

Identifying the Best Locations in the City of Toronto for a New Restaurant

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1. Introduction

Many people wish to have their own business. However, a lot of them believe that starting a business is a mysterious process and involves a lot of tough tasks. They pull back even before starting. In fact, starting a business is not that difficult if the person has done his or her homework of reading and planning. It does require time, money, efforts and patience but planning is a must.

Some people always wonder if this is a good time to start their business. The fact is there's really never a bad time to launch a business (Entrepreneur.com, 2020, a). Many entrepreneurs have difficulty in choosing what business to start and this makes sense because it is a heavy decision that could change the person's life. Maddie Shepherd marked six questions that should be answered to guide anyone who wants to start a business and does not know what to choose (Maddie, S., 2020). The questions are:

1. What Experience Do I Have?
2. What Am I Passionate About?
3. What Problem Can I Solve?
4. What Is My Lifestyle Preference?
5. How Much Capital Do I Have Access To?
6. What Ideas Can I Test Easily?

1.1. Restaurant Business

Restaurant business is one of the many bound-to-succeed businesses. This is due the increasing numbers of consumers who want to dine out or take prepared food home. Busy consumers do not have the time to cook. People want meals without dishes to wash. More and more singles, working parents and elderly people are demanding greater convenience when it comes to buying their meals (Entrepreneur.com, 2020, b).

The success of a restaurant business depends on many factors. First factor is understanding the restaurant business. A restaurant business, like any other business, needs experience and knowledge to run efficiently after considering all the factors. It requires a thorough research to understand all internal and external elements of the restaurant.

The second factor is good-quality food. The first intention of the restaurant is to serve food. If the food is not great at your restaurant, customers will not return no matter what you do. You do not need to re-invent the wheel and come up with the new food. You can deliver the same food as your competitors but make sure it tastes better.

The third factor is good customer service. Customer service constitutes the entire customer experience, right from the politeness and helpfulness of the staff, to the service—how soon the food arrives, the price of the dishes, restaurant ambiance, etc. Effective customer engagement also plays a vital role in improving the overall customer experience (posist.com, 2020).

The fourth factor is restaurant LOCATION. With a restaurant, location is everything. You need a spot that draws crowds, is easily accessible, and has the potential for growth. Of course, you need a location that fits within your budget too (Lisa, F., 2020). There are other factors that need thorough investigation before choosing a location. Some of these are:

- **Customer parking facilities.** The site should provide convenient, adequate parking as well as easy access for customers.
- **Accessibility to potential customers.** Consider how easy it will be for customers to get into your business.
- **Traffic density.** With careful examination of foot traffic, you can determine the approximate sales potential of each pedestrian passing a given location.
- **Proximity to other businesses.** Neighbouring businesses may influence your store's volume, and their presence can work for you or against you

The fifth success factor is staff satisfaction. A happy staff is a productive staff. If employees are not satisfied, their dissatisfaction is almost certain to be reflected in their work.

The sixth factor is Marketing. Marketing is one of the essential key elements of a successful restaurant business and it can be online or offline marketing.

Another success factor is a smart menu. A well-designed menu draws the attention of the customers to the high-profit items and boosts sales (posist.com, 2020).

1.2. Problem Statement

Choosing the best location for a new restaurant in the city of Toronto is a bit difficult. Toronto is Ontario's capital city, Canada's largest municipality and the fourth largest city in North America. The city is home to a large immigrant population, and is a national and international hub for finance, communications and cultural life (thecanadianencyclopedia.ca, 2020). Its population is 2,731,571 (2016 Census).

Due to its diversity in culture and tourism spots, and its large inhabitants, choosing just the right location for a restaurant is a tricky task.

1.3. Who Benefits from this Project

This project will provide a valuable information to entrepreneur who have decided to start a new restaurant in the city of Toronto. It will help them in deciding one of the most critical aspects of having a new restaurant which is restaurant location!

1.4. Aim and Objectives

The aim of this project is to identify and recommend the best locations in the city of Toronto to start a new restaurant. The project applies data science methods on Foursquare location data.

