Exploring Toronto Neighborhoods - To open a new Indian Restaurant

Introduction

As a part of IBM Data Science professional certification Capstone Project, we have to work on the real data to get an experience of what a data scientist go through in real life. I would like to explore the city Toronto and the objectives of this assignments is to define a business problem, find data in the web and, use Foursquare location data to compare different neighborhoods of Toronto to figure out which neighborhood is suitable for starting a new restaurant business. I go through all the process in a step by step manner from Business problem, data preparation to final analysis and finally will provide a conclusion that can be leveraged by the business stakeholders to make their decisions.

1. Description of the Problem

Problem Statement: Prospects of opening an Indian Restaurant in Toronto, Canada**.**

Toronto, the capital of the province of Ontario, is the most widespread Canadian city. Its diversity is reflected in Toronto's ethnic neighborhoods such as Chinatown, Corso Italia, Greektown, Kensington Market, Koreatown, Little India, Little Italy, Little Jamaica, Little Portugal & Roncesvalles. One of the most immigrant-friendly cities in Canada with more than half of the entire Indian Canadian population be located in Toronto. it might be one of the best places to start an Indian restaurant. In this project we will go through step by step process to decide whether it is a good idea to open an Indian restaurant. We analyze the neighborhoods in Toronto to identify the most profitable area since the success of the restaurant depends on the people and ambience. Since we already know that Toronto shelter a greater number of Indians than any other city in Canada, it is a good idea to start the restaurant here. Let us analyze and explore whether it is a profitable idea or not. If profitable in which place, we can start the restaurant, so that it gets more profit to the owner.

Target Audience

Who will be more interested in this project? What type of clients or a group of people would be benefitted?

1. Business personnel who wants to invest or open an Indian restaurant in Toronto. This analysis will be a comprehensive guide to start or expand restaurants targeting the Indian crowd.
2. Freelancer who loves to have their own restaurant as a side business. This analysis will give an idea, how beneficial it is to open a restaurant and what are the pros and cons of this business.
3. Indian crowd who wants to find neighborhoods with lots of option for Indian restaurants.
4. Business Analyst or Data Scientists, who wish to analyze the neighborhoods of Toronto

using Exploratory Data Analysis and other statistical & machine learning techniques to obtain all the necessary data, perform some operations on it and, finally be able to tell a story out of it.

2. Data acquisition and cleaning:

2.1 Data Sources

a) I'm using "List of Postal code of Canada: M" (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M) wiki page to get all the information about the neighborhoods present in Toronto. This page has the postal code, borough & the name of all the neighborhoods present in Toronto.

b) Then I'm using "https://cocl.us/Geospatial_data" csv file to get all the geographical coordinates of the neighborhoods.

c) To get information about the distribution of population by their ethnicity I'm using "Demographics of Toronto" (https://en.m.wikipedia.org/wiki/Demographics_of_Toronto#Ethnic_diversity) wiki page. Using this page I'm going to identify the neighborhoods which are densely populated with Indians as it might be helpful in identifying the suitable neighborhood to open a new Indian restaurant.

d) To get location and other information about various venues in Toronto I'm using Foursquare's explore API. Using the Foursquare's explore API (which gives venues recommendations), I'm fetching details about the venues up present in Toronto and collected their names, categories and locations (latitude and longitude).
From Foursquare API (https://developer.foursquare.com/docs), I retrieved the following for each venue:

- **Name**: The name of the venue.
- **Category**: The category type as defined by the API.
- **Latitude**: The latitude value of the venue.
- **Longitude**: The longitude value of the venue.

2.2 Data Cleaning

a) Scraping Toronto Neighborhoods Table from Wikipedia

Scraped the following Wikipedia page, "**List of Postal code of Canada: M**" in order to obtain the data about the Toronto & the Neighborhoods in it.

