distinct groups. The group labeled as cluster 1 included the following Etobicoke neighborhoods:

- Islington Avenue
- Kingsway Park South West,Mimico NW,The Queensway West,Royal York South
- NorthWest
- The Kingsway,Montgomery Road,Old Mill North

Analyzing the types of venue in the 5 neighborhoods reveals interesting insight. All the above neighborhoods that were clustered into one group have a common trait of an eatery such as a cafe, bar, Coffee Shop, Wing's Joint as common 3 top venues. The 5th neighborhood was clustered alone in

a group: Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea. The top 3 most common venue in this grouped neighborhood is a baseball field, park and locksmith business.

This suggests to potential entrepreneurs/ chefs that the neighborhood group of "Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea" would be an ideal location in Etobicoke to open a new pizza place as there are no other eateries in the immediate area to offer immediate direct competition. The type of venues in the area such as a baseball field and park are venues that create high foot traffic area and offer more opportunity for customers to visit the new pizza place.

The other 4 neighborhoods without a pizza place could potentially be new sites for a pizza place. But further analysis is needed to asses the level of competition from other eateries in the neighborhood, prior to making recommendation to interested business restaurateurs.

5. Conclusion

Purpose of this project was to identify the best neighborhood in Etobicoke to open a pizza place for potential entrepreneurs or chefs interested in opening a pizza restaurant. Etobicoke has many venues but only a handful of pizza places. Only 10 pizza places to be exact. An ideal neighborhood has zero to minimal competition from other eateries and surrounding venues should offer high foot traffic. Based on my analysis, the neighborhood group of "Humber Bay,King's Mill Park,Kingsway Park South East,Mimico NE,Old Mill South,The Queensway East,Royal York South East,Sunnylea" would be an ideal location in Etobicoke to open a new pizza place based on the aforementioned criteria. This would be my recommendation to potential entrepreneurs or chefs.