

# Part\_1\_The\_Battle\_of\_Neighborhoods

March 14, 2020

## 1 Final Capstone Project

### 1.1 Introduction

Vegetarians and vegans now account for nearly 10 per cent of Canada's population, and their increased presence is forcing the restaurant and meat production industries to consider new approaches.

According to research from Dalhousie University, there are 2.3 million vegetarians in Canada, up from 900,000 15 years ago. Another 850,000 people consider themselves vegan. Those two numbers add up to 9.4 per cent of the Canadian population. The interested readers could refer to the link below:

<https://www.ctvnews.ca/canada/more-than-3-million-canadians-vegetarian-or-vegan-study-1.4027606>

Since the most populated city in Canada is Toronto. It is home to 5,429,524 people. Toronto is the capital of Ontario and located in the east-central region of the country. Nearly half of the population is made up of foreign-born residents. After Miami in the US, this is the second largest percentage of foreign-born residents in the world. Interestingly, no nationality holds the dominant position, making Toronto the most diverse city in the world. Therefore we are going to explore Toronto for our business prospects. The interested readers could refer to the link below:

<https://www.worldatlas.com/articles/biggest-cities-in-canada.html>

### 1.2 Business Problem and Interested Community

With increasing number of people turning vegetarian and vegan, there is a good scope of opening the Vegetarian/Vegan Restaurant. Based on this we define the following:

**Problem:** The aim of this project is to explore the possibility of opening Fruit & Vegetable Stores near Vegetarian/Vegan Restaurants in Canada.

**Interested Community:** Food Business Industry

1. The results of this project could be of interest to the investors who want to invest in a Food Business.
2. Since the vegetarian/vegan restaurants would provide good retail opportunities for Fruit & Vegetable Store. Therefore, the results could be of interest to the investors who want to invest in these stores.

## 1.3 Data Sources

### 1.3.1 Toronto neighborhood data:

**Data Source:** [https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)

**Description:** For the Toronto neighborhood data, a Wikipedia page exists that has all the information we need to explore and cluster the neighborhoods in Toronto.

### 1.3.2 Vegetarian/Vegan restaurants in each neighborhood of Toronto.

**Data source:** Foursquare API <https://foursquare.com/>

**Description:** By using this API we will get all the venues in each neighborhood. We can filter these venues to get explore the possibilities of opening Vegetarian/Vegan restaurants.

### 1.3.3 Geospatial Coordinates

**Data source:** [http://cocl.us/Geospatial\\_data](http://cocl.us/Geospatial_data)

**Description:** To utilize the Foursquare location data, we will get the latitude and the longitude coordinates of each neighbourhood.

```
[1]: import numpy as np # library to handle data in a vectorized manner
from bs4 import BeautifulSoup
import pandas as pd # library for data analysis
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json # library to handle JSON files

#!conda install -c conda-forge geopy --yes # uncomment this line if you haven't
    ↳ completed the Foursquare API lab
from geopy.geocoders import Nominatim # convert an address into latitude and
    ↳ longitude values

import requests # library to handle requests
from pandas.io.json import json_normalize # transform JSON file into a pandas
    ↳ dataframe

# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.colors as colors
import matplotlib.pyplot as plt
```

```
# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you
↳ haven't completed the Foursquare API lab
import folium # map rendering library

print('Libraries imported.')
```

Libraries imported.

## 1.4 1. Download and Explore Dataset

We will begin with defining the function that will provide us the parsed dataframe.

```
[2]: def parseData(url_param):
    url= url_param
    website_url=requests.get(url).text

    soup = BeautifulSoup(website_url,'lxml')
    M_table = soup.find('table',{'class':'wikitable sortable'})
    headers= [header.text for header in M_table.find_all('th')]
    headers[-1] = headers[-1].strip() # obtain the dataframe columns

    rows = []
    for row in M_table.find_all('tr'):
        rows.append([val.text.encode('utf8').strip().decode("utf-8") for val in
↳ row.find_all('td')])
        dataframe = pd.DataFrame(rows[1:], columns=headers) # Remove the None
↳ row, can be seen by selecting all rows

    return dataframe
```

Pass the url as an argument that we want to Parse

```
[3]: url= 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'
df = parseData(url)
df.head()
```

```
[3]:
```

	Postcode	Borough	Neighbourhood
0	M1A	Not assigned	Not assigned
1	M2A	Not assigned	Not assigned
2	M3A	North York	Parkwoods
3	M4A	North York	Victoria Village
4	M5A	Downtown Toronto	Harbourfront

Since there are Not assigned entries, data will require further processing and cleaning

## 2 2. Data Preprocessing

In this Section, we will build a dataframe of the postal code of each neighbourhood along with the borough name and neighbourhood name.