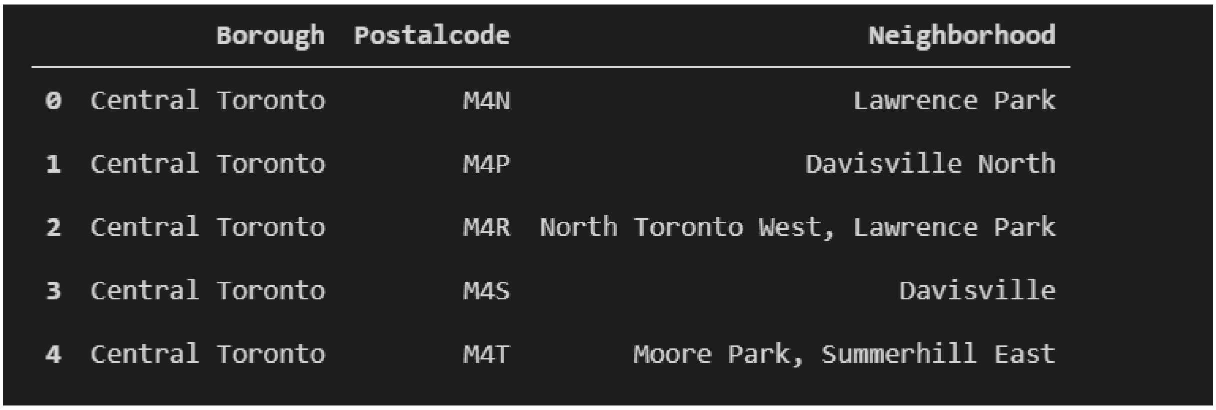
Assumptions made to attain the below DataFrame:

a. Dataframe will consist of three columns: PostalCode, Borough, and Neighborhood
b. Only the cells that have an assigned borough will be processed. Borough that is not assigned are ignored.
c. More than one neighborhood can exist in one postal code area. For example, in the table on the Wikipedia page, you will notice that M5A is listed twice and has two neighborhoods: Harbourfront and Regent Park. These two rows will be combined into

one row with the neighborhoods separated with a comma as shown in row 11 in the above table.

d. If a cell has a borough but a Not assigned neighborhood, then the neighborhood will be the same as the borough.

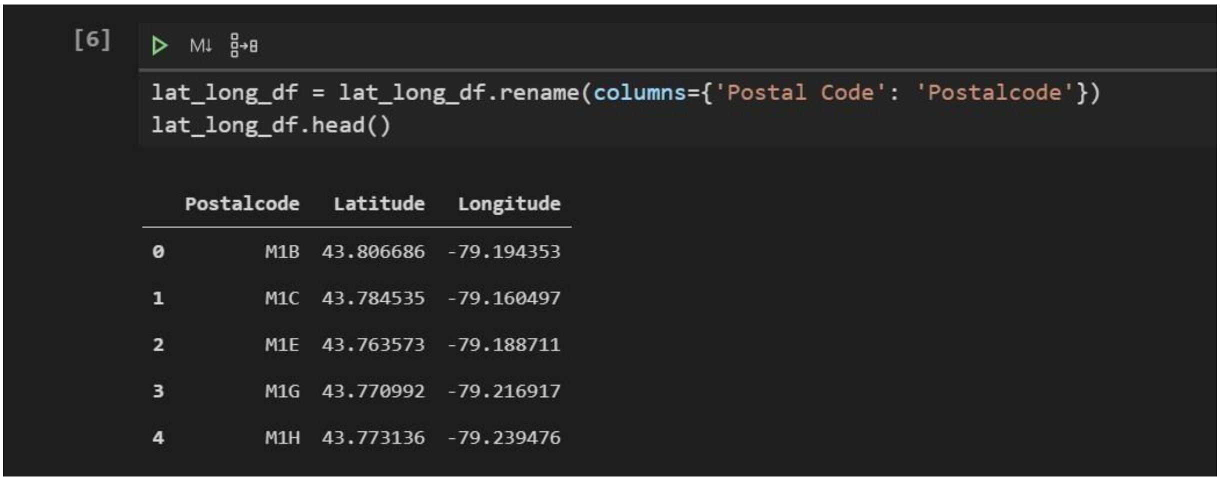
Note: Wikipedia — package is used to scrape the data from wiki.



	Borough	Postalcode	Neighborhood
0	Central Toronto	M4N	Lawrence Park
1	Central Toronto	M4P	Davisville North
2	Central Toronto	M4R	North Toronto West, Lawrence Park
3	Central Toronto	M4S	Davisville
4	Central Toronto	M4T	Moore Park, Summerhill East

