Battle of the Neighborhoods: Examining the Diversity of Cuisines in Toronto

BY: RITIKA CHAKRAVARTY

1. INTRODUCTION:

According to the article published by The Culture Trip, Toronto is one of the most multicultural cities in the world. With millions of people migrating to Canada annually, it's cultural diversity has been enriched over the years, as have the food habits of this country.

For my Capstone Project, I have chosen to explore the variance in cuisines of two different boroughs of Toronto, to truly fathom the impact of immigration on Canada's gastronomic diversity.

As we will see later in the project, the Folium map of the Toronto neighborhoods shows us that the neighborhoods are spread out in a roughly rectangular shape. Hence, there is a greater probability of variety in cuisines in the East-West direction, than there is in the North-South direction. Therefore, I have chosen to explore Scarborough (a borough from the East of Toronto) and Etobicoke (a borough from the West of Toronto), to understand the true diversity in cuisines of Toronto as a result of immigration.

2. DATA:

1. This project gathers the Toronto neighborhood data from List of postal codes of Canada: M source. The page is a comprehensive database of all the Postal Codes of the neighbourhoods and their subsequent boroughs, in Toronto. For accurate results, neighborhoods with unassigned boroughs will retain their neighborhood name. Unassigned boroughs will also be eliminated. Neighborhoods with the same postal codes will be grouped, for the ease of mapping. Mapping the neighborhoods will help me shortlist the boroughs I want to evaluate.

2. The postal codes (from the source above) will also help me find the coordinates of each neighborhood in the Geospatial_Coordinates file. The file Toronto location data by IBM contains the longitude and latitude locations of each postal code.. With the neighborhood coordinates, I will be able to focus my Foursquare search queries to the venues of the boroughs I want to analyze.

3. Using Foursquare API, I will be able to retrieve the features of restaurants (in this case category and number) in each borough for my analysis. Learning about the cuisines in the boroughs, will help me evaluate their gastronomic diversity.

3. METHODOLOGY:

1. **Import libraries necessary to execute this project.**

   In order to get to the results of this project, I needed a few libraries that would help the Python code achieve greater functionality. I have used the Numpy and Pandas libraries for data processing. The geocoders library helped me retrieve the latitude and longitude values of locations I wanted to map. Json_normalize and requests help with data exchange between the code and URL. Matplotlib is a data visualization library. For my project, I used this library to plot three different bar graphs. The first graph counts the number of neighborhoods in each borough. The other two graphs help visualize the most popular restaurants in each borough. Lastly, the folium library is a great tool for creating mapping. I have used Folium to create three maps. The first map visualizes the neighborhoods in Toronto. The other two maps are used to visualize the locations of restaurants in each borough.

```
# to transform raw data into numpy arrays
import numpy as np

#to create a Pandas dataframe from the raw data
import pandas as pd
pd.set_option('display.max_columns',None) #displays all columns
pd.set_option('display.max_rows',None) #displays all rows

#to get the latitude and longitude data for each city
!conda install -c conda-forge geopy --yes
from geopy.geocoders import Nominatim

#to make it easier to share data between code and URL easier
import requests
from pandas.io.json import json_normalize

#to retrieve data from URL
!pip install beautifulsoup4
from bs4 import BeautifulSoup

#import data visualization libraries
import matplotlib.cm as cm
import matplotlib.colors as colors
import matplotlib as mpl
import matplotlib.pyplot as plt


!conda install -c conda-forge folium=0.5.0 --yes
import folium

print("All the necessary libraries have been imported")
```

Figure 1: Libraries used for this project.

2. **Creating the Toronto dataframe.**

   Firstly, I extract the neighborhood data table from this Wikipedia page and create a Pandas Dataframe. I then populate the data frame with the data extracted from the Wikipedia page. Lastly, I clean the data frame by removing all unassigned boroughs, grouping neighborhoods with the same postal codes and checking to see if all neighborhoods have boroughs (if not, then the borough names become the neighborhood names).

