

APPLIED DATA SCIENCE CAPSTONE

THE BATTLE OF NEIGHBORHOODS

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1, Introduction:

1.1 Background

Toronto city is the capital of the Canadian Province of Canada and its demographics shows that it is one of the most multicultural and multiracial cities in the world. It is the most populous city of Canada and fourth most populous city of North America. The diverse population of Toronto reflects its current and historical role as an important destination for immigrants to Canada. More than 50 percent of residents belong to a visible minority population group, and over 200 distinct ethnic origins are represented among its inhabitants. Annually, almost half of all immigrants to Canada settle in the Greater Toronto Area. East Asians made up the largest ethnic group (33 percent), with South Asians (28 percent) coming in second of the city of Toronto's overall population. Indians have played major role in immigration from south Asia to Canada. Toronto has the largest Indian Canadian population in Canada. Almost 51% of the entire Indian Canadian community resides in the Greater Toronto Area. Most Indian Canadians in the Toronto area live in Brampton, Markham, Scarborough, Etobicoke, and Mississauga.

Toronto with being such a diverse city with so many communities having presence is a great place for the restaurant prospects and for finding variety food. Therefore, there are many types of restaurants serving food from different cultures such as Chinese, Japanese, Indian, Italian, etc. Indians having a visible presence as a community in the city of Toronto, there are plenty of Indian restaurants available in Toronto.

The aim of this project is to obtain the data of Indian restaurants located in various neighborhoods, boroughs in Toronto and organize the data based on neighborhood, likes and ratings of restaurants, which can help people to gain clear information about Indian restaurants located in Toronto.

1.2 Problem:

Based on the collected information of Indian restaurants located in Toronto, the aim of this project is to find the answers of following questions:

1. Which restaurant is the best choice, if you are looking for the best Indian food in Toronto?
2. Which neighborhood/borough has the highest number of Indian restaurants?
3. Which are the 5 neighborhoods that have the best Indian food in Toronto?
4. Which are the top 3 boroughs to stay if you want to find the best Indian food around?

2, Data Description:

We will be using a Wikipedia link to scrap the data of different neighborhoods and boroughs in Toronto. Using the link, we will be preparing the dataset containing the details of different neighborhoods, boroughs and their respective latitudes, longitudes with the help of libraries such as bs4, json and pandas, etc.

Link: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

2.1 Foursquare API

We will need data about different venues in different neighborhoods of that specific borough. In order to gain that information, we will use "Foursquare" locational information. Foursquare is a location data provider with information about all manner of venues and events within an area of interest. Such information includes venue names, locations, menus and even photos. As such, the foursquare location platform will be used as the sole data source since all the stated required information can be obtained through the API. After finding the list of neighborhoods, we then connect to the Foursquare API to gather information about venues inside each and every neighborhood. For each neighborhood, we have chosen the radius to be 1000 meters and the limit of number of venues to be 200. We can filter these venues to get only those venues that are categorized as Indian restaurants.

The data retrieved from Foursquare contained information of venues within a specified distance of the longitude and latitude of the postcodes. The information obtained per venue as follows:

1. Restaurant Borough 2. Restaurant Neighborhood 3. Venue ID(Restaurants) 4. Venue name e.g., the name of a restaurant 5. Restaurant Likes 6. Restaurant Rating 7. Restaurant Tips

3, Methodology:

- We start by importing some libraries that will be necessary in order to achieve the desired results of this project.
 - numpy: library to handle data in a vectorized manner.
 - pandas: library for data analysis.
 - BeautifulSoup: library for pulling data out of HTML and XML files.
 - json: library to handle json files.
 - geopy.geocoders: convert an address into latitude and longitude values.
 - requests: library to handle requests
 - Matplotlib: library for data visualization
- We collect the data of neighborhoods and boroughs of the city of Toronto from following link: 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M' using the libraries we imported. After that, we import the data from a downloaded csv file that shows the data of latitudes and longitudes of various neighborhoods of Toronto. We combine both the dataframe into one that will look like below.

	PostalCode	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	Queen's Park	Ontario Provincial Government	43.662301	-79.389494

- We visualized the map of Toronto and marked the locations of neighborhoods with the help of latitudes and longitudes using the folium library.