The project aim is divided into three objectives; importing and understanding Toronto neighbourhoods' data, analysing imported data, build the data science model.

2. Dataset

The project uses Foursquare location data. It also uses a Wikipedia web page that contains table of Toronto neighbourhoods and their postal codes. The Wikipedia web page is https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M. In addition to that, one more dataset is used which contains latitudes and longitudes of Toronto Neighbourhoods. This data is provided by IBM in a data science course they launched through Coursera.com (coursera.com, 2020).

Foursquare is “a location technology platform dedicated to improving how people move through the real world” (foursquare.com, 2020). This project utilises Foursquare location data and other type of data like ratings and comments of users.

The table that exists in the Wikipedia page contains three features: postal code, borough and neighbourhood (Table 1).

Table 1 Sample of Postal Codes of Toronto Neighbourhoods

Postal Code	Borough	Neighbourhood
M1A	Not assigned	Not assigned
M1B	Scarborough	Malvern, Rouge
M1C	Scarborough	Rouge Hill, Port Union, Highland Creek
M1E	Scarborough	Guildwood, Morningside, West Hill
M1G	Scarborough	Woburn

A sample of the latitude and longitude dataset is shown in Table 2.

Table 2 Sample of Latitude and Longitude Data

POSTAL CODE	LATITUDE	LONGITUDE
M1B	43.80669	-79.1944
M1C	43.78454	-79.1605
M1E	43.76357	-79.1887
M1G	43.77099	-79.2169
M1H	43.77314	-79.2395

3. Methodology

3.1. Exploratory Data Analysis

Web Page Scraping

One of the datasets used in this project is available in a web page as a table. The web page contains a list of postal codes in the city of Toronto, Canada. Figure 1 shows the content of the web page.

Postal Code	Borough	Neighbourhood
M1A	Not assigned	Not assigned
M2A	Not assigned	Not assigned
M3A	North York	Parkwoods
M4A	North York	Victoria Village
M5A	Downtown Toronto	Regent Park, Harbourfront
M6A	North York	Lawrence Manor, Lawrence Heights
M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government
M8A	Not assigned	Not assigned
M9A	Etobicoke	Islington Avenue, Humber Valley Village

Figure 1 Screenshot of A Wikipedia Web Page Containing List of Postal Codes of Toronto

The content of the web page is first read and stored in xml format. Then, the table is read from the xml parameter into a python list. After that, the list is converted into pandas dataframe. The next step was cleaning the dataframe. Examples of cleaning were removal of empty lines, removal of rows that contain empty postal codes after they are converted into Numpy.Nan, and removal of rows with 'Not Assigned' borough. The cleaned dataframe looks like the figure below (Table 3).

Table 3 Sample of Cleaned Postal Codes Table of the City of Toronto

	Postal Code	Borough	Neighbourhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Regent Park, Harbourfront
3	M6A	North York	Lawrence Manor, Lawrence Heights
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government

The cleaned dataframe is merged (using left merge) with the other dataframe that contains the latitude and longitude of Toronto postal codes. A sample of the merged dataframes is shown in Table 4.

Table 4 Sample of the Merged Dataframes

	Postal Code	Borough	Neighbourhood	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	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494

Foursquare Data

The neighbourhoods from the merged dataframe were used to extract venues' details from the Foursquare location database. These venues within 500 metres of each neighbourhood were collected and stored in a dataframe (Table 5).

Table 5 Sample of Toronto's Venues

	Neighbourhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Parkwoods	43.753259	-79.329656	Brookbanks Park	43.751976	-79.332140	Park
1	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop
2	Victoria Village	43.725882	-79.315572	Victoria Village Arena	43.723481	-79.315635	Hockey Arena
3	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant
4	Victoria Village	43.725882	-79.315572	Tim Hortons	43.725517	-79.313103	Coffee Shop

All venues that contains 'Restaurant' string in their category were replaced by Restaurant category name. Remaining venues were categorised as Non Restaurant.