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M3A	North York	Parkwoods, Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village, Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Regent Park, Harbourfront, Regent Park, Harbou...	43.654260	-79.360636
3	M6A	North York	Lawrence Manor, Lawrence Heights, Lawrence Man...	43.718518	-79.464763
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government, Q...	43.662301	-79.389494

Figure 2: A few rows from the Toronto data frame.

3. **Mapping out the neighborhoods in Toronto.**

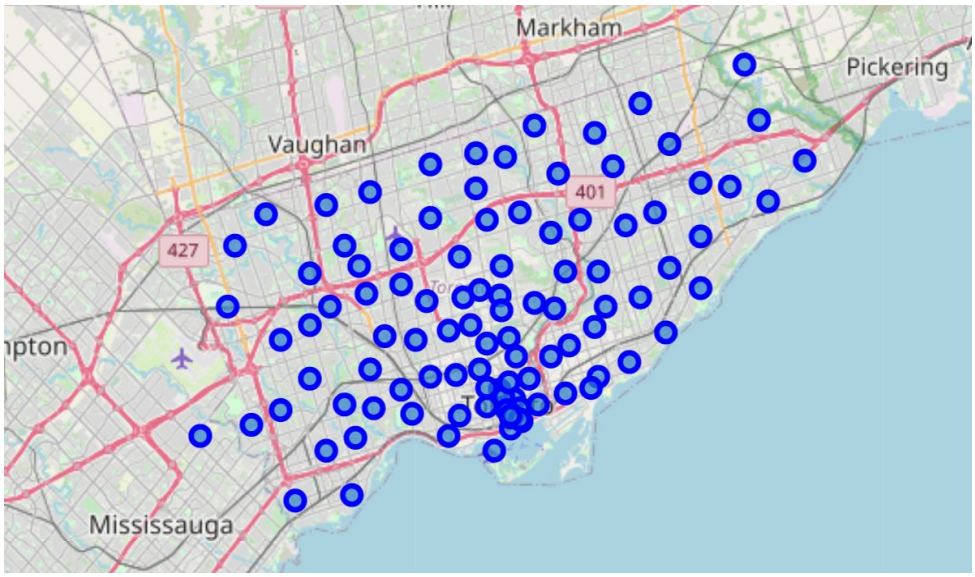

Figure 3: A map of all Toronto neighborhoods.

This map provides the locations of each neighborhood in Toronto (subject to data available on the Wikipedia page). The map helped me shortlist the borough I wanted to analyze for this project.