- In the next step, we created the functions that will help us extract the list of venues that are classified as 'Indian Restaurant' in each neighborhood with the use of Foursquare API, which will give us a list of 47 Indian restaurants in Toronto, which will look like following:

	Borough	Neighbourhood	ID	Name
0	Downtown Toronto	Regent Park, Harbourfront	4af9a379f964a520c91222e3	Bombay Palace
1	Downtown Toronto	Regent Park, Harbourfront	52af6dc5498e33995b0bbf03	Sultan Of Samosas
2	Queen's Park	Ontario Provincial Government	4bedf8b5e24d20a17b567214	Kothur Indian Cuisine
3	East Toronto	The Beaches	4dcd7c6352b1f8915b7e7f7e	Delhi Bistro
4	Scarborough	Woburn	4c632edeedd320a19ad5ae29	Bombay Palace
5	East York	Leaside	504bcf32e4b0ef19b0e2ecf8	Mt Everest Restaurant
6	Downtown Toronto	Christie	4adb969ef964a520332921e3	Banjara Indian Cuisine
7	Downtown Toronto	Christie	4b7369d7f964a52049ad2de3	Madras Masala
8	Scarborough	Cedarbrae	4d6008f829ef236a8832a059	CANBE Foods Inc
9	Scarborough	Cedarbrae	4c77fc87bd346dcb8c90f0ef	La Sani Grill
10	East York	Thornciffe Park	4daf08e66e81e2dffdd4fe40	Iqbal Kebab & Sweet Centre

- After preparing a dataframe as shown in the previous step, we created a function that used FourSquare API to fetch the venue details such as ratings, likes, tips based on the ID of the list of restaurants and put it in a dataframe. The dataframe was merged with the one that was created in the previous step.

	Borough	Neighbourhood	ID	Name	Likes	Rating	Tips
0	Downtown Toronto	Regent Park, Harbourfront	4af9a379f964a520c91222e3	Bombay Palace	14	7.1	13
1	Downtown Toronto	Regent Park, Harbourfront	52af6dc5498e33995b0bbf03	Sultan Of Samosas	9	6.7	4
2	Queen's Park	Ontario Provincial Government	4bedf8b5e24d20a17b567214	Kothur Indian Cuisine	16	8.0	19
3	East Toronto	The Beaches	4dcd7c6352b1f8915b7e7f7e	Delhi Bistro	6	6.9	3
4	Scarborough	Woburn	0	0	0	0.0	0

4, Results and Discussions:

- Using pandas library, data of Indian restaurants in Toronto was analyzed in order to find out the answers to the questions asked in the beginning.
- Indian restaurant that has the maximum number of likes in Toronto: Banjara Indian Cuisine.

```
# Resturant with maximum Likes
indian_rest_stats_toronto.iloc[indian_rest_stats_toronto['Likes'].idxmax()]

Borough          Downtown Toronto
Neighbourhood      Christie
ID              4adb969ef964a520332921e3
Name              Banjara Indian Cuisine
Likes              142.0
Rating              8.8
Tips              75.0
Name: 6, dtype: object
```

- Indian restaurant that has the maximum rating in Toronto: Banjara Indian Cuisine.

```
# Resturant with maximum Rating
indian_rest_stats_toronto.iloc[indian_rest_stats_toronto['Rating'].idxmax()]

Borough          Downtown Toronto
Neighbourhood      Christie
ID              4adb969ef964a520332921e3
Name              Banjara Indian Cuisine
Likes              142.0
Rating              8.8
Tips              75.0
Name: 6, dtype: object
```

- Indian restaurant that has the maximum tips in Toronto: Banjara Indian Cuisine.