3.2. Machine Learning

Before talking about what machine learning methods were used, it is good to mention the other statistics that were used. The venues above were categorised into two categories: restaurant and non-restaurant. Then, mean, count and maximum were used to arrive at the final dataframe. Table 6 presents a sample of this dataframe.

Table 6 Sample of Final Toronto Venues Dataframe

	Neighbourhood	Non Restaurant	Restaurant	Count
0	Agincourt	0.800000	0.200000	0.05
1	Alderwood, Long Branch	1.000000	0.000000	0.07
2	Bathurst Manor, Wilson Heights, Downsview North	0.809524	0.190476	0.21
3	Bayview Village	0.500000	0.500000	0.04
4	Bedford Park, Lawrence Manor East	0.590909	0.409091	0.22

Clustering machine learning algorithm was applied on the final dataframe. The purpose of clustering is to group similar neighbourhoods together. The criteria is percentage of restaurants located in that neighbourhood and the count of all venues. The idea behind this is that neighbourhoods with large number of venues indicate that this neighbourhood is a vibrant area and more people are expected to visit or live in this neighbourhood. But if this neighbourhood has a high percentage of restaurants, then having a new restaurant might not be a wise decision.

The clustering of neighbourhoods was done in trials with different number of clusters. The final one that was selected is the 4 clusters algorithm.

4. Results

There are 103 neighbourhoods in the city of Toronto as per the imported datasets. The data from Foursquare showed that there are 2139 venues in the neighbourhoods of Toronto.