4. **Number of neighborhoods per borough.**

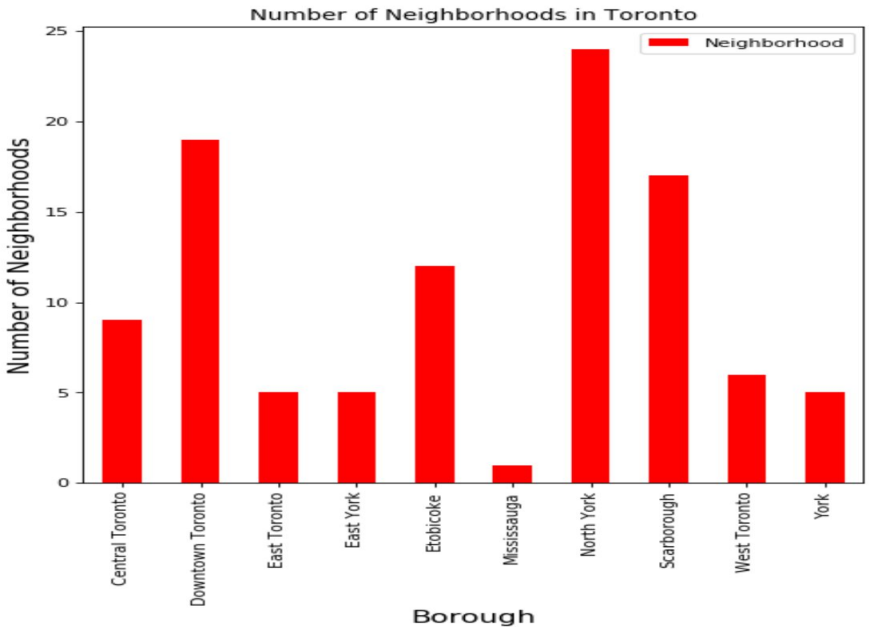

Figure 4: The number of neighborhoods per borough in Toronto

The graph contains the number of neighborhoods per borough, helping finalize the boroughs to shortlist for analysis, in this project. My criteria was to choose two boroughs (one in the East, and the other, in the West) with a similar number of neighborhoods so that they would be of similar areas. They also needed to be far away from each other, for me to get an accurate assessment of the diversity in cuisines. Mississauga has only one neighborhood. So, although the borough satisfies the location requirement, I chose not to use this borough to measure the variance in diversity.

5. **Shortlisting neighborhoods for analysis.**

I chose Scarborough and Etobicoke, since the two boroughs met the project requirements. Although the number of neighborhoods is not equal, the locations of these boroughs serves the purpose of this project.

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M1B	Scarborough	Malvern, Rouge, Malvern, Rouge	43.806686	-79.194353
1	M1C	Scarborough	Rouge Hill, Port Union, Highland Creek, Rouge ...	43.784535	-79.160497
2	M1E	Scarborough	Guildwood, Morningside, West Hill, Guildwood, ...	43.763573	-79.188711
3	M1G	Scarborough	Woburn, Woburn	43.770992	-79.216917
4	M1H	Scarborough	Cedarbrae, Cedarbrae	43.773136	-79.239476

Figure 5: A few rows of the Scarborough data frame.

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M9A	Etobicoke	Islington Avenue, Humber Valley Village, Islin...	43.667856	-79.532242
1	M9B	Etobicoke	West Deane Park, Princess Gardens, Martin Grov...	43.650943	-79.554724
2	M9C	Etobicoke	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201
3	M9P	Etobicoke	Westmount, Westmount	43.696319	-79.532242
4	M9R	Etobicoke	Kingsview Village, St. Phillips, Martin Grove ...	43.688905	-79.554724

Figure 6: A few rows of the Etobicoke data frame.

6. Foursquare API.

- Enter your CLIENT ID and CLIENT SECRET to login in to Foursquare.
- Set the radius (here 5000 m) and LIMIT (here 100), for the number of locations you want to retrieve for a given set of coordinates.
- Write a function to retrieve venues from the Foursquare database, using a URL to access the Foursquare API.
- Enter a search query and create a URL to access venues for a radius around a given set of coordinates.

```
LIMIT = 100
search_query = 'Restaurant'
radius = 5000 #in meters
print(search_query + ' .... OK!')
```

```
Restaurant .... OK!
```

Figure 7: The search query.

7. Analyze the boroughs.

For my gastronomic diversity analysis, I chose to find the number of restaurants of each cuisine within a 5000 m radius from the center of each borough. The more popular a cuisine, the more number of restaurants it will have, so this is a good method of a borough's gastronomic diversity.

Also, with the exponential expansion of fast food joints worldwide, it will be impossible not to come across at least one such establishment in our database. Since standalone fast food joints, mall food courts (containing a mix of fast food joints and restaurants), pizza and sandwich places, pubs, BBQ joints diners, breakfast spots, office canteens and miscellaneous restaurants (Asian or otherwise) do not project any cuisine in particular, they will be excluded from the gastronomic diversity analysis.

Let's take a look at the venues databases for Scarborough and Etobicoke.