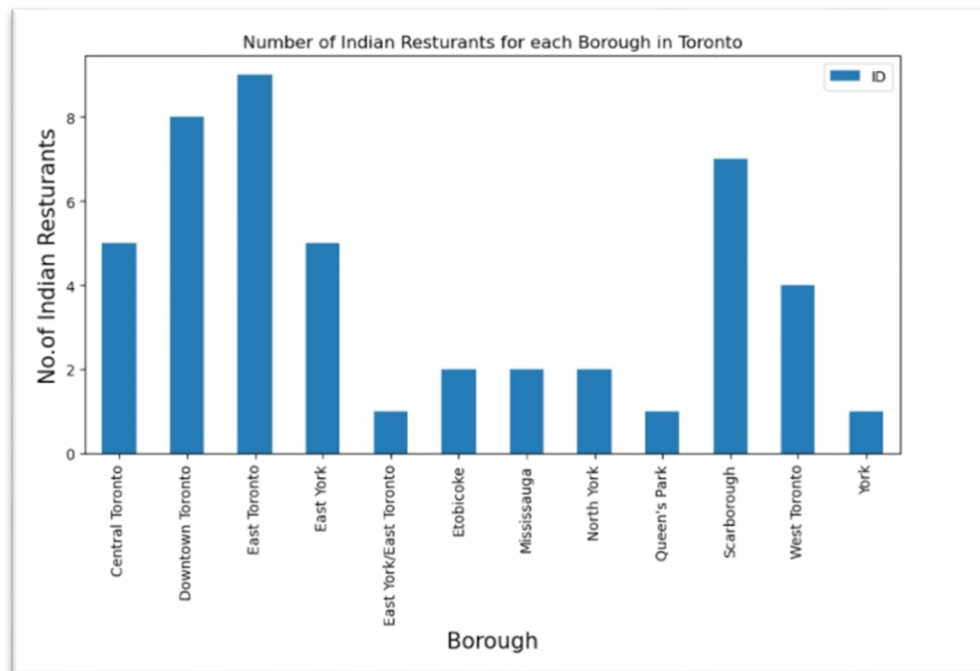
```
# Resturant with maximum Tips
indian_rest_stats_toronto.iloc[indian_rest_stats_toronto['Tips'].idxmax()]

Borough          Downtown Toronto
Neighbourhood      Christie
ID              4adb969ef964a520332921e3
Name              Banjara Indian Cuisine
Likes              142.0
Rating              8.8
Tips              75.0
Name: 6, dtype: object
```

As we can see, we discovered that 'Banjara Indian Cuisine' which is located in Downtown, Toronto's Christie neighborhood is the restaurant that has the highest rating, highest number

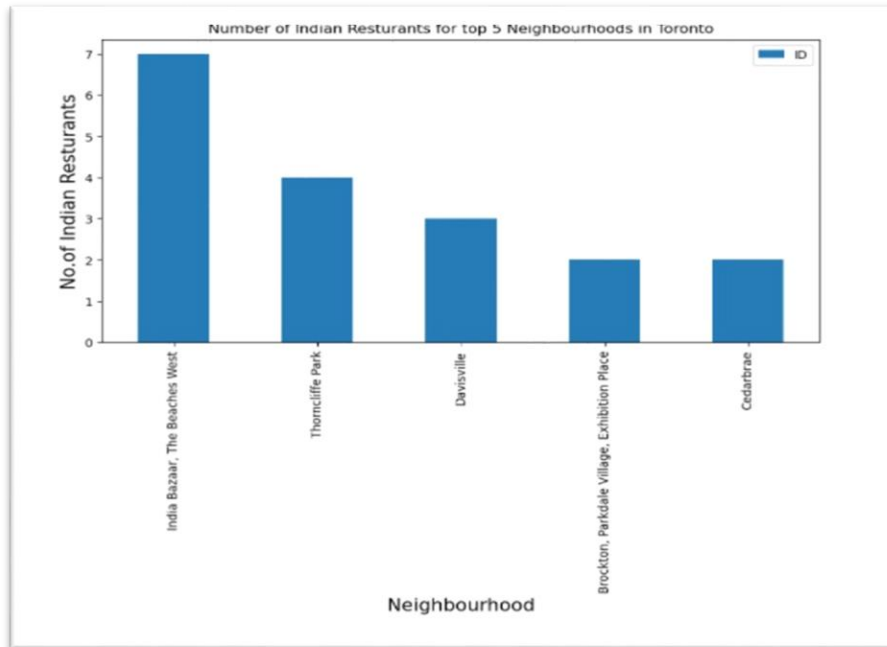
of likes and tips in Toronto. Hence, it can be said from the analysis that 'Banjara Indian Cuisine' is the best restaurant in Toronto for eating the Indian food.

- we create a bar plot that shows number of Indian restaurants for each Borough in Toronto.



We can see from the Bar Plot that Borough - East Toronto has 9 Indian restaurants, which is the highest among all the boroughs.

- we created a bar plot that shows the top 5 neighborhoods that have higher number of Indian restaurants than any other restaurants in Toronto.



We can see from the bar plot, 'India Bazaar, The Beaches West' neighborhood has the highest number of Indian restaurants (7) in Toronto than any other neighborhoods in Toronto.