b) Adding geographical coordinates to the neighbourhoods

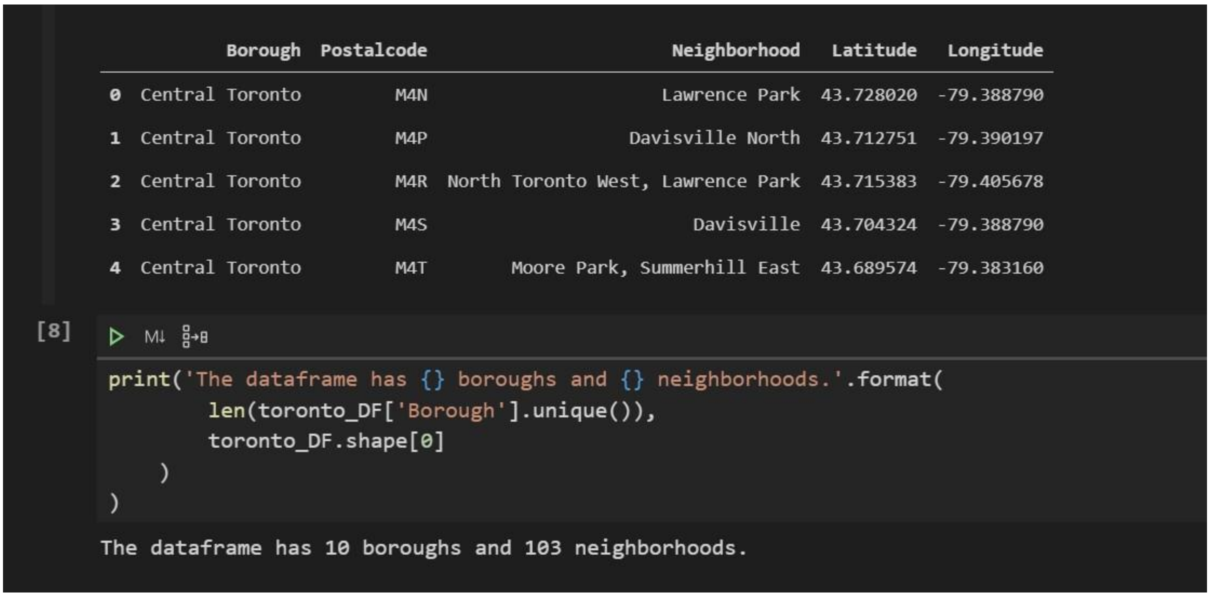
Next important step is adding the geographical coordinates to these neighbourhoods. To do so I'm extracting the data present in the Geospatial Data csv file and I'm combining it with the existing neighbourhood dataframe by merging them both based on the postal code.



```
lat_long_df = lat_long_df.rename(columns={'Postal Code': 'Postalcode'})
lat_long_df.head()
```

	Postalcode	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

I'm renaming the columns to match the existing dataframe formed from 'List of Postal code of Canada: M' wiki page. After that I'm merging both the dataframe into one by merging on the postal code.



	Borough	Postalcode	Neighborhood	Latitude	Longitude
0	Central Toronto	M4N	Lawrence Park	43.728020	-79.388790
1	Central Toronto	M4P	Davisville North	43.712751	-79.390197
2	Central Toronto	M4R	North Toronto West, Lawrence Park	43.715383	-79.405678
3	Central Toronto	M4S	Davisville	43.704324	-79.388790
4	Central Toronto	M4T	Moore Park, Summerhill East	43.689574	-79.383160

