The Battle of Neighborhoods Final Report

1. Introduction

1.1 Background

Toronto is the most well-known city in Canada and also one of the most densely populated. This makes it a very promising location to start a new restaurant, as the returns on investment are lucrative. However, given the multitude of options and competitors, it is necessary to undertake adequate amounts of research to ensure that the investment is fruitful.

1.2 The Business Problem

The key business problem that persists while opening up a new restaurant is choosing the right neighborhood for the business venture. There are numerous benefits associated with selecting a good location, including greater customer footfall, more security, lower marketing costs, as well as a greater level of overall profitability. On the other hand, choosing a less favorable location may result in greater costs and lower profitability, even if the quality of the food and ambiance within the restaurant are excellent.

Researching neighborhood data in Toronto to understand the types of restaurants that exist will enable a budding restaurant entrepreneur to make the right decision in opening up her restaurant. This project will examine Foursquare venue and location data to find the entrepreneur's ideal location for the new restaurant. This project takes a look at the frequency of finding Japanese restaurants in Toronto. The criteria for setting up a new restaurant is that there needs to be a hotel and a park in the same neighborhood.

1.3 Audience and Interest

This research will be particularly valuable to new entrepreneurs who are seeking to open restaurants in Toronto. The objective is to pinpoint and recommend which neighborhood will be the best choice in Toronto and to rationalize why it is being recommended. Although this research project looks at Japanese restaurants, the findings will be useful to those setting up other restaurants as well. This project will also be of interest to others in the restaurant industry, such as those who are seeking to expand their business or those who aspire to relocate due to challenges in their existing location.

2. Data Sources

2.1 Data Acquisition and Cleaning

The data requirements for this project are taken from:

- Neighborhood information regarding the boroughs, neighborhoods, and postcodes will be scraped from Wikipedia and a dataframe will be created: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
- The geographical coordinates will be taken from a CSV file shared on this course http://cocl.us/Geospatial_data_
- The Foursquare API will be used to find information regarding various locations and venues.

The data required extensive cleaning and modification to curate the findings. Firstly, the Wikipedia data was scraped to find the boroughs in Toronto, and the BeautifulSoup package was then applied to transform it into a pandas dataframe for further analysis. This is a python package which is used for parsing XML and HTML documents, which creates a parse tree for pages which can then be used to extract data, and is hence very useful for scraping websites.

For the purpose of this research, it was unnecessary to use all the information available in the dataset, hence the dataset was narrowed down to include only the relevant information. The top ten rows of this dataframe, which has thirty-nine neighborhoods across seven boroughs is depicted below. The postal code, which is not highly relevant, was omitted, and Figure 2 shows the results of the top five rows of this further refined dataframe.

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M3A	North York	Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Regent Park , Harbourfront	43.654260	-79.360636
3	M6A	North York	Lawrence Manor , Lawrence Heights	43.718518	-79.464763
4	M7A	Queen's Park	Ontario Provincial Government	43.662301	-79.389494
5	M9A	Etobicoke	Islington Avenue	43.667856	-79.532242
6	M1B	Scarborough	Malvern , Rouge	43.806686	-79.194353
7	M3B	North York	Don Mills North	43.745906	-79.352188
8	M4B	East York	Parkview Hill , Woodbine Gardens	43.706397	-79.309937
9	M5B	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937
10	M6B	North York	Glencairn	43.709577	-79.445073

Fig 1: The first ten rows of the dataframe

	Borough	Neighborhood	Latitude	Longitude
0	Downtown Toronto	Regent Park , Harbourfront	43.654260	-79.360636
1	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937
2	Downtown Toronto	St. James Town	43.651494	-79.375418
3	East Toronto	The Beaches	43.676357	-79.293031
4	Downtown Toronto	Berczy Park	43.644771	-79.373306

Fig 2: Top five rows of cleaned dataframe

3. Methodology

3.1 Exploratory Data Analysis

Python's geopy and folium libraries were used to create a visual representation of the neighborhoods in Toronto. This is shown in Figure 3. The Foursquare API has been leveraged to provide information regarding the venues which are prevalent in each neighborhood. Toronto has 232 unique venue categories according to the Foursquare data, which were then inserted into a pandas dataframe.

