BATTLE OF NEIGHBOURHOODS

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1. Introduction

1.1 Background

A chain of restaurant owners in Ontario, Canada want to expand their business in other cities. Currently they have their restaurants open in cities like Ottawa, Brampton and Hamilton. They figured out that they would make much more profit by opening up a restaurant in Toronto as Toronto is the largest city of Canada and has large population density. So they want to open up a new restaurant some place nice with good neighbourhood in Toronto.

1.2 Problem

As Toronto is a very large city, they are having trouble figuring out which place to choose within Toronto for their new restaurant. We have to help them figure out which place to choose where their business will be good, they have less competition and nice people live around. They want to know about 3-4 such places so that they can decide for themselves which one is the best for them according to the type of their restaurant.

1.3 Interest

Obviously, people in the business of restaurant chains, hotels, etc. who are willing to expand their business in new cities would be very interested in my project for competitive advantage and business values. Others who are new to this business and want to set up their business in a new city might also be interested.

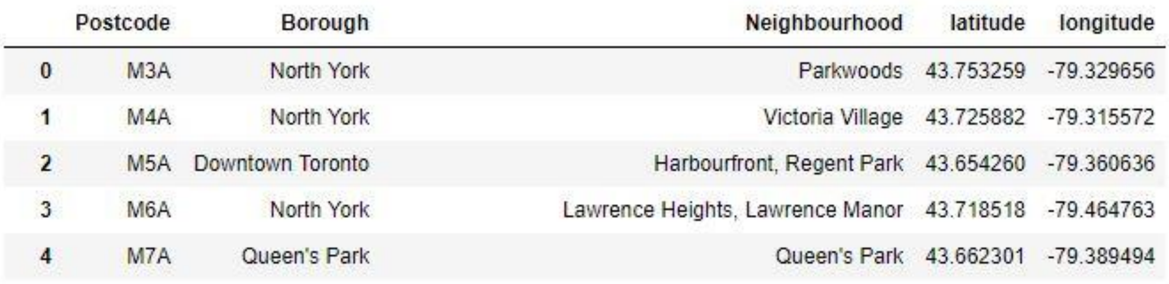
2. Data Acquisition and cleaning

2.1 Data Sources

There were two main datasets that were used for this project.

First Dataset: List of all the neighbourhoods in Toronto

Firstly, I used data from a Wikipedia page which provides information about all the neighbourhoods of Toronto, Canada. Then I used a web scrapping tool named BeautifulSoup for extracting the data in the form of a csv table from this Wikipedia page. This table consisted of 3 columns: Postal Code, Borough and Neighbourhood. The link for this Wikipedia page: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M . After importing this table into a data frame, pre-processing this data frame and adding two more columns of Latitude and Longitude of each Neighbourhood, this data frame was ready for use. Final data frame will have 5 columns: Postal Code, Borough, Neighbourhood, Latitude, Longitude. And it will contain 103 rows having 103 unique neighbourhoods of Toronto and 11 unique Boroughs. For example, below photo depicts first 5 rows of the dataset:



	Postcode	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	Harbourfront, Regent Park	43.654260	-79.360636
3	M6A	North York	Lawrence Heights, Lawrence Manor	43.718518	-79.464763
4	M7A	Queen's Park	Queen's Park	43.662301	-79.389494