1. Removing the entries of Borough which is not assigned.
2. Assigning the neighborhood as a borough, where neighborhood is Not assigned

```
[4]: df['Borough'] = df['Borough'].replace('Not assigned', float('nan'))
if df['Borough'] is not None:
    df['Neighbourhood'] = df['Neighbourhood'].replace('Not assigned',
    ↪df['Borough'])

df=df.dropna()
print(df.shape)
df.head() # Check all the Not assigned entries are removed
```

(210, 3)

```
[4]:   Postcode      Borough      Neighbourhood
2      M3A      North York      Parkwoods
3      M4A      North York  Victoria Village
4      M5A  Downtown Toronto      Harbourfront
5      M6A      North York  Lawrence Heights
6      M6A      North York  Lawrence Manor
```

### 2.0.1 3. Grouping by Postcode to remove duplicate entries

Additional step: group by Borough for understanding postal code distribution, makes things easier in Part 2 and clustering

```
[5]: df1=df.groupby(['Postcode','Borough'])['Neighbourhood'].unique()
df_uq=df1.to_frame().reset_index()
df_uq['Neighbourhood']= df_uq['Neighbourhood'].transform(lambda x: ', '.join(x))

df_uq.head()
```

```
[5]:   Postcode      Borough      Neighbourhood
0      M1B  Scarborough      Rouge, Malvern
1      M1C  Scarborough  Highland Creek, Rouge Hill, Port Union
2      M1E  Scarborough      Guildwood, Morningside, West Hill
3      M1G  Scarborough      Woburn
4      M1H  Scarborough      Cedarbrae
```

## 2.0.2 4. Shape of final dataset

```
[6]: df_uq.shape
```

```
[6]: (103, 3)
```

Now in this Section, in order to utilize the Foursquare location data, we will get the latitude and the longitude coordinates of each neighbourhood.

## 2.0.3 5. Geospatial Coordinates

```
[7]: url = 'http://cocl.us/Geospatial_data'
df_geo=pd.read_csv(url)

#!wget -q http://cocl.us/Geospatial_data

#df_geo=pd.read_csv('Geospatial_Coordinates.csv')

print(df_geo.shape) #to check if the spatial coordinates matches our output
↳ datashape
print(df_geo.head())
```

```
(103, 3)
```

	Postal Code	Latitude	Longitude
0	M1B	43.806686	-79.194353
1	M1C	43.784535	-79.160497
2	M1E	43.763573	-79.188711
3	M1G	43.770992	-79.216917
4	M1H	43.773136	-79.239476

```
[8]: if df_uq['Postcode'].equals(df_geo['Postal Code']): # Cross check if both
↳ df_geo and df_uq are equal
    df_uq['Latitude']=df_geo['Latitude']
    df_uq['Longitude']=df_geo['Longitude']

df_uq.head()
```

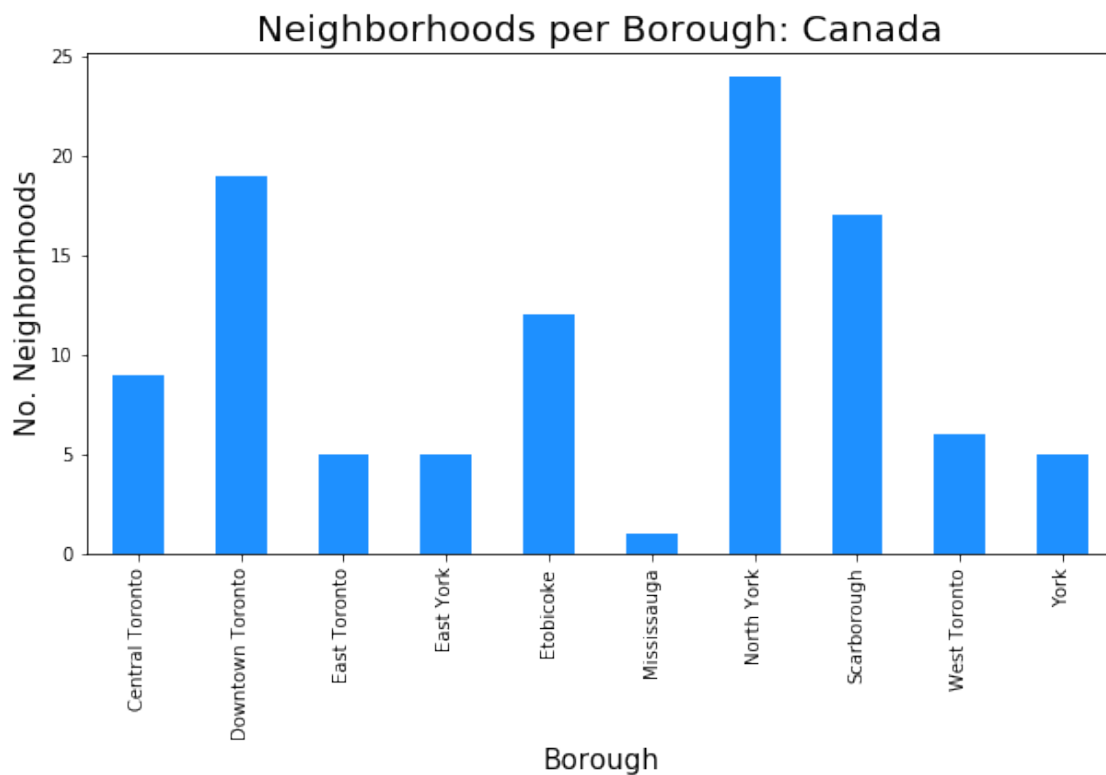
```
[8]: Postcode      Borough      Neighbourhood  Latitude \
0      M1B  Scarborough      Rouge, Malvern  43.806686
1      M1C  Scarborough  Highland Creek, Rouge Hill, Port Union  43.784535
2      M1E  Scarborough      Guildwood, Morningside, West Hill  43.763573
3      M1G  Scarborough      Woburn  43.770992
4      M1H  Scarborough      Cedarbrae  43.773136
```

```
Longitude
0 -79.194353
1 -79.160497
2 -79.188711
3 -79.216917
4 -79.239476
```

### 3. Exploratory data analysis

3.1 1. In this section we will justify if it make sense to choose Toronto as a place for opening Restaurant

```
[9]: clr = "dodgerblue"
df_uq.groupby('Borough')['Neighbourhood'].count().plot.bar(figsize=(10,5),
    color=clr)
plt.title('Neighborhoods per Borough: Canada', fontsize = 20)
plt.xlabel('Borough', fontsize = 15)
plt.ylabel('No. Neighborhoods', fontsize = 15)
plt.xticks(rotation = 90)
plt.show()
```



As can be seen in the above Graph, if we combine different Borough of 'Toronto', the number of neighbors are going to be highest. Now, we will explore and cluster the neighbourhood in Toronto

We have built a dataframe of the postal code of each neighbourhood along with the borough name and neighbourhood name.

In order to utilize the Foursquare location data, we have got the latitude and the longitude coordinates of each neighbourhood for Toronto.

### 1. Filter the boroughs that contain the word Toronto

```
[10]: tr_df=df_uq[df_uq['Borough'].str.contains('Toronto')]

tr_df.reset_index(drop=True, inplace=True)
print(tr_df.shape)

tr_df.head()
```

(39, 5)

```
[10]:
```

	Postcode	Borough	Neighbourhood	Latitude	Longitude
0	M4E	East Toronto	The Beaches	43.676357	-79.293031
1	M4K	East Toronto	The Danforth West, Riverdale	43.679557	-79.352188
2	M4L	East Toronto	The Beaches West, India Bazaar	43.668999	-79.315572
3	M4M	East Toronto	Studio District	43.659526	-79.340923
4	M4N	Central Toronto	Lawrence Park	43.728020	-79.388790

**2. Use geopy library to get the latitude and longitude values of Toronto.** Note :This step is optional to see how geopy works. Latitude and longitude can be obtained from the df\_tr in the above step

In order to define an instance of the geocoder, we need to define a user\_agent. We will name our agent tr\_explorer, as shown below.

```
[11]: address = 'Toronto'

geolocator = Nominatim(user_agent="tr_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
```

```
print('The geograpical coordinate of Toronto are {}, {}'.format(latitude, longitude))
```

The geograpical coordinate of Toronto are 43.653963, -79.387207.

## 2. Create a map of Toronto with neighbourhoods superimposed on top

```
[12]: # create map of Toronto using latitude and longitude values
map_toronto = folium.Map(location=[latitude, longitude], zoom_start=10)

# add markers to map
for lat, lng, borough, neighbourhood in zip(tr_df['Latitude'],
tr_df['Longitude'],
tr_df['Borough'],
tr_df['Neighbourhood']):
    label = '{} {}'.format(neighbourhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_toronto)

map_toronto
```

```
[12]: <folium.folium.Map at 0x1e11ed27da0>
```

Next, we are going to start utilizing the Foursquare API to explore the neighbourhoods and segment them.

```
[13]: CLIENT_ID = 'L3ASOH21PLOKOFAGUOENKSBLOELN1ZQLTCRT3ZB5NZPJXPEF' # your
Foursquare ID
CLIENT_SECRET = 'NC4LIKESX3AKSTLTBQRQEVCSUA1ZCTID3KLZ5XFWAHTOWX' # your
Foursquare Secret
VERSION = '20180605' # Foursquare API version

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)

LIMIT = 100
```

Your credentails:

CLIENT\_ID: L3ASOH21PLOKOFAGUOENKSBLOELN1ZQLTCRT3ZB5NZPJXPEF



CLIENT\_SECRET:NC4LIKESX3AKSTLTBQRQEVCESUA1ZCTID3KLZ5XFWAHTOWX

## 3.2 2. Explore Neighbourhoods in Toronto

Let's create a function to explore the neighbourhoods in Toronto

```
[14]: def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

        # create the API request URL
        url = 'https://api.foursquare.com/v2/venues/explore?
        →&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

        # make the GET request
        results = requests.get(url).json()["response"]['groups'][0]['items']

        # return only relevant information for each nearby venue
        venues_list.append([
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['categories'][0]['name']) for v in results])

    nearby_venues = pd.DataFrame([item for venue_list in venues_list for item
    →in venue_list])
    nearby_venues.columns = ['Neighbourhood',
                            'Neighbourhood Latitude',
                            'Neighbourhood Longitude',
                            'Venue',
                            'Venue Latitude',
                            'Venue Longitude',
                            'Venue Category']

    return(nearby_venues)
```

```

def getVenueDetails(venue_id):
    #url to fetch data from foursquare api
    url = 'https://api.foursquare.com/v2/venues/{}?
    →&client_id={} &client_secret={} &v={} '.format(
        venue_id,
        CLIENT_ID,
        CLIENT_SECRET,
        VERSION)
    # get all the data
    results = requests.get(url).json()
    print(results)
    venue_data=results['response']['venue']
    venue_details=[]
    try:
        venue_id=venue_data['id']
        venue_name=venue_data['name']
        venue_likes=venue_data['likes']['count']
        venue_rating=venue_data['rating']
        venue_tips=venue_data['tips']['count']
        venue_details.
    →append([venue_id,venue_name,venue_likes,venue_rating,venue_tips])
    except KeyError:
        pass
    column_names=['ID','Name','Likes','Rating','Tips']
    df_details = pd.DataFrame(venue_details,columns=column_names)
    return df_details

def getVenues(lat,lng):
    #set variables
    radius=400
    LIMIT=100
    #url to fetch data from foursquare api
    url = 'https://api.foursquare.com/v2/venues/explore?
    →&client_id={} &client_secret={} &v={} &ll={},{} &radius={} &limit={} '.format(
        CLIENT_ID,
        CLIENT_SECRET,
        VERSION,
        lat,
        lng,
        radius,
        LIMIT)
    # get all the data

```

```

results = requests.get(url).json()
venue_data=results["response"]["groups"][0]['items']
venue_details=[]
for row in venue_data:
    try:
        venue_id=row['venue']['id']
        venue_name=row['venue']['name']
        venue_category=row['venue']['categories'][0]['name']
        venue_details.append([venue_id,venue_name,venue_category])
    except KeyError:
        pass
column_names=['ID','Name','Category']
df_venues = pd.DataFrame(venue_details,columns=column_names)
return df_venues

```

```

[18]: # Avoid running it again because of limited calls allowed

#tr_venues = getNearbyVenues(names=tr_df['Neighbourhood'],
                             #latitudes=tr_df['Latitude'],
                             #longitudes=tr_df['Longitude']
                             #)

```

The Beaches  
 The Danforth West, Riverdale  
 The Beaches West, India Bazaar  
 Studio District  
 Lawrence Park  
 Davisville North  
 North Toronto West  
 Davisville  
 Moore Park, Summerhill East  
 Deer Park, Forest Hill SE, Rathnelly, South Hill, Summerhill West  
 Rosedale  
 Cabbagetown, St. James Town  
 Church and Wellesley  
 Harbourfront  
 Ryerson, Garden District  
 St. James Town  
 Berczy Park  
 Central Bay Street  
 Adelaide, King, Richmond  
 Harbourfront East, Toronto Islands, Union Station  
 Design Exchange, Toronto Dominion Centre  
 Commerce Court, Victoria Hotel  
 Roselawn  
 Forest Hill North, Forest Hill West

The Annex, North Midtown, Yorkville  
 Harbord, University of Toronto  
 Chinatown, Grange Park, Kensington Market  
 CN Tower, Bathurst Quay, Island airport, Harbourfront West, King and Spadina,  
 Railway Lands, South Niagara  
 Stn A PO Boxes 25 The Esplanade  
 First Canadian Place, Underground city  
 Christie  
 Dovercourt Village, Dufferin  
 Little Portugal, Trinity  
 Brockton, Exhibition Place, Parkdale Village  
 High Park, The Junction South  
 Parkdale, Roncesvalles  
 Runnymede, Swansea  
 Queen's Park  
 Business Reply Mail Processing Centre 969 Eastern

Let's check the size of the resulting dataframe

```
[19]: tr_venues.to_csv('tr_venues.csv')
tr_venues= pd.read_csv('tr_venues.csv', index_col=0)
tr_venues.reset_index(drop=True, inplace=True)
print(tr_venues.shape)
tr_venues.head()
```

(1715, 7)

```
[19]:
```

	Neighbourhood	Neighbourhood Latitude \
0	The Beaches	43.676357
1	The Beaches	43.676357
2	The Beaches	43.676357
3	The Beaches	43.676357
4	The Danforth West, Riverdale	43.679557

	Neighbourhood Longitude	Venue \
0	-79.293031	Glen Manor Ravine
1	-79.293031	The Big Carrot Natural Food Market
2	-79.293031	Grover Pub and Grub
3	-79.293031	Upper Beaches
4	-79.352188	Pantheon

	Venue Latitude	Venue Longitude	Venue Category
0	43.676821	-79.293942	Trail
1	43.678879	-79.297734	Health Food Store
2	43.679181	-79.297215	Pub
3	43.680563	-79.292869	Neighborhood
4	43.677621	-79.351434	Greek Restaurant

Let's check how many venues were returned for each neighbourhood

Let's find out how many unique categories can be curated from all the returned venues

```
[20]: print('There are {} uniques categories.'.format(len(tr_venues['Venue Category'].
        ↳unique()))))

#tr_venues['Venue Category'].unique()
```

There are 233 uniques categories.

Since we are interested in Toronto as it has the highest number of neighborhoods. We will look for the Vegetarian restaurants in that area.

```
[21]: column_names=['Postcode', 'Borough', 'Neighbourhood', 'ID','Name']
veg_rest=pd.DataFrame(columns=column_names)
count=1
for row in tr_df.values.tolist():
    Postcode, Borough, Neighbourhood, Latitude, Longitude=row
    #venues = getVenues(Latitude,Longitude) # Avoid running it twice will cost_
    ↳calls
    veg_resturants=venues[venues['Category']=='Vegetarian / Vegan Restaurant']
    print('(',count,'/',len(tr_df),')','Vegetarian Resturants in_
    ↳'+Neighbourhood+', '+Borough+' :'+str(len(veg_resturants)))
    print(row)
    for restaurant_detail in veg_resturants.values.tolist():
        id, name , category=restaurant_detail
        veg_rest = veg_rest.append({ 'Postcode': Postcode,
                                     'Borough': Borough,
                                     'Neighbourhood': Neighbourhood,
                                     'ID': id,
                                     'Name' : name
                                     }, ignore_index=True)

    count+=1
```

```
( 1 / 39 ) Vegetarian Resturants in The Beaches, East Toronto:0
['M4E', 'East Toronto', 'The Beaches', 43.67635739999999, -79.2930312]
( 2 / 39 ) Vegetarian Resturants in The Danforth West, Riverdale, East Toronto:0
['M4K', 'East Toronto', 'The Danforth West, Riverdale', 43.6795571, -79.352188]
( 3 / 39 ) Vegetarian Resturants in The Beaches West, India Bazaar, East
Toronto:0
['M4L', 'East Toronto', 'The Beaches West, India Bazaar', 43.6689985,
-79.31557159999998]
( 4 / 39 ) Vegetarian Resturants in Studio District, East Toronto:0
['M4M', 'East Toronto', 'Studio District', 43.6595255, -79.340923]
( 5 / 39 ) Vegetarian Resturants in Lawrence Park, Central Toronto:0
['M4N', 'Central Toronto', 'Lawrence Park', 43.7280205, -79.3887901]
( 6 / 39 ) Vegetarian Resturants in Davisville North, Central Toronto:0
```

['M4P', 'Central Toronto', 'Davisville North', 43.7127511, -79.3901975]  
 ( 7 / 39 ) Vegetarian Resturants in North Toronto West, Central Toronto:0  
 ['M4R', 'Central Toronto', 'North Toronto West', 43.7153834, -79.40567840000001]  
 ( 8 / 39 ) Vegetarian Resturants in Davisville, Central Toronto:0  
 ['M4S', 'Central Toronto', 'Davisville', 43.7043244, -79.3887901]  
 ( 9 / 39 ) Vegetarian Resturants in Moore Park, Summerhill East, Central  
 Toronto:0  
 ['M4T', 'Central Toronto', 'Moore Park, Summerhill East', 43.6895743,  
 -79.38315990000001]  
 ( 10 / 39 ) Vegetarian Resturants in Deer Park, Forest Hill SE, Rathnelly, South  
 Hill, Summerhill West, Central Toronto:0  
 ['M4V', 'Central Toronto', 'Deer Park, Forest Hill SE, Rathnelly, South Hill,  
 Summerhill West', 43.68641229999999, -79.4000493]  
 ( 11 / 39 ) Vegetarian Resturants in Rosedale, Downtown Toronto:0  
 ['M4W', 'Downtown Toronto', 'Rosedale', 43.6795626, -79.37752940000001]  
 ( 12 / 39 ) Vegetarian Resturants in Cabbagetown, St. James Town, Downtown  
 Toronto:0  
 ['M4X', 'Downtown Toronto', 'Cabbagetown, St. James Town', 43.667967,  
 -79.3676753]  
 ( 13 / 39 ) Vegetarian Resturants in Church and Wellesley, Downtown Toronto:0  
 ['M4Y', 'Downtown Toronto', 'Church and Wellesley', 43.6658599,  
 -79.38315990000001]  
 ( 14 / 39 ) Vegetarian Resturants in Harbourfront, Downtown Toronto:0  
 ['M5A', 'Downtown Toronto', 'Harbourfront', 43.6542599, -79.3606359]  
 ( 15 / 39 ) Vegetarian Resturants in Ryerson, Garden District, Downtown  
 Toronto:0  
 ['M5B', 'Downtown Toronto', 'Ryerson, Garden District', 43.6571618,  
 -79.37893709999999]  
 ( 16 / 39 ) Vegetarian Resturants in St. James Town, Downtown Toronto:0  
 ['M5C', 'Downtown Toronto', 'St. James Town', 43.6514939, -79.3754179]  
 ( 17 / 39 ) Vegetarian Resturants in Berczy Park, Downtown Toronto:1  
 ['M5E', 'Downtown Toronto', 'Berczy Park', 43.644770799999996, -79.3733064]  
 ( 18 / 39 ) Vegetarian Resturants in Central Bay Street, Downtown Toronto:0  
 ['M5G', 'Downtown Toronto', 'Central Bay Street', 43.6579524, -79.3873826]  
 ( 19 / 39 ) Vegetarian Resturants in Adelaide, King, Richmond, Downtown  
 Toronto:2  
 ['M5H', 'Downtown Toronto', 'Adelaide, King, Richmond', 43.65057120000001,  
 -79.3845675]  
 ( 20 / 39 ) Vegetarian Resturants in Harbourfront East, Toronto Islands, Union  
 Station, Downtown Toronto:1  
 ['M5J', 'Downtown Toronto', 'Harbourfront East, Toronto Islands, Union Station',  
 43.6408157, -79.38175229999999]  
 ( 21 / 39 ) Vegetarian Resturants in Design Exchange, Toronto Dominion Centre,  
 Downtown Toronto:0  
 ['M5K', 'Downtown Toronto', 'Design Exchange, Toronto Dominion Centre',  
 43.6471768, -79.38157640000001]  
 ( 22 / 39 ) Vegetarian Resturants in Commerce Court, Victoria Hotel, Downtown  
 Toronto:0

['M5L', 'Downtown Toronto', 'Commerce Court, Victoria Hotel', 43.6481985,  
 -79.37981690000001]  
 ( 23 / 39 ) Vegetarian Resturants in Roselawn, Central Toronto:0  
 ['M5N', 'Central Toronto', 'Roselawn', 43.7116948, -79.41693559999999]  
 ( 24 / 39 ) Vegetarian Resturants in Forest Hill North, Forest Hill West,  
 Central Toronto:0  
 ['M5P', 'Central Toronto', 'Forest Hill North, Forest Hill West', 43.6969476,  
 -79.41130720000001]  
 ( 25 / 39 ) Vegetarian Resturants in The Annex, North Midtown, Yorkville,  
 Central Toronto:1  
 ['M5R', 'Central Toronto', 'The Annex, North Midtown, Yorkville', 43.6727097,  
 -79.40567840000001]  
 ( 26 / 39 ) Vegetarian Resturants in Harbord, University of Toronto, Downtown  
 Toronto:0  
 ['M5S', 'Downtown Toronto', 'Harbord, University of Toronto', 43.6626956,  
 -79.4000493]  
 ( 27 / 39 ) Vegetarian Resturants in Chinatown, Grange Park, Kensington Market,  
 Downtown Toronto:3  
 ['M5T', 'Downtown Toronto', 'Chinatown, Grange Park, Kensington Market',  
 43.6532057, -79.4000493]  
 ( 28 / 39 ) Vegetarian Resturants in CN Tower, Bathurst Quay, Island airport,  
 Harbourfront West, King and Spadina, Railway Lands, South Niagara, Downtown  
 Toronto:0  
 ['M5V', 'Downtown Toronto', 'CN Tower, Bathurst Quay, Island airport,  
 Harbourfront West, King and Spadina, Railway Lands, South Niagara', 43.6289467,  
 -79.3944199]  
 ( 29 / 39 ) Vegetarian Resturants in Stn A PO Boxes 25 The Esplanade, Downtown  
 Toronto:1  
 ['M5W', 'Downtown Toronto', 'Stn A PO Boxes 25 The Esplanade', 43.6464352,  
 -79.37484599999999]  
 ( 30 / 39 ) Vegetarian Resturants in First Canadian Place, Underground city,  
 Downtown Toronto:1  
 ['M5X', 'Downtown Toronto', 'First Canadian Place, Underground city',  
 43.6484292, -79.3822802]  
 ( 31 / 39 ) Vegetarian Resturants in Christie, Downtown Toronto:0  
 ['M6G', 'Downtown Toronto', 'Christie', 43.669542, -79.4225637]  
 ( 32 / 39 ) Vegetarian Resturants in Dovercourt Village, Dufferin, West  
 Toronto:0  
 ['M6H', 'West Toronto', 'Dovercourt Village, Dufferin', 43.66900510000001,  
 -79.4422593]  
 ( 33 / 39 ) Vegetarian Resturants in Little Portugal, Trinity, West Toronto:1  
 ['M6J', 'West Toronto', 'Little Portugal, Trinity', 43.647926700000006,  
 -79.4197497]  
 ( 34 / 39 ) Vegetarian Resturants in Brockton, Exhibition Place, Parkdale  
 Village, West Toronto:0  
 ['M6K', 'West Toronto', 'Brockton, Exhibition Place, Parkdale Village',  
 43.6368472, -79.42819140000002]  
 ( 35 / 39 ) Vegetarian Resturants in High Park, The Junction South, West

```
Toronto:0
['M6P', 'West Toronto', 'High Park, The Junction South', 43.6616083,
-79.46476329999999]
( 36 / 39 ) Vegetarian Resturants in Parkdale, Roncesvalles, West Toronto:0
['M6R', 'West Toronto', 'Parkdale, Roncesvalles', 43.6489597, -79.456325]
( 37 / 39 ) Vegetarian Resturants in Runnymede, Swansea, West Toronto:0
['M6S', 'West Toronto', 'Runnymede, Swansea', 43.6515706, -79.4844499]
( 38 / 39 ) Vegetarian Resturants in Queen's Park, Downtown Toronto:1
['M7A', 'Downtown Toronto', "Queen's Park", 43.6623015, -79.3894938]
( 39 / 39 ) Vegetarian Resturants in Business Reply Mail Processing Centre 969
Eastern, East Toronto:0
['M7Y', 'East Toronto', 'Business Reply Mail Processing Centre 969 Eastern',
43.6627439, -79.321558]
```

```
[22]: veg_rest.to_csv('veg_rest.csv') # Save the information so far to a .csv file
      ↪due to limited calls on FourSquare
df_veg_rest = pd.read_csv('veg_rest.csv', index_col=0)
df_veg_rest.head()
```

```
[22]: Postcode      Borough \
0      M5E  Downtown Toronto
1      M5H  Downtown Toronto
2      M5H  Downtown Toronto
3      M5J  Downtown Toronto
4      M5R   Central Toronto

                                Neighbourhood \
0                                Berczy Park
1                                Adelaide, King, Richmond
2                                Adelaide, King, Richmond
3  Harbourfront East, Toronto Islands, Union Station
4                                The Annex, North Midtown, Yorkville

                                ID      Name
0  5b5bca904aa3f8002c97f85d  Fresh On Front
1  5aff06ca6e4650002cc6286b    Rosalinda
2  5c9d602f25fb7b002c79b669    Planta Queen
3  5481b06c498ee191fa045a00    Kupfert & Kim
4  4ad4c061f964a52099f720e3  Live Organic Food Bar
```

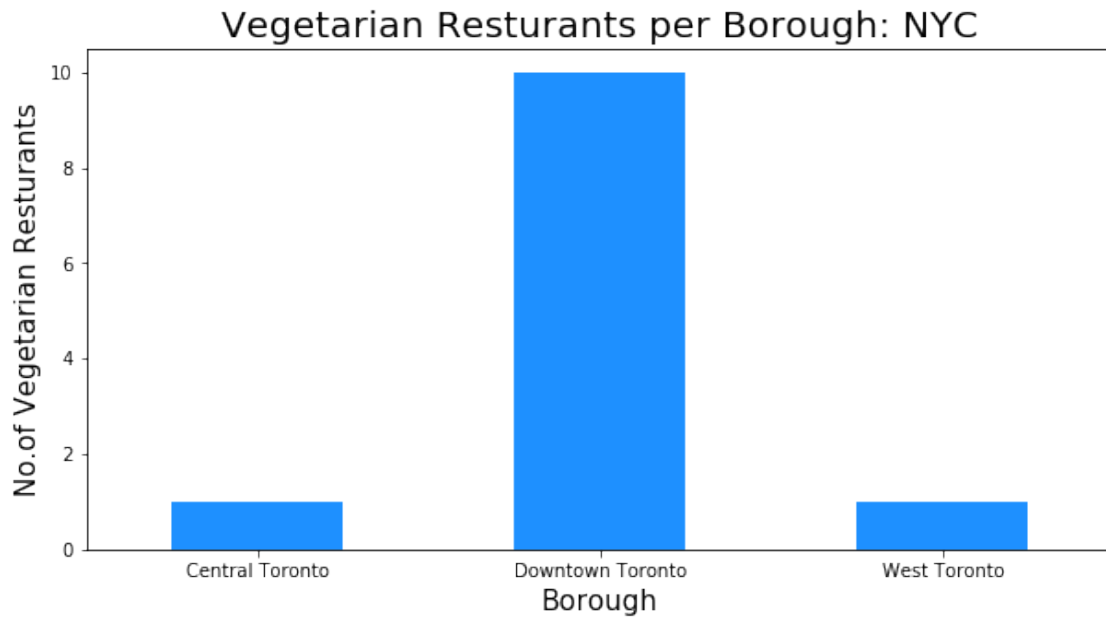
```
[23]: df_veg_rest.shape
```

```
[23]: (12, 5)
```

```
[24]: df_veg_rest.groupby('Borough')['ID'].count().plot.bar(figsize=(10,5), color =_
      ↪clr)
plt.title('Vegetarian Resturants per Borough: NYC', fontsize = 20)
```



```
plt.xlabel('Borough', fontsize = 15)
plt.ylabel('No.of Vegetarian Resturants', fontsize=15)
plt.xticks(rotation = 'horizontal')
plt.show()
```



From the bar graph it makes sense if we open the Fruits and Vegetables store in DownTown Toronto as it has the highest number of Vegetarian Restaurants. We will explore the neighborhood of DOWntown further to look for the more opportunities for business.