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```
print('The dataframe has {} boroughs and {} neighborhoods.'.format(
        len(toronto_DF['Borough'].unique()),
        toronto_DF.shape[0]
    )
)
```

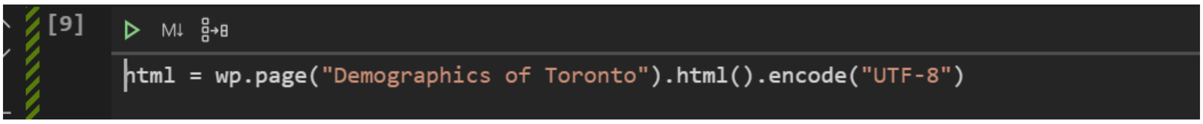
```
The dataframe has 10 boroughs and 103 neighborhoods.
```

c) Scrap the distribution of population from Wikipedia

Another factor that can help us in deciding which neighbourhood would be best option to open a restaurant is, the distribution of population based on the ethnic diversity for each neighbourhood. As this helps us in identifying the neighbourhoods which are densely populated with Indian crowd since that neighbourhood would be an ideal place to open an Indian restaurant.

Scraped the following Wikipedia page, "Demographics of Toronto" in order to obtain the data about the Toronto & the Neighbourhoods in it. Compared to all the neighbourhoods in Toronto below given neighbourhoods only had considerable amount of Indian crowd. We are examining those neighbourhood's population to identify the densely populated neighbourhoods with Indian population.

There were only six neighbourhoods in Toronto which Indian population spread across, so we are gathering the population, it's percentage in each riding in those neighbourhoods



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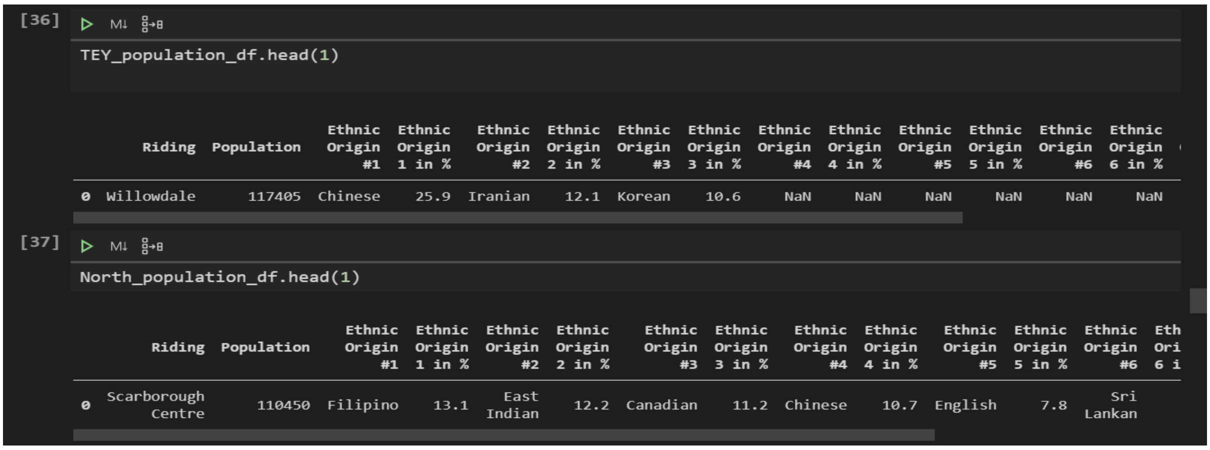
```
html = wp.page("Demographics of Toronto").html().encode("UTF-8")
```



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```
TEY_population_df.head(1)
```

	Riding	Population	Ethnic Origin #1	Ethnic Origin 1 in %	Ethnic Origin #2	Ethnic Origin 2 in %	Ethnic Origin #3	Ethnic Origin 3 in %	Ethnic Origin #4	Ethnic Origin 4 in %	Ethnic Origin #5	Ethnic Origin 5 in %	Ethnic Origin #6	Ethnic Origin 6 in %
0	Willowdale	117405	Chinese	25.9	Iranian	12.1	Korean	10.6	NaN	NaN	NaN	NaN	NaN	NaN

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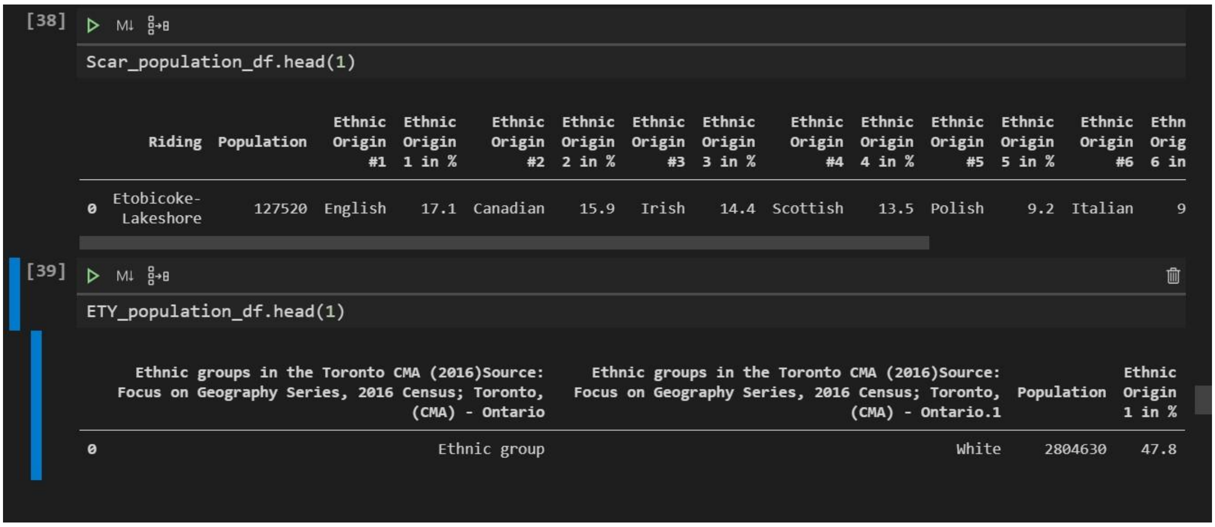
```
North_population_df.head(1)
```