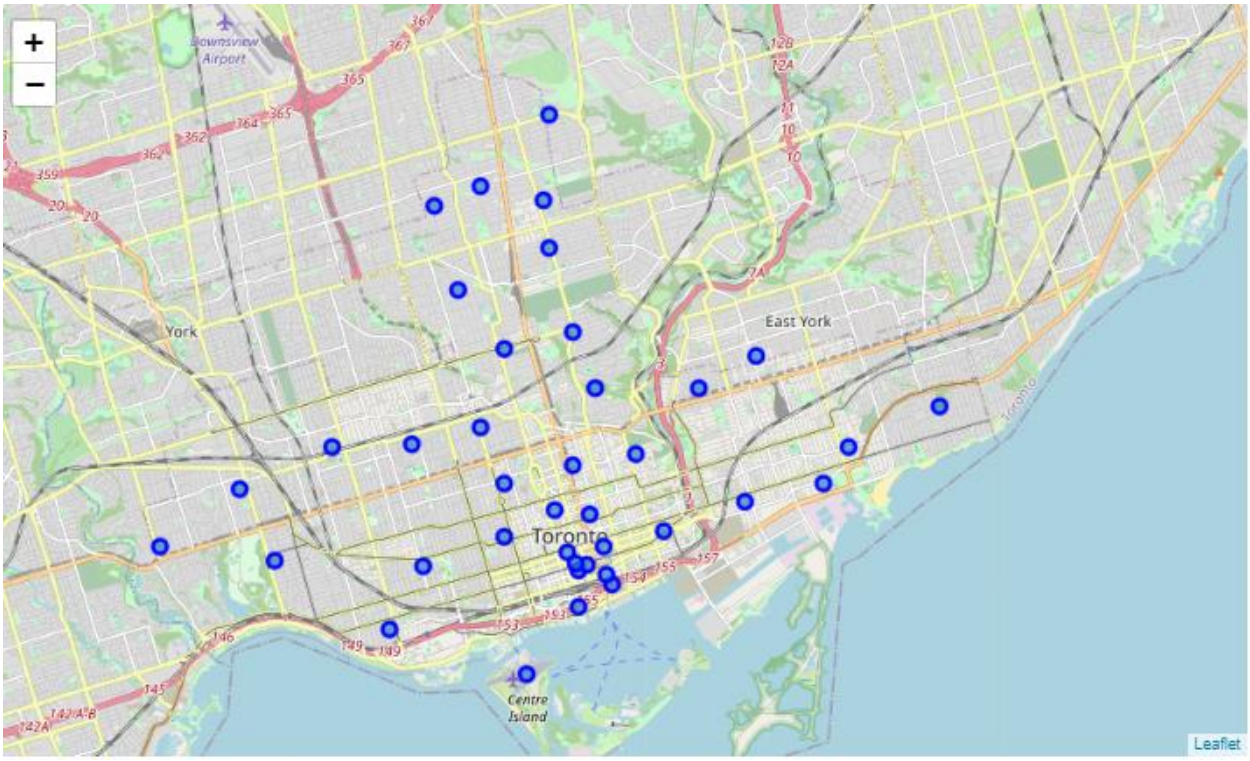

Fig 3: Map of Toronto showing the various neighborhoods.

4. Results

The most popular venues in each neighborhood were then determined, using another Python staple function, numpy. This is shown in Figure 5.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Berczy Park	Coffee Shop	Cocktail Bar	Cheese Shop	Seafood Restaurant	Bakery
1	Brockton , Parkdale Village , Exhibition Place	Café	Breakfast Spot	Coffee Shop	Gym	Intersection
2	CN Tower , King and Spadina , Railway Lands , ...	Airport Lounge	Airport Service	Bar	Harbor / Marina	Plane
3	Central Bay Street	Coffee Shop	Sandwich Place	Italian Restaurant	Café	Burger Joint
4	Christie	Grocery Store	Café	Park	Nightclub	Candy Store
5	Church and Wellesley	Japanese Restaurant	Sushi Restaurant	Coffee Shop	Restaurant	Hotel
6	Commerce Court , Victoria Hotel	Coffee Shop	Restaurant	Café	Hotel	Gym
7	Davisville	Sandwich Place	Dessert Shop	Pizza Place	Coffee Shop	Italian Restaurant
8	Davisville North	Gym	Hotel	Breakfast Spot	Food & Drink Shop	Sandwich Place
9	Dufferin , Dovercourt Village	Pharmacy	Bakery	Supermarket	Pet Store	Music Venue
10	Enclave of M4L	Light Rail Station	Yoga Studio	Auto Workshop	Park	Comic Shop
11	Enclave of M5E	Coffee Shop	Seafood Restaurant	Cocktail Bar	Restaurant	Beer Bar
12	First Canadian Place , Underground city	Coffee Shop	Café	Hotel	Restaurant	Japanese Restaurant
13	Forest Hill North & West	Park	Trail	Jewelry Store	Sushi Restaurant	Women's Store
14	Garden District, Ryerson	Coffee Shop	Clothing Store	Café	Middle Eastern Restaurant	Bubble Tea Shop
15	Harbourfront East , Union Station , Toronto Is...	Coffee Shop	Aquarium	Café	Hotel	Fried Chicken Joint
16	High Park , The Junction South	Mexican Restaurant	Café	Thai Restaurant	Fast Food Restaurant	Flea Market
17	India Bazaar , The Beaches West	Park	Fast Food Restaurant	Pizza Place	Gym	Food & Drink Shop
18	Kensington Market , Chinatown , Grange Park	Café	Coffee Shop	Mexican Restaurant	Vietnamese Restaurant	Vegetarian / Vegan Restaurant
19	Lawrence Park	Park	Construction & Landscaping	Swim School	Bus Line	Women's Store
20	Little Portugal , Trinity	Bar	Vietnamese Restaurant	Vegetarian / Vegan Restaurant	Restaurant	Café
21	Moore Park , Summerhill East	Restaurant	Trail	Department Store	Ethiopian Restaurant	Escape Room
22	North Toronto West	Clothing Store	Coffee Shop	Sporting Goods Shop	Fast Food Restaurant	Diner
23	Parkdale , Roncesvalles	Gift Shop	Breakfast Spot	Bookstore	Italian Restaurant	Bank
24	Regent Park , Harbourfront	Coffee Shop	Café	Park	Pub	Bakery
25	Richmond , Adelaide , King	Coffee Shop	Café	Restaurant	Gym	Clothing Store