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country	formattedAddress
0	Perfect Chinese Restaurant 雅瓊海鮮酒家	Chinese Restaurant	4386 Sheppard Ave. E	at Brimley Rd.	43.787774	-79.270294	[{'label': 'display', 'lat': 43.78777423062292...	1920	M1S 1T8	CA	Toronto	ON	Canada	[4386 Sheppard Ave. E (at Brimley Rd.), Toront...
1	Karaikudi Chettinad South Indian Restaurant	Indian Restaurant	1225 Kennedy Rd	at Forbes (Between Lawrence and Ellesmere)	43.756042	-79.276276	[{'label': 'display', 'lat': 43.75604153945313...	2410	M1P 4Y1	CA	Toronto	ON	Canada	[1225 Kennedy Rd (at Forbes (Between Lawrence ...
2	South Sea Fish Village Chinese Restaurant	Chinese Restaurant	1 Glen Watford Dr.	NaN	43.786210	-79.275701	[{'label': 'display', 'lat': 43.78620976205095...	2052	NaN	CA	Scarborough	ON	Canada	[1 Glen Watford Dr., Scarborough ON, Canada]
3	In Cheon House Korean & Japanese Restaurant 인천관	Korean Restaurant	9 Glen Watford Dr.	at Sheppard Ave. E	43.786468	-79.275693	[{'label': 'display', 'lat': 43.78646767038441...	2072	M1S 2B9	CA	Scarborough	ON	Canada	[9 Glen Watford Dr. (at Sheppard Ave. E), Scar...
4	Beef Noodle Restaurant 老李牛肉麵	Chinese Restaurant	4271 Sheppard Ave. E	btwn Brimley & Midland Ave.	43.785937	-79.276031	[{'label': 'display', 'lat': 43.78593747713555...	2050	M1S 4G4	CA	Scarborough	ON	Canada	[4271 Sheppard Ave. E (btwn Brimley & Midland ...

Figure 8: The data frame containing a few of the restaurants in Scarborough.

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country	formattedAddress
0	Cross Eyed Bear Restaurant	Restaurant	555 Burnhamthorpe	The West Mall	43.644725	-79.568009	[{'label': 'display', 'lat': 43.64472458866585...	231	M9C 2Y3	CA	Etobicoke	ON	Canada	[555 Burnhamthorpe (The West Mall), Etobicoke ...
1	Muddy Duck Restaurant	American Restaurant	2200 Dundas St. E	btw Regional Rd. 4 & Highway 407	43.625972	-79.565427	[{'label': 'display', 'lat': 43.62597233051833...	1957	L4X 2V3	CA	Mississauga	ON	Canada	[2200 Dundas St. E (btw Regional Rd. 4 & Highw...
2	VAHALLA RESTAURANT	Scandinavian Restaurant	314 W Center Ave	NaN	43.640954	-79.564951	[{'label': 'display', 'lat': 43.64095401822603...	294	93291	CA	Vahalla	CA	Canada	[314 W Center Ave, Vahalla CA 93291, Canada]
3	Silk Road Restaurant 丝绸之路	Xinjiang Restaurant	1852 Dundas St E	at Wharton Way	43.619278	-79.573031	[{'label': 'display', 'lat': 43.61927817099883...	2767	L4X 1L9	CA	Mississauga	ON	Canada	[1852 Dundas St E (at Wharton Way), Mississaug...
4	The Olive Restaurant	Restaurant	100 The East Mall	North Queen	43.619846	-79.549690	[{'label': 'display', 'lat': 43.619846, 'lng':...	2935	M8Z 5X2	CA	Etobicoke	ON	Canada	[100 The East Mall (North Queen), Etobicoke ON...

Figure 9: The data frame containing a few of the restaurants in Etobicoke.

8. Graphs and Maps,

I have plotted the number of restaurants of a particular cuisine in each borough, to find out the most and least popular cuisines in each borough. The plot also highlighted the different cuisines in both these boroughs. The maps helped visualize the restaurant density from the center of the borough, as well as each other.