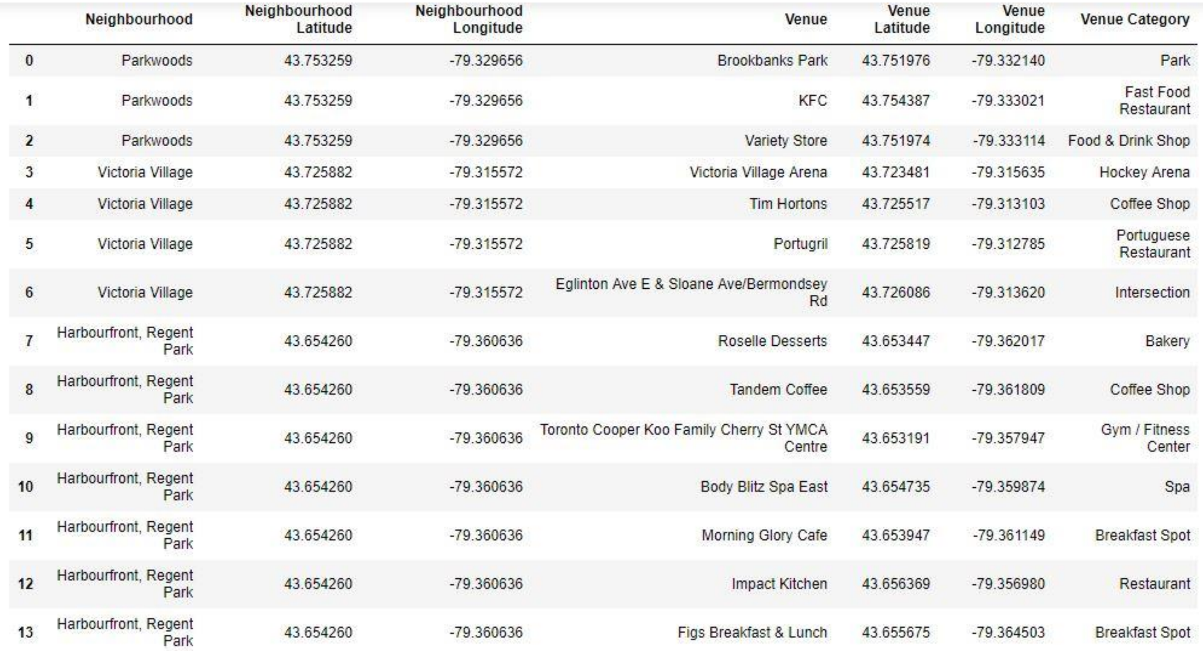
Second Dataset: List of different venues in the neighbourhoods of Toronto:

This dataset will be formed using the Foursquare API. Foursquare is a website that provides any information about a particular venue. I used the Foursquare location data to explore different venues in each neighbourhood of Toronto.

These venues can be any place. For example: Parks, Coffee Shops, Hotels, Gyms, etc.

Using the Foursquare location data, information about these venues can be taken and the neighbourhoods of Toronto can be easily analysed based on this information.

I will use the geographical coordinates from above dataset to generate this Location dataset. This dataset is named **toronto_venues.**



	Neighbourhood	Neighbourhood Latitude	Neighbourhood 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	KFC	43.754387	-79.333021	Fast Food Restaurant
2	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop
3	Victoria Village	43.725882	-79.315572	Victoria Village Arena	43.723481	-79.315635	Hockey Arena
4	Victoria Village	43.725882	-79.315572	Tim Hortons	43.725517	-79.313103	Coffee Shop
5	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant
6	Victoria Village	43.725882	-79.315572	Eglinton Ave E & Sloane Ave/Bermondsey Rd	43.726086	-79.313620	Intersection
7	Harbourfront, Regent Park	43.654260	-79.360636	Roselle Desserts	43.653447	-79.362017	Bakery
8	Harbourfront, Regent Park	43.654260	-79.360636	Tandem Coffee	43.653559	-79.361809	Coffee Shop
9	Harbourfront, Regent Park	43.654260	-79.360636	Toronto Cooper Koo Family Cherry St YMCA Centre	43.653191	-79.357947	Gym / Fitness Center
10	Harbourfront, Regent Park	43.654260	-79.360636	Body Blitz Spa East	43.654735	-79.359874	Spa
11	Harbourfront, Regent Park	43.654260	-79.360636	Morning Glory Cafe	43.653947	-79.361149	Breakfast Spot
12	Harbourfront, Regent Park	43.654260	-79.360636	Impact Kitchen	43.656369	-79.356980	Restaurant
13	Harbourfront, Regent Park	43.654260	-79.360636	Figs Breakfast & Lunch	43.655675	-79.364503	Breakfast Spot

For example, the neighbourhood named Parkwoods in Toronto contains 3 nearby venues depicted by first 3 rows of above dataset. Information about these venues is also provided in this dataset.