26	Rosedale	Park	Playground	Trail	Women's Store	Dessert Shop
27	Roselawn	Home Service	Garden	Women's Store	Dessert Shop	Event Space
28	Runnymede , Swansea	Café	Restaurant	Pub	Pizza Place	Sushi Restaurant
29	St. James Town	Coffee Shop	Café	Clothing Store	Cosmetics Shop	Gastropub
30	St. James Town , Cabbagetown	Coffee Shop	Café	Bakery	Park	Italian Restaurant
31	Studio District	Coffee Shop	Brewery	Gastropub	Bakery	Café
32	Summerhill West , Rathnelly , South Hill , For...	Coffee Shop	Pub	American Restaurant	Sushi Restaurant	Light Rail Station
33	The Annex , North Midtown , Yorkville	Sandwich Place	Café	Coffee Shop	Burger Joint	Middle Eastern Restaurant
34	The Beaches	Health Food Store	Trail	Pub	Women's Store	Dessert Shop
35	The Danforth East	Park	Convenience Store	Women's Store	Diner	Event Space
36	The Danforth West , Riverdale	Greek Restaurant	Coffee Shop	Italian Restaurant	Ice Cream Shop	Furniture / Home Store
37	Toronto Dominion Centre , Design Exchange	Coffee Shop	Hotel	Café	Salad Place	Japanese Restaurant
38	University of Toronto , Harbord	Café	Bakery	Bar	Italian Restaurant	Japanese Restaurant

Figure 4: Most popular venues in each neighborhood in Toronto

To cluster the neighborhoods, the k-means clustering algorithm was utilized. This is an iterative form of clustering strives to divide *n* observations into *k* clusters, whereby each observation belongs to the cluster with the nearest mean. The k-means clustering of Toronto's neighborhoods are depicted in Figure 5.