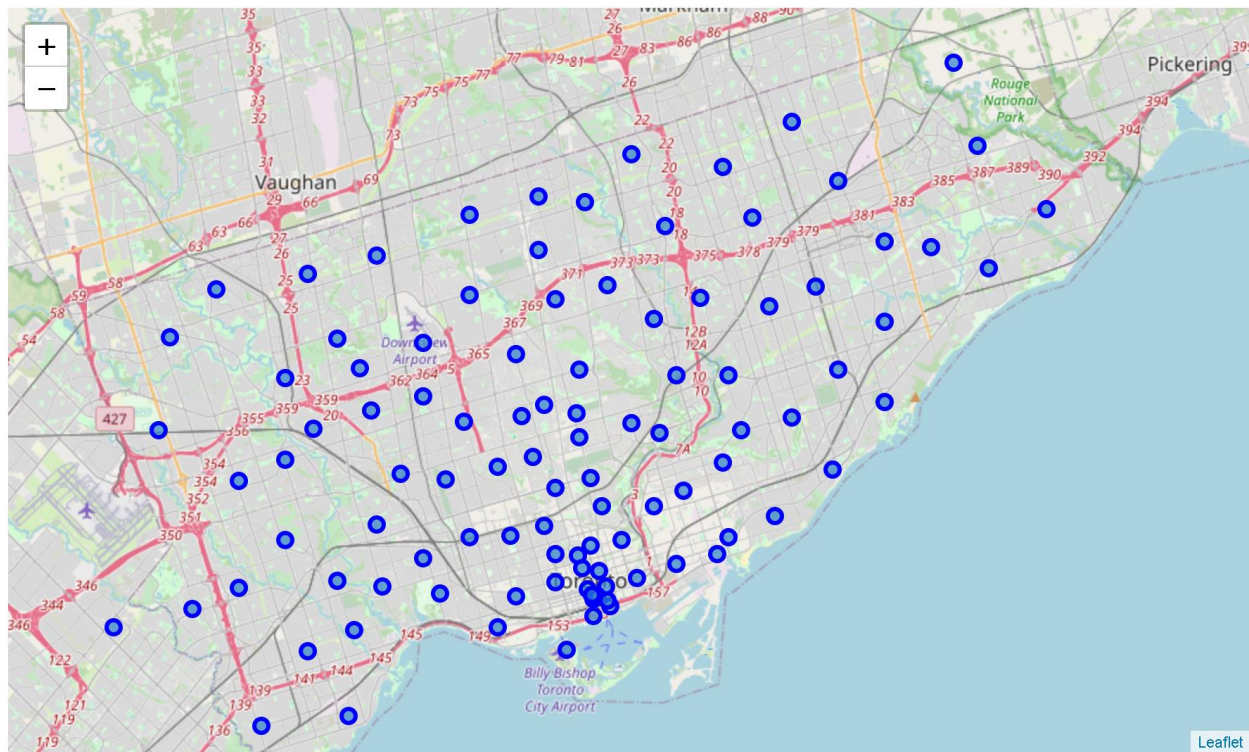


Figure 2 Map of the City of Toronto with its Neighbourhoods

After categorisation, the venues' dataframe looks as shown below in Table 7.

Table 7 Sample of the Final Venues' Dataframe

	Neighbourhood	Non Restaurant	Restaurant	Count
0	Agincourt	0.800000	0.200000	0.05
1	Alderwood, Long Branch	1.000000	0.000000	0.07
2	Bathurst Manor, Wilson Heights, Downsview North	0.809524	0.190476	0.21
3	Bayview Village	0.500000	0.500000	0.04
4	Bedford Park, Lawrence Manor East	0.590909	0.409091	0.22

The dataframe has four columns: Neighbourhood, Non Restaurant, Restaurant, and Count. The Restaurant and Non Restaurant columns contain ratios of restaurant and non-restaurant types venues to all venues in that neighbourhood, respectively.

A sample of the result of clustering is presented in Table 8. There are total of different clusters.

Table 8 Sample of Clustered Neighbourhoods

	Postal Code	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
0	M3A	North York	Parkwoods	43.753259	-79.329656	1.0	1.000000	0.000000	0.02
1	M4A	North York	Victoria Village	43.725882	-79.315572	0.0	0.800000	0.200000	0.05
2	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636	1.0	0.931818	0.068182	0.44
3	M6A	North York	Lawrence Manor, Lawrence Heights	43.718518	-79.464763	1.0	0.923077	0.076923	0.13
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494	0.0	0.818182	0.181818	0.33