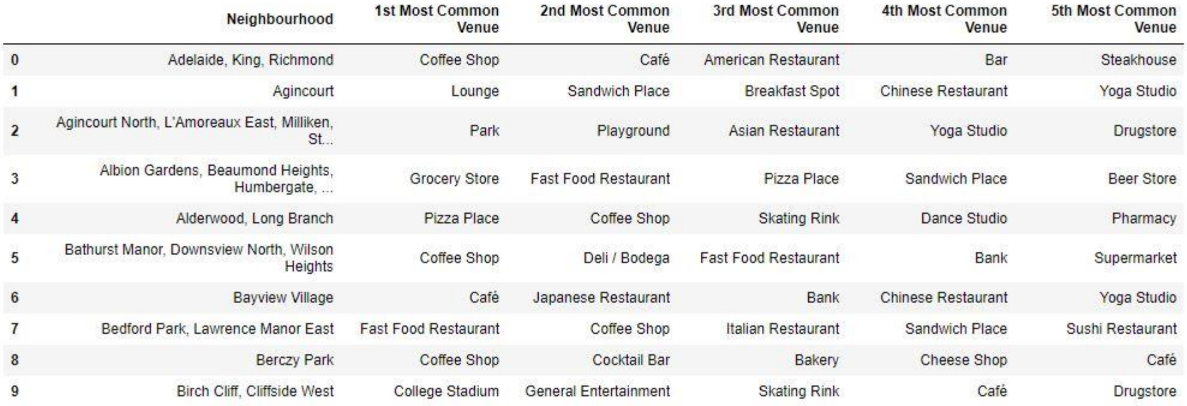
2.2 Data Pre-processing

After the 2 datasets were obtained, pre-processing of the second dataset was needed so that it can be used for clustering algorithm easily. I pre-processed **toronto_venues** data frame using **one-hot encoding** tool. The pre-processed data was stored in a data frame named **toronto_onehot**.

Now, we have a dataset named **toronto_onehot** that is pre-processed and through one-hot encoding, it is ready to be used for clustering technique. But this dataset contains information about all the nearby venues like Park, Gym, Shops, etc. which is not necessary. As we are only interested in venues in 'food' category, therefore venues like Park, Gym, Playground are discarded from the **toronto_onehot** data frame.

Also we are looking for only those venues that are proper restaurants. Hence venues such as coffee shops, pizza places, bakeries etc. are not direct competitors of the restaurant business, so we don't care about those. Hence we will include in our list only venues that have 'restaurant' in category name, and we'll make sure to detect and include all the subcategories of different restaurants in the neighbourhood. For example, Afghan restaurant, Italian restaurant, etc. For this, we locate venues from **toronto_onehot** data frame that are restaurants only and store this in a new data frame named **toronto_restaurants**. This new data frame will now be used for clustering algorithm.

Also, a data frame named **venues_sorted** was also created which listed all the neighbourhoods of Toronto along with their respective 5 most common venues. This dataset would eventually help in visualising the solution. First 10 rows of this data frame is depicted in figure below:



	Neighbourhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Adelaide, King, Richmond	Coffee Shop	Café	American Restaurant	Bar	Steakhouse
1	Agincourt	Lounge	Sandwich Place	Breakfast Spot	Chinese Restaurant	Yoga Studio
2	Agincourt North, L'Amoreaux East, Milliken, St...	Park	Playground	Asian Restaurant	Yoga Studio	Drugstore
3	Albion Gardens, Beaumond Heights, Humbergate, ...	Grocery Store	Fast Food Restaurant	Pizza Place	Sandwich Place	Beer Store
4	Alderwood, Long Branch	Pizza Place	Coffee Shop	Skating Rink	Dance Studio	Pharmacy
5	Bathurst Manor, Downsview North, Wilson Heights	Coffee Shop	Deli / Bodega	Fast Food Restaurant	Bank	Supermarket
6	Bayview Village	Café	Japanese Restaurant	Bank	Chinese Restaurant	Yoga Studio
7	Bedford Park, Lawrence Manor East	Fast Food Restaurant	Coffee Shop	Italian Restaurant	Sandwich Place	Sushi Restaurant
8	Berczy Park	Coffee Shop	Cocktail Bar	Bakery	Cheese Shop	Café
9	Birch Cliff, Cliffside West	College Stadium	General Entertainment	Skating Rink	Café	Drugstore