	Riding	Population	Ethnic Origin #1	Ethnic Origin 1 in %	Ethnic Origin #2	Ethnic Origin 2 in %	Ethnic Origin #3	Ethnic Origin 3 in %	Ethnic Origin #4	Ethnic Origin 4 in %	Ethnic Origin #5	Ethnic Origin 5 in %	Ethnic Origin #6	Eth Ori 6 i
0	Scarborough Centre	110450	Filipino	13.1	East Indian	12.2	Canadian	11.2	Chinese	10.7	English	7.8	Sri Lankan	



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```
Scar_population_df.head(1)
```

	Riding	Population	Ethnic Origin #1	Ethnic Origin 1 in %	Ethnic Origin #2	Ethnic Origin 2 in %	Ethnic Origin #3	Ethnic Origin 3 in %	Ethnic Origin #4	Ethnic Origin 4 in %	Ethnic Origin #5	Ethnic Origin 5 in %	Ethnic Origin #6	Ethn Orig 6 in
0	Etobicoke-Lakeshore	127520	English	17.1	Canadian	15.9	Irish	14.4	Scottish	13.5	Polish	9.2	Italian	9

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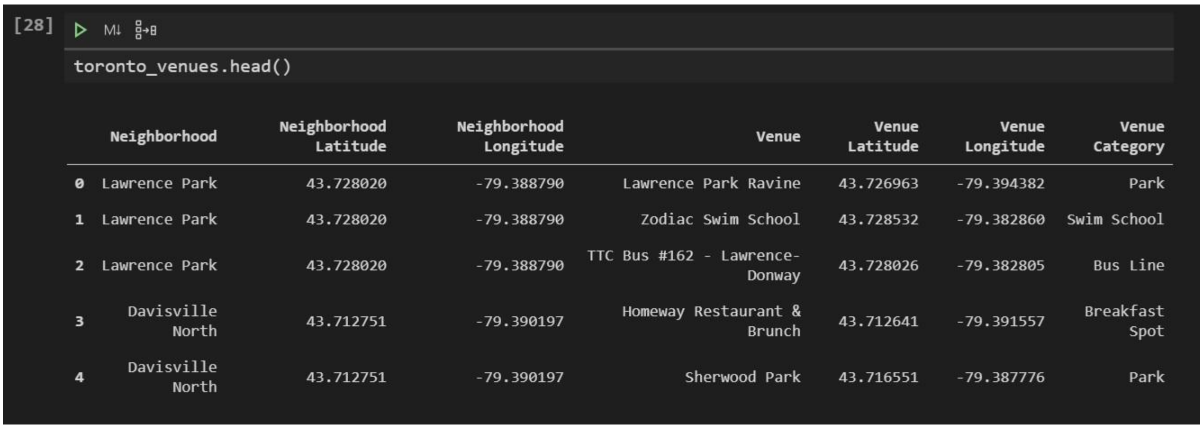
```
ETY_population_df.head(1)
```

	Ethnic groups in the Toronto CMA (2016)Source: Focus on Geography Series, 2016 Census; Toronto, (CMA) - Ontario	Ethnic groups in the Toronto CMA (2016)Source: Focus on Geography Series, 2016 Census; Toronto, (CMA) - Ontario.1	Population	Ethnic Origin 1 in %
0	Ethnic group	White	2804630	47.8

d) Get location data using Foursquare

Foursquare API is very useful online application used my many developers & other applications like Uber etc. In this project I have used it to retrieve information about the places present in the neighbourhoods of Toronto. The API returns a JSON file and we need to turn that into a data-frame. Here I've chosen 100 popular spots for each neighbourhood within a radius of 1km.



[28]

```
toronto_venues.head()
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Lawrence Park	43.728020	-79.388790	Lawrence Park Ravine	43.726963	-79.394382	Park
1	Lawrence Park	43.728020	-79.388790	Zodiac Swim School	43.728532	-79.382860	Swim School
2	Lawrence Park	43.728020	-79.388790	TTC Bus #162 - Lawrence-Donway	43.728026	-79.382805	Bus Line
3	Davisville North	43.712751	-79.390197	Homeway Restaurant & Brunch	43.712641	-79.391557	Breakfast Spot
4	Davisville North	43.712751	-79.390197	Sherwood Park	43.716551	-79.387776	Park