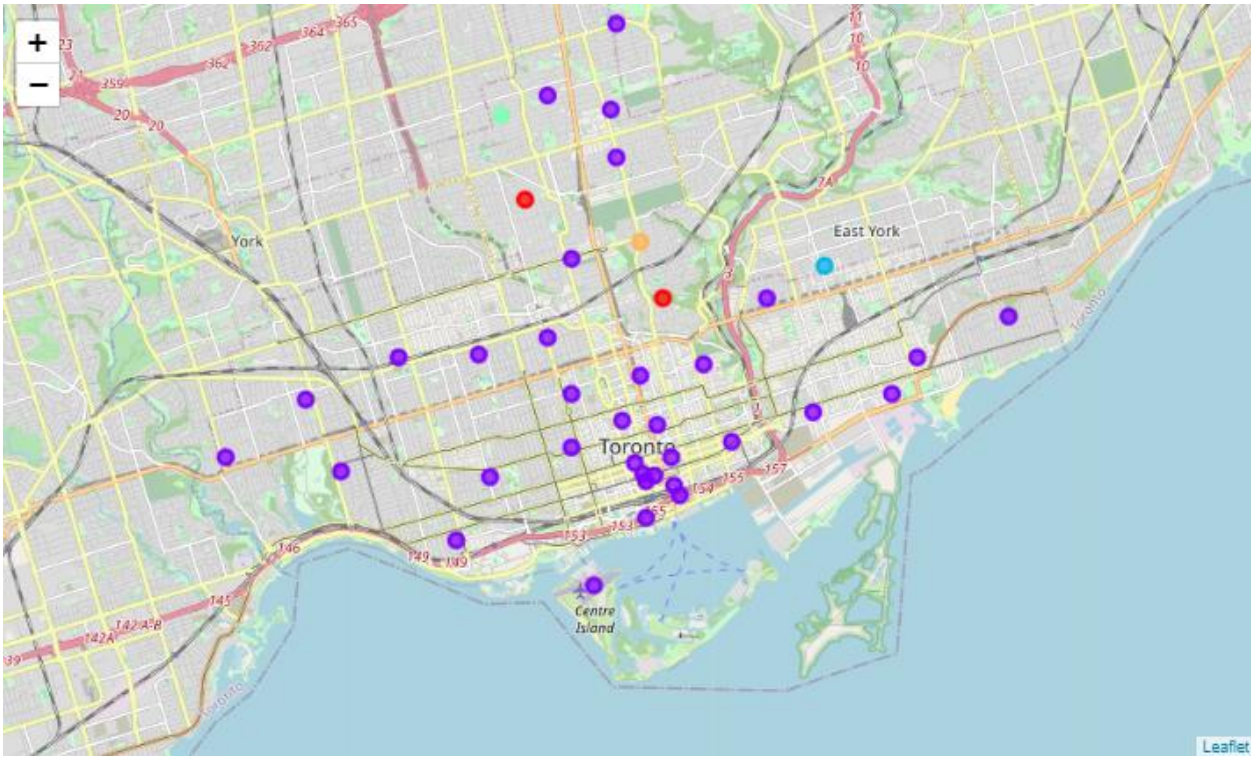

Fig 5: K-means cluster of Toronto neighborhoods

In order to decide where to open a new Japanese restaurant, it is imperative that we find the neighborhoods which already have one. For the purpose of this study, which was carried out with the impression that the restaurant to be opened is slightly upscale and trendy, it was ascertained that the neighborhood must also have a hotel and a park. The results from this are shown in Figure 6. After carrying out this analysis, it was arbitrarily decided that it would be nice to have a yoga studio in the neighborhood as well, and this is shown in Figure 7.

	Neighborhood	Japanese Restaurant	Hotel	Park
0	Berczy Park	0.016949	0.016949	0.016949
5	Church and Wellesley	0.068493	0.027397	0.013699
6	Commerce Court , Victoria Hotel	0.030000	0.060000	0.010000
11	Enclave of M5E	0.030928	0.030928	0.020619
14	Garden District, Ryerson	0.030000	0.020000	0.010000
15	Harbourfront East , Union Station , Toronto Is...	0.010000	0.040000	0.020000
25	Richmond , Adelaide , King	0.010753	0.021505	0.010753
29	St. James Town	0.012195	0.024390	0.024390

Figure 6: Neighborhoods with a Japanese restaurant, a hotel, and a park

	Neighborhood	Japanese Restaurant	Hotel	Park	Yoga Studio
0	Berczy Park	0.016949	0.016949	0.016949	0.000000
5	Church and Wellesley	0.068493	0.027397	0.013699	0.027397
6	Commerce Court , Victoria Hotel	0.030000	0.060000	0.010000	0.000000
11	Enclave of M5E	0.030928	0.030928	0.020619	0.010309
14	Garden District, Ryerson	0.030000	0.020000	0.010000	0.000000
15	Harbourfront East , Union Station , Toronto Is...	0.010000	0.040000	0.020000	0.000000
25	Richmond , Adelaide , King	0.010753	0.021505	0.010753	0.000000
29	St. James Town	0.012195	0.024390	0.024390	0.000000

Figure 7: Neighborhoods with a Japanese restaurant, a hotel, a park, and a yoga studio

5. Discussion

The above results showcase that the neighborhood of Church and Wellesley may be a safe choice to open a new Japanese restaurant as it already has a many Japanese restaurants in the area, and also has a hotel, park, and yoga studio nearby. However, there are seven other neighborhoods with hotels, parks, and yoga studios, which may be better choices, as there is a possibility that the neighborhood of Church and Wellesley is already too saturated. The existing restaurants may have an established clientele and a loyal consumer base, which may make it challenging for a new restaurant to gain popularity in that neighborhood. Given that there is a scope of starting the new restaurant in seven other neighborhoods, it may be fruitful to explore these other locations first.

6. Conclusion

This project examined neighborhood data for the city of Toronto to narrow down choices to open a new Japanese restaurant. The Foursquare API was utilized to obtain venue information, and various Python tools such as Numpy, Geopy, and Folium were used to visualize and clean the date to gather the information that is required. Further research can be undertaken, especially that with more specific objectives, in order to make a well-informed business decision.