- After that, we prepared a list of top 10 neighborhoods that have higher average ratings of Indian restaurants.

```
toronto_neighbourhood_stats.sort_values(['Average Rating'],ascending=False).head(10)
```

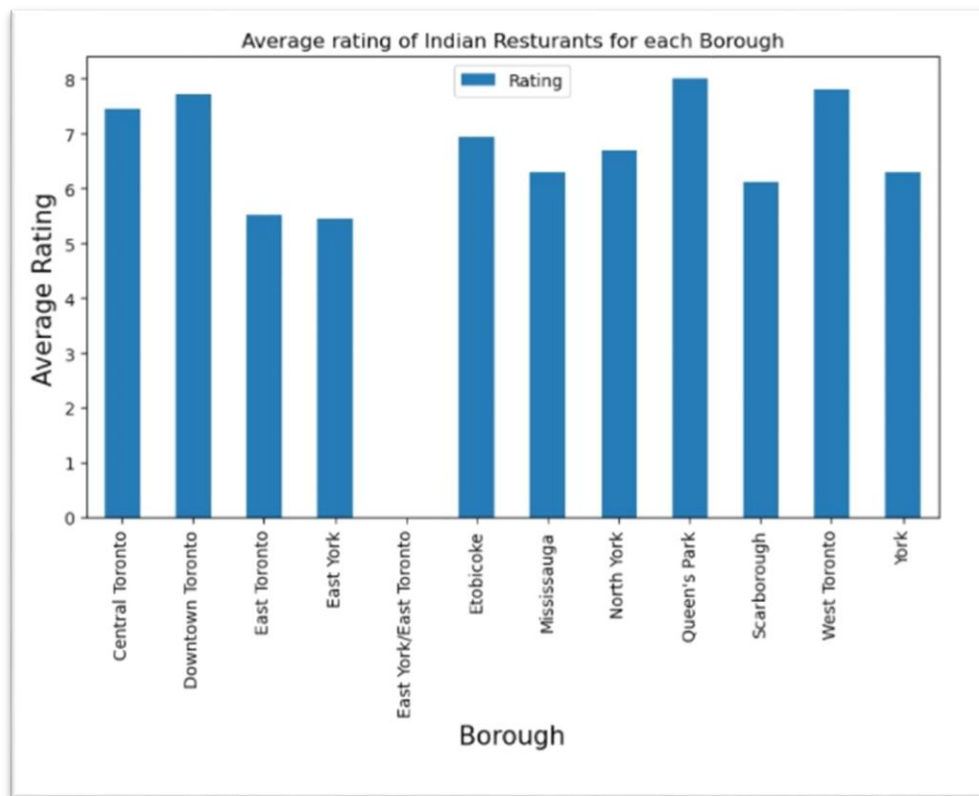
	Neighbourhood	Average Rating
20	The Annex, North Midtown, Yorkville	8.400000
4	Christie	8.300000
11	High Park, The Junction South	8.300000
5	Church and Wellesley	8.050000
15	Ontario Provincial Government	8.000000
26	Wexford, Maryvale	8.000000
2	Brockton, Parkdale Village, Exhibition Place	7.950000
19	St. James Town, Cabbagetown	7.900000
6	Davisville	7.333333
10	Harbourfront East, Union Station, Toronto Islands	7.300000

- Similarly, we found out the average rating of Indian restaurants for each Borough.


```
toronto_borough_stats.sort_values(['Average Rating'],ascending=False).head()
```

	Borough	Average Rating
8	Queen's Park	8.0000
10	West Toronto	7.8000
1	Downtown Toronto	7.7125

Then, we created a bar plot that would show the average rating of Indian restaurants of each borough.



- Using the pandas library and the visualization library matplotlib, we discovered that Queen's Park, West Toronto and Downtown Toronto are the top 3 boroughs that have higher ratings of Indian restaurant.

Conclusion:

From our analysis, we can answer the questions that were asked in the beginning.

1. 'Banjara Indian Cuisine' is the best choice if you are looking for the best Indian food in Toronto as it has the highest rating, highest number of likes and tips among all the restaurants in Toronto. This restaurant is located in Christie neighborhood which is in Downtown Toronto.
2. 'India Bazaar, The Beaches West' neighborhood has the highest number of Indian restaurants (7) in Toronto than any other neighborhoods in Toronto.
3. East Toronto has 9 Indian restaurants, which is the highest among all the boroughs. However, it is the borough with least average rating of Indian restaurants in Toronto.
4. The Annex, North Midtown, Yorkville, Christie, High Park, The Junction South are the top 5 neighborhoods that you would want to go if you are looking for best restaurants in Toronto to eat Indian food.
5. Queen's Park, West Toronto, Downtown Toronto are the top 3 boroughs for average rating of Indian restaurants.¶

There is always a room for improvement as this analysis is only based upon the data that was available. More data can be collected and more parameters can be included that can help find out the best Indian restaurants in Toronto.