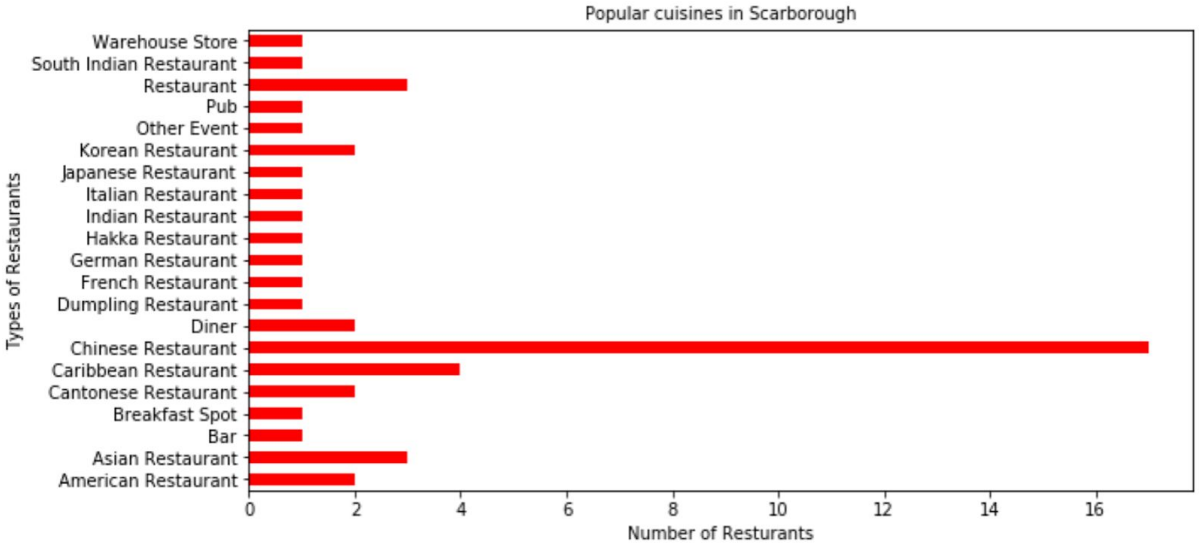

Figure 10: Number and types of restaurants in Scarborough.