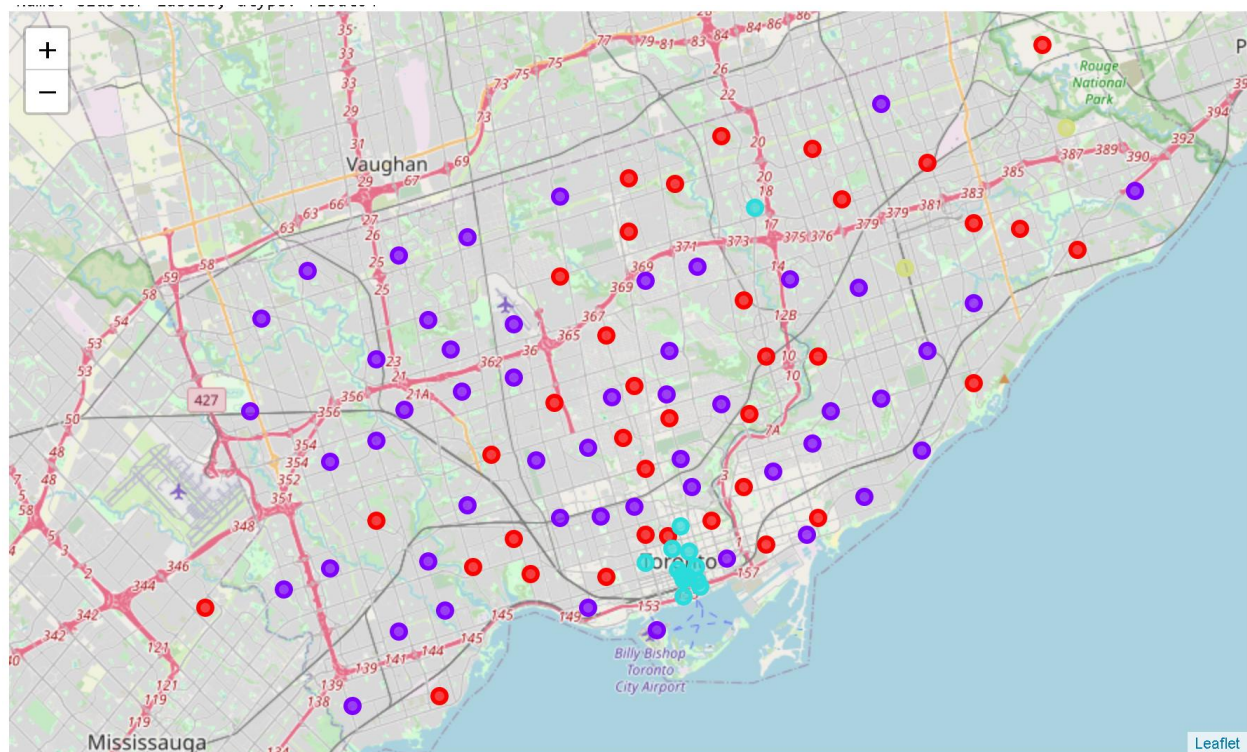


Figure 3 Toronto's Map Showing Clustered Neighbourhoods

Cluster 1

This cluster consist of 34 neighbourhoods. Table 9 shows a sample of these neighbourhoods. These clusters are those that have low number of venues.

Table 9 Sample of Cluster 1 Neighbourhoods

	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
1	North York	Victoria Village	43.725882	-79.315572	0.0	0.800000	0.200000	0.05
4	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494	0.0	0.818182	0.181818	0.33
7	North York	Don Mills	43.745906	-79.352188	0.0	0.652174	0.347826	0.23
10	North York	Glencairn	43.709577	-79.445073	0.0	0.800000	0.200000	0.05
13	North York	Don Mills	43.725900	-79.340923	0.0	0.652174	0.347826	0.23

Cluster 2

This cluster consist of 51 neighbourhoods. Table 10 shows a sample of these neighbourhoods. The properties of these neighbourhoods is that they have the lowest ratio of restaurants but low number of venues.

Table 10 Sample of Cluster 2 Neighbourhoods

(51, 8)

	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
0	North York	Parkwoods	43.753259	-79.329656	1.0	1.000000	0.000000	0.02
2	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636	1.0	0.931818	0.068182	0.44
3	North York	Lawrence Manor, Lawrence Heights	43.718518	-79.464763	1.0	0.923077	0.076923	0.13
8	East York	Parkview Hill, Woodbine Gardens	43.706397	-79.309937	1.0	1.000000	0.000000	0.11
11	Etobicoke	West Deane Park, Princess Gardens, Martin Grov...	43.650943	-79.554724	1.0	1.000000	0.000000	0.01

Cluster 3

This cluster consist of 13 neighbourhoods. Table 11 shows a sample of these neighbourhoods. These neighbourhoods have the highest number of venues and with relatively low number of restaurant ratio.

Table 11 Sample of Cluster 3 Neighbourhoods

(13, 8)

	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
9	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937	2.0	0.790000	0.210000	1.00
15	Downtown Toronto	St. James Town	43.651494	-79.375418	2.0	0.717647	0.282353	0.85
20	Downtown Toronto	Berczy Park	43.644771	-79.373306	2.0	0.763636	0.236364	0.55
24	Downtown Toronto	Central Bay Street	43.657952	-79.387383	2.0	0.705882	0.294118	0.68
30	Downtown Toronto	Richmond, Adelaide, King	43.650571	-79.384568	2.0	0.770000	0.230000	1.00

Cluster 4

This cluster consist of 13 neighbourhoods. Table 12 shows a sample of these neighbourhoods. These neighbourhoods have low number of venues and most or all of these venues are restaurants.

Table 12 Cluster 4 Neighbourhoods

(2, 8)

	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
6	Scarborough	Malvern, Rouge	43.806686	-79.194353	3.0	0.0	1.0	0.01
65	Scarborough	Dorset Park, Wexford Heights, Scarborough Town...	43.757410	-79.273304	3.0	0.2	0.8	0.05

5. Discussion of Results

As clearly shown in the results section, most of the neighbourhoods have low to moderate number of venues and very low ratio of restaurants. These neighbourhoods are scattered all over Toronto boroughs. Such neighbourhoods are not ideal for having a new restaurant due to their low number of residents indicated by the low number of venues. These are cluster 2 neighbourhoods.

On the other hand, cluster 4 contains the lowest number of neighbourhoods (only 2). They are the last neighbourhoods to be considered for a new restaurant because they have very low number of venues and most or all of these venues are actually restaurants.

Cluster 1 is the second largest group and it represents neighbourhoods that have low number of venues and moderate restaurants ratio.

Cluster 3, having large number of venues and with relatively low number of restaurant, represents the best neighbourhoods to start a new restaurant. It contains 13 neighbourhoods and most of them are in Downtown Toronto borough. These neighbourhoods are expected to have large number of visitors or residents but they still have room for a new restaurant.

Further analysis on cluster 3 shows that the best neighbourhood is 'Harbourfront East, Union Station, Toronto Islands' neighbourhood. It has the lowest ratio of restaurants compared to similar neighbourhoods that have very high number of venues.

Table 13 Organised Cluster 3 Neighbourhoods

	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	Non Restaurant	Restaurant	Count
36	Downtown Toronto	Harbourfront East, Union Station, Toronto Islands	43.640816	-79.381752	2.0	0.870000	0.130000	1.00
9	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937	2.0	0.790000	0.210000	1.00
30	Downtown Toronto	Richmond, Adelaide, King	43.650571	-79.384568	2.0	0.770000	0.230000	1.00
42	Downtown Toronto	Toronto Dominion Centre, Design Exchange	43.647177	-79.381576	2.0	0.740000	0.260000	1.00
97	Downtown Toronto	First Canadian Place, Underground city	43.648429	-79.382280	2.0	0.710000	0.290000	1.00
48	Downtown Toronto	Commerce Court, Victoria Hotel	43.648198	-79.379817	2.0	0.690000	0.310000	1.00
92	Downtown Toronto	Stn A PO Boxes	43.646435	-79.374846	2.0	0.770833	0.229167	0.96
15	Downtown Toronto	St. James Town	43.651494	-79.375418	2.0	0.717647	0.282353	0.85
99	Downtown Toronto	Church and Wellesley	43.665860	-79.383160	2.0	0.680000	0.320000	0.75
84	Downtown Toronto	Kensington Market, Chinatown, Grange Park	43.653206	-79.400049	2.0	0.716216	0.283784	0.74
33	North York	Fairview, Henry Farm, Oriole	43.778517	-79.346556	2.0	0.814286	0.185714	0.70
24	Downtown Toronto	Central Bay Street	43.657952	-79.387383	2.0	0.705882	0.294118	0.68
20	Downtown Toronto	Berczy Park	43.644771	-79.373306	2.0	0.763636	0.236364	0.55

6. Conclusion and Future Work

The purpose of this project was to find the best neighbourhood(s) in the city of Toronto to start a new restaurant. The result of this study is beneficial to entrepreneurs who are planning to start a new restaurant business in Toronto as it pinpoints the ideal location for their business. The project shows that the best neighbourhood in Toronto is located in Downtown Toronto borough. It is '**Harbourfront East, Union Station, Toronto Islands**' neighbourhood. What makes ideal for a new restaurant is its buzzing area which have huge number of visitors. The other important trait is that it has relatively low ratio of standing restaurants.

This work could be further extended and improved by incorporating more features like user rating of the venues. This features brings more insights about the surrounding venues. Even if the area has large number of venues, that alone does not mean the area is good for starting a new business. It is good to check how satisfied the users are with these venues. As they say, successful work brings more success!

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