Applied Capstone Project - The Battle of Neighborhoods in Toronto, Canada

Introduction

Toronto is Canada's largest city and a world leader in such areas as business, finance, technology, entertainment and culture. Its large population of immigrants from all over the globe has also made Toronto one of the most multicultural cities in the world. Toronto has the largest Indo-Canadian population in Canada comprising of 10.4% (approx. 0.6 million people) Almost 51% of the entire Indo-Canadian community resides in the Greater Toronto Area. Most Indo-Canadians in the Toronto area live in Brampton, Markham, Scarborough, Etobicoke, and Mississauga. The Indo-Canadians in this region are mostly of Punjabi, Telugu, Tamil, Gujarati, Marathi, Malayalee and Goan origin. Canadian carrier Air Canada operates flights from Toronto Pearson International Airport back to India. Also, students of Indian origin make up over 35% of Ryerson University, 30% of York University, and 20% of the University of Toronto's student bodies, respectively. With its diverse culture, comes diverse food items. There are many restaurants in Toronto, each belonging to different categories like Indian, Chinese, French etc. So as part of this project, we will list and visualize all major parts of Toronto that has great Indian Restaurants.

Data

For this project we need the following data: Toronto data that contains list Boroughs, Neighborhoods along with their latitude and longitude. Data source: click here Description: This webpage contains the required information. And we will scrape this data set to explore various neighborhoods of Toronto. Indian Restaurants in each neighborhood of Toronto Data source: Foursquare API Description: By using this API we will get all the venues in each neighborhood. We can filter these venues to get only Indian Restaurants. We can then get the likes, ratings etc., to rank the restaurants. GeoSpace data Data source: click here By using this data we draw boundaries and visualize venues on map.

Approach

View the Toronto's city data from: URL Using Web Scrapping technique, collect required data. Using Foursquare API, we will find all venues for each neighborhood. Filter out all venues that are Indian Restaurants. Find rating, tips and like count for each Indian Restaurants using Foursquare API. Using rating for each restaurant, we will sort that data. Visualize the Ranking of neighborhoods using folium library(python)

Questions that can be asked using the above-mentioned datasets

What is best location in Toronto for Indian Cuisine? Which areas have potential Indian Restaurant Market? Which all areas lack Indian Restaurants? Which is the best place to stay if I prefer Indian Cuisine?

ANALYSIS

In [5]:
```
from bs4 import BeautifulSoup as bs # for webscrapping
import requests # for handling request to websites
import pandas as pd # for data analysis and manipulation
import numpy as np #for mathematical computing
import matplotlib.pyplot as plt # for plotting
import seaborn as sns# for plotting
import folium # map rendering library
from folium import plugins # to group nearby locations
from pandas.io.json import json_normalize # tranform JSON file into a pandas dat
aframe
from geopy.geocoders import Nominatim # convert an address into latitude and lon
gitude values
```

Loading web page

In [6]:
```
page = requests.get('https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canad
a:_M').text
soup = bs(page,'html.parser')
```

Viewing the required data from webpage,extracting data and making a dataframe

In [7]:
```
table_post=soup.find('table')
```

In [8]:
```
fields = table_post.find_all('td') # All required values are at 'td'

postcode = [] #Empty list to be appended
borough = [] #Empty list to be appended
neighbourhood = [] #Empty list to be appended

for i in range(0, len(fields),3): # Range Intitalizing from 0 to len(fields) whi
ch is no of 'td'=540, and step size of 3, since there are 3 columns
    postcode.append(fields[i].text.strip()) # field 0, it is post code
    borough.append(fields[i+1].text.strip()) # filed 1, it is borough
    neighbourhood.append(fields[i+2].text.strip()) # field 2, it is neighborhood

df = pd.DataFrame(data=[postcode, borough, neighbourhood]).transpose()# since al
l are list, we have to transform it to columns
df.columns = ['Postcode', 'Borough', 'Neighborhood']
df.head()
```

Out[8]:

	Postcode	Borough	Neighborhood
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	Regent Park, Harbourfront

Dataframe without Borough as not assigned

In [11]:
```
df_reqd_1 = df[df['Borough'] != 'Not assigned'].reset_index(drop=True)
df_reqd_1.head()
```

Out[11]:

	Postcode	Borough	Neighborhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Regent Park, Harbourfront
3	M6A	North York	Lawrence Manor, Lawrence Heights
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government

Loading geospatial data and merging it into a single data frame

In [12]:
```
geo_url = 'https://cocl.us/Geospatial_data'
df_geo = pd.read_csv(geo_url)
df_geo.rename(columns={'Postal Code':'Postcode'}, inplace=True) #Renaming 'Postal Code' from GeoSpatial df to 'Postcode', same as df_reqd_1
df_geo.head()
```

Out[12]:

	Postcode	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

In [13]:
```
df_reqd_2 = pd.merge(df_reqd_1,df_geo,on='Postcode')
print(df_reqd_2.isnull().sum())
df_reqd_2.head()
```

```
Postcode        0
Borough         0
Neighborhood    0
Latitude        0
Longitude       0
dtype: int64
```

Out[13]:

	Postcode	Borough	Neighborhood	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	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494

Defining a function to get the latitude and longitude values

In [14]:
```
def geo_location(address):
    geolocator = Nominatim(user_agent="toronto_explorer")
    location = geolocator.geocode(address)
    latitude = location.latitude
    longitude = location.longitude
    return latitude,longitude
    print('The geograpical coordinate of {} are {}, {}.'.format(address,latitud
e, longitude))
```

Visualizing the map

In [19]:
```
map_toronto = folium.Map(location=geo_location('Toronto'), zoom_start=10,tiles='
https://api.mapbox.com/styles/v1/explorer020/cka9yy2dn14l51iptugr1shzf/tiles/256
/{z}/{x}/{y}@2x?access_token=pk.eyJ1IjoiZXhwbG9yZXIwMjAiLCJhIjoiY2thOXhvYjdyMHJo
YzJycDRlbmw3YTg3ZiJ9.T9QjJc87oYLSknnlBH21Tg',attr='XXX Mapbox Attribution') # ca
lling the geo_location function by passing address as Toronto.

# add markers to map
for lat, lng, borough, neighborhood in zip(df_reqd_2['Latitude'], df_reqd_2['Lon
gitude'], df_reqd_2['Borough'], df_reqd_2['Neighborhood']):
    label = '{}, {}'.format(neighborhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=8,
        popup=label,
        color='blue',
        fill=True,
        fill_color='orange',
        fill_opacity=0.7,
        parse_html=False).add_to(map_toronto)

map_toronto
```

Out[19]: Make this Notebook Trusted to load map: File -> Trust Notebook

Here we can see that there is 1 place which belongs to Mississauga but it is wrongly mentioned under the Toronto City. We will remove it and plot it again.

In [18]:
```
df_reqd_2=df_reqd_2[~df_reqd_2["Borough"].isin(['Mississauga'])] #dropping Missi
ssauga
# create map of Toronto using latitude and longitude values
map_toronto = folium.Map(location=geo_location('Toronto'), zoom_start=11,tiles='
https://api.mapbox.com/styles/v1/explorer020/cka9yy2dn14l51iptugr1shzf/tiles/256
/{z}/{x}/{y}@2x?access_token=pk.eyJ1IjoiZXhwbG9yZXIwMjAiLCJhIjoiY2thOXhvYjdyMHJo
YzJycDRlbmw3YTg3ZiJ9.T9QjJc87oYLSknnlBH21Tg',attr='XXX Mapbox Attribution')

# add markers to map
for lat, lng, borough, neighborhood in zip(df_reqd_2['Latitude'], df_reqd_2['Lon
gitude'], df_reqd_2['Borough'], df_reqd_2['Neighborhood']):
    label = '{}, {}'.format(neighborhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=8,
        popup=label,
        color='yellow',
        fill=True,
        fill_color='Green',
        fill_opacity=0.7,
        parse_html=False).add_to(map_toronto)


map_toronto.save('map_1.html')
map_toronto
```

Out[18]: Make this Notebook Trusted to load map: File -> Trust Notebook

Loading foursquare API

In [20]:
```
CLIENT_ID='ITW1NY0MRQ5OBN3XE1CW10OZZOYG2YE10244WWQVPFZ1AHHC'
CLIENT_SECRET='5ESDAEHJEPDCCAQEPOXHPACLIRXN3WEKFRLDZOLW14QKDUK5'
VERSION='20200622'
```

Now, let's get the top 100 venues that are in within a radius of 3000 meters.

Defining a Function to get list of neighborhood

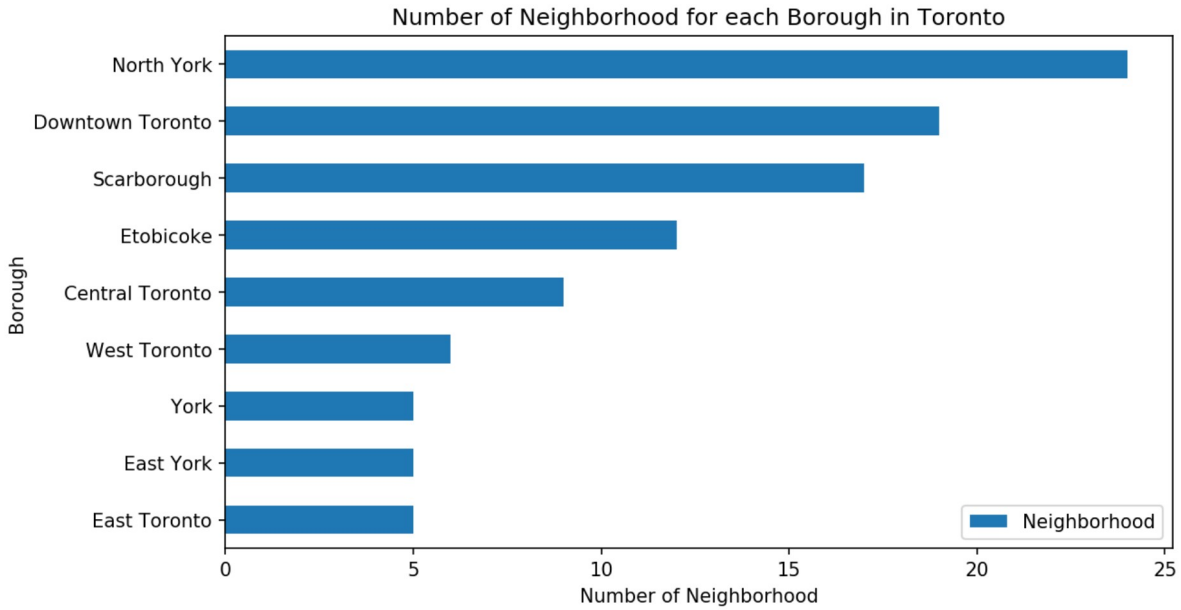
In [21]:
```
def get_venues(lat,lng):

    #set variables
    radius=3000
    LIMIT=100

    #url to fetch data from foursquare api
    url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_sec
ret={}&v={}&ll={},{}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

    # get all the data
    results = requests.get(url).json()
    #results = json_normalize(results)
    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']
    df1 = pd.DataFrame(venue_details,columns=column_names)
    return df1
```

Defining a function to get venue details like like count , rating , tip counts for a given venue id. This will be used for ranking.

In [22]:
```
def get_venue_details(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()
    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']
    df2 = pd.DataFrame(venue_details,columns=column_names)
    return df2
```

Visualizing No. of Neighborhood in each Borough

In [23]:
```
plt.figure(figsize=(9,5), dpi=150)
# title
plt.title('Number of Neighborhood for each Borough in Toronto')
#On x-axis
plt.xlabel('Number of Neighborhood', fontsize = 10)
#On y-axis
plt.ylabel('Borough', fontsize=10)
#giving a bar plot
df_reqd_2.groupby('Borough')['Neighborhood'].count().sort_values().plot(kind='barh')
#legend
plt.legend()
#displays the plot
plt.show()
```



Let us find out number of Indian Restaurants in Each Neighborhood.

In [25]:
```
column_names=['Borough', 'Neighborhood', 'ID','Name']
indian_rest_toronto=pd.DataFrame(columns=column_names)
count=1
for row in df_reqd_2.values.tolist():
    Postcode, Borough, Neighborhood, Latitude, Longitude = row
    venues = get_venues(Latitude,Longitude)
    indian_resturants=venues[venues['Category']=='Indian Restaurant']
    print('(',count,'/',len(df_reqd_2),')','Indian Resturants in '+Neighborhoo
d+', '+Borough+':'+str(len(indian_resturants)))
    for resturant_detail in indian_resturants.values.tolist():
        id, name , category=resturant_detail
        indian_rest_toronto = indian_rest_toronto.append({'Borough': Borough,
                                                'Neighborhood': Neighborhood,
                                                'ID': id,
                                                'Name' : name
                                               }, ignore_index=True)
    count+=1
```

```
( 1 / 102 ) Indian Resturants in Parkwoods, North York:1
( 2 / 102 ) Indian Resturants in Victoria Village, North York:2
( 3 / 102 ) Indian Resturants in Regent Park, Harbourfront, Downtown Toronto:0
( 4 / 102 ) Indian Resturants in Lawrence Manor, Lawrence Heights, North York:
0
( 5 / 102 ) Indian Resturants in Queen's Park, Ontario Provincial Government,
Downtown Toronto:0
( 6 / 102 ) Indian Resturants in Islington Avenue, Humber Valley Village, Etob
icoke:1
( 7 / 102 ) Indian Resturants in Malvern, Rouge, Scarborough:0
( 8 / 102 ) Indian Resturants in Don Mills, North York:0
( 9 / 102 ) Indian Resturants in Parkview Hill, Woodbine Gardens, East York:2
( 10 / 102 ) Indian Resturants in Garden District, Ryerson, Downtown Toronto:0
( 11 / 102 ) Indian Resturants in Glencairn, North York:0
( 12 / 102 ) Indian Resturants in West Deane Park, Princess Gardens, Martin Gr
ove, Islington, Cloverdale, Etobicoke:0
( 13 / 102 ) Indian Resturants in Rouge Hill, Port Union, Highland Creek, Scar
borough:0
( 14 / 102 ) Indian Resturants in Don Mills, North York:2
( 15 / 102 ) Indian Resturants in Woodbine Heights, East York:6
( 16 / 102 ) Indian Resturants in St. James Town, Downtown Toronto:0
( 17 / 102 ) Indian Resturants in Humewood-Cedarvale, York:2
( 18 / 102 ) Indian Resturants in Eringate, Bloordale Gardens, Old Burnhamthor
pe, Markland Wood, Etobicoke:1
( 19 / 102 ) Indian Resturants in Guildwood, Morningside, West Hill, Scarborou
gh:0
( 20 / 102 ) Indian Resturants in The Beaches, East Toronto:3
( 21 / 102 ) Indian Resturants in Berczy Park, Downtown Toronto:0
( 22 / 102 ) Indian Resturants in Caledonia-Fairbanks, York:2
( 23 / 102 ) Indian Resturants in Woburn, Scarborough:3
( 24 / 102 ) Indian Resturants in Leaside, East York:1
( 25 / 102 ) Indian Resturants in Central Bay Street, Downtown Toronto:0
( 26 / 102 ) Indian Resturants in Christie, Downtown Toronto:2
( 27 / 102 ) Indian Resturants in Cedarbrae, Scarborough:4
( 28 / 102 ) Indian Resturants in Hillcrest Village, North York:0
( 29 / 102 ) Indian Resturants in Bathurst Manor, Wilson Heights, Downsview No
rth, North York:1
( 30 / 102 ) Indian Resturants in Thorncliffe Park, East York:0
( 31 / 102 ) Indian Resturants in Richmond, Adelaide, King, Downtown Toronto:0
( 32 / 102 ) Indian Resturants in Dufferin, Dovercourt Village, West Toronto:4
( 33 / 102 ) Indian Resturants in Scarborough Village, Scarborough:3
( 34 / 102 ) Indian Resturants in Fairview, Henry Farm, Oriole, North York:0
( 35 / 102 ) Indian Resturants in Northwood Park, York University, North York:
0
( 36 / 102 ) Indian Resturants in East Toronto, Broadview North (Old East Yor
k), East York:2
( 37 / 102 ) Indian Resturants in Harbourfront East, Union Station, Toronto Is
lands, Downtown Toronto:0
( 38 / 102 ) Indian Resturants in Little Portugal, Trinity, West Toronto:1
( 39 / 102 ) Indian Resturants in Kennedy Park, Ionview, East Birchmount Park,
Scarborough:0
( 40 / 102 ) Indian Resturants in Bayview Village, North York:0
( 41 / 102 ) Indian Resturants in Downsview, North York:0
( 42 / 102 ) Indian Resturants in The Danforth West, Riverdale, East Toronto:1
( 43 / 102 ) Indian Resturants in Toronto Dominion Centre, Design Exchange, Do
wntown Toronto:0
( 44 / 102 ) Indian Resturants in Brockton, Parkdale Village, Exhibition Plac
e, West Toronto:1
( 45 / 102 ) Indian Resturants in Golden Mile, Clairlea, Oakridge, Scarboroug
h:1
( 46 / 102 ) Indian Resturants in York Mills, Silver Hills, North York:1
( 47 / 102 ) Indian Resturants in Downsview, North York:0
( 48 / 102 ) Indian Resturants in India Bazaar, The Beaches West, East Toront
o:2
```

How many Indian Restaurants did we get? Are there any null values?

In [26]:
```
print(indian_rest_toronto.shape)
print(indian_rest_toronto.isnull().sum())
indian_rest_toronto.head()
```

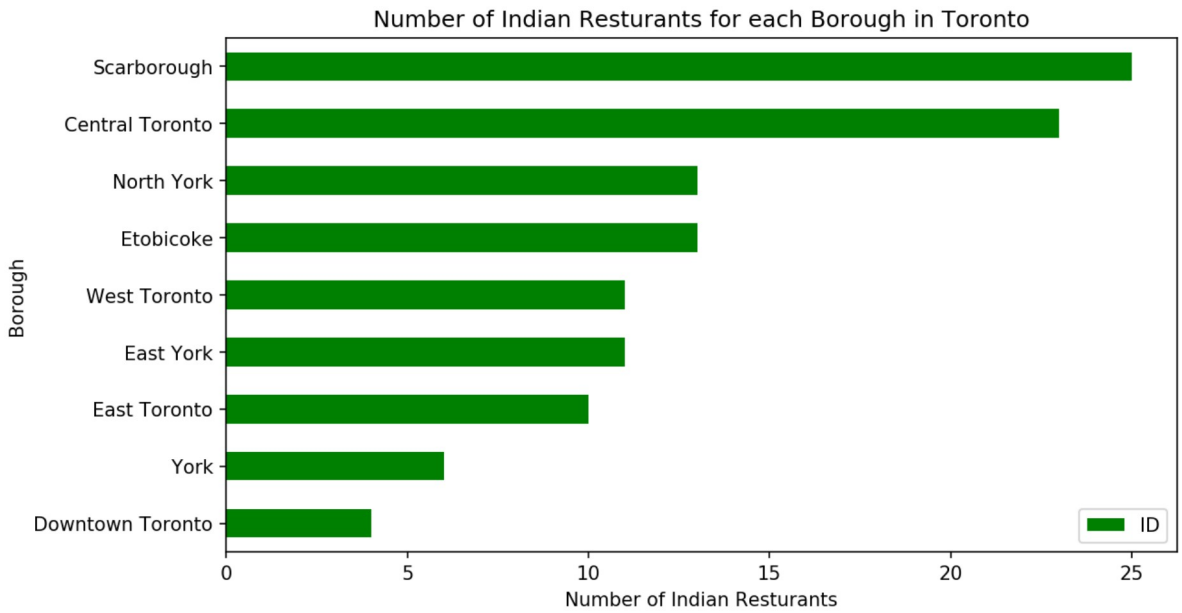
```
(116, 4)
Borough         0
Neighborhood    0
ID              0
Name            0
dtype: int64
```

Out[26]:

	Borough	Neighborhood	ID	Name
0	North York	Parkwoods	4c27cddd9fb5d13a8cab9857	Patna Kebab House
1	North York	Victoria Village	4b9bccbef964a520ae2636e3	Sultan Of Samosas
2	North York	Victoria Village	4c27cddd9fb5d13a8cab9857	Patna Kebab House
3	Etobicoke	Islington Avenue, Humber Valley Village	4af1c64ff964a5200ae321e3	Chutneys Fine Indian Cuisine
4	East York	Parkview Hill, Woodbine Gardens	4b9bccbef964a520ae2636e3	Sultan Of Samosas

Let us look Indian Restaurants in each Borough