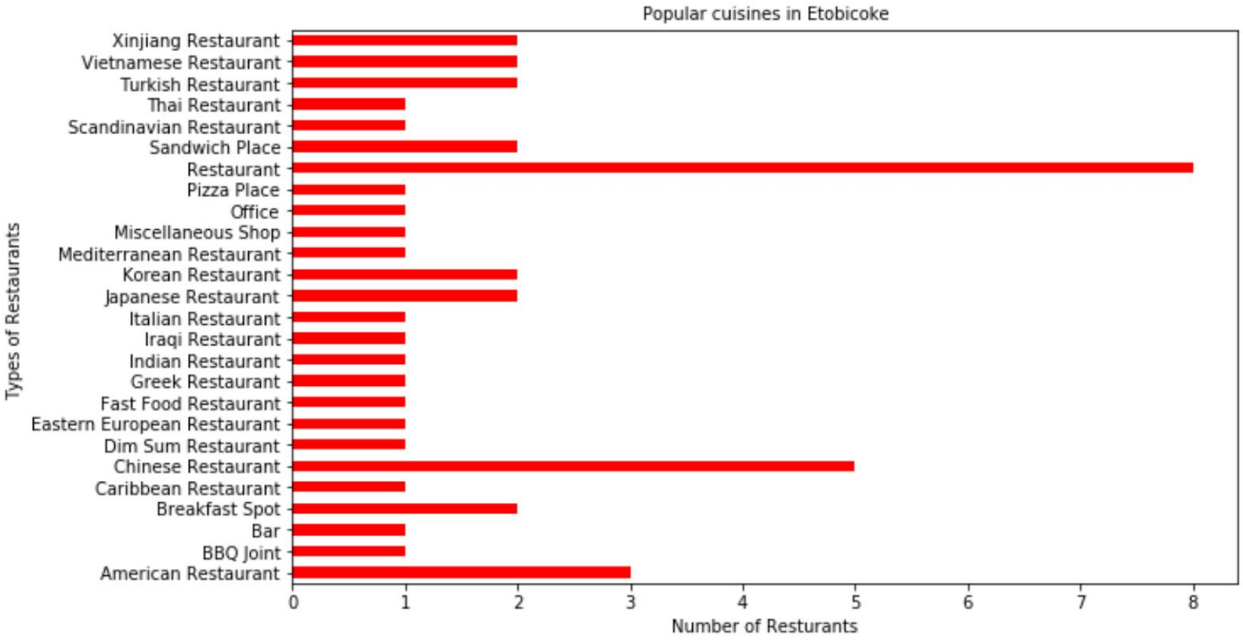

Figure 11: Number and types of restaurants in Etobicoke.

The layout of in Scarborough:

Figure 12: Map of restaurants in Scarborough

The layout of in Etobicoke:

Figure 13: Map of restaurants in Etobicoke

4. RESULTS:

I have tabulated the results from the bar graphs above, for the ease of understanding. If restaurants of a particular cuisine are present in the borough, the number of restaurants of that cuisine have been entered into the table. In case, the borough does not have a restaurant of that particular cuisine, a '-' is put in its place. For cuisines and number of restaurants of the cuisine, common to both boroughs, the entries have been highlighted in green. The most popular cuisine in both boroughs, has been highlighted in blue.

Cuisine	Present in Scarborough (as number of restaurants)	Present in Etobicoke (as number of restaurants)
American	**2**	**3**
Cantonese	**2**	**-**
Caribbean	**4**	**1**
Chinese	**18**	**5**
Dumpling/ Dim Sum	**1**	**1**

Eastern European	**-**	**1**
French	**1**	**-**
German	**1**	**-**
Greek	**-**	**1**
Hakka	**1**	**-**
Indian	**1**	**1**
Iraqi	**-**	**1**
Italian	**1**	**1**
Japanese	**1**	**2**
Korean	**2**	**2**
Mediterranean	**-**	**1**
Scandinavian	**-**	**1**
South Indian	**1**	**-**
Thai	**-**	**1**
Turkish	**-**	**2**
Vietnamese	**-**	**2**
Xinjiang	**-**	**2**

From the table, we see that:

- Chinese cuisine is the most popular in both boroughs.
- American cuisine is more popular in Etobicoke. While Caribbean cuisine is more popular in Scarborough.
- Scarborough's cuisine is influenced by Asian, Caribbean, European and American cuisines.
- Etobicoke's cuisine is influenced by Far East Asian and Asian, American, European and Mediterranean cuisines.

5. DISCUSSION:

Given the high migration rates of Asians to Canada, it is expected that a category of the Asian cuisine would be the most popular in the region. Surprisingly, though the South Asians form a greater percentage of the population of Toronto, than the Chinese (as of 2016), there are more Chinese restaurants than restaurants of all South Asian cuisines combined.

From the Folium map of Scarborough, we see that, there are more restaurants towards the North, than there are towards the South. Most restaurants are located within a two block radius of the center of Scarborough. The Folium map of Etobicoke shows the exact opposite trend. Restaurants are located away from the center of the borough. Also, there are more restaurants in the South than there are in the North of Etobicoke. The layout of restaurants in the restaurant dense neighborhoods of both boroughs is roughly similar.

Another interesting fact about this data is that each borough has exactly 1 Dim Sum/ Dumpling, Indian and Italian restaurant. The boroughs also have exactly 2 Korean restaurants.

6. CONCLUSION:

From this analysis we learnt that both the most popular cuisine in Etobicoke and Scarborough is Chinese. While Scarborough has mostly Asian, Caribbean, European and American gastronomic influences, Etobicoke has Far East Asian and Asian, American, European and Mediterranean influences in its cuisine. Therefore, despite the fewer number of neighborhoods, the borough with the greatest gastronomic diversity is Etobicoke. So, for those who enjoy or wish to experience a variety of cuisines, Etobicoke is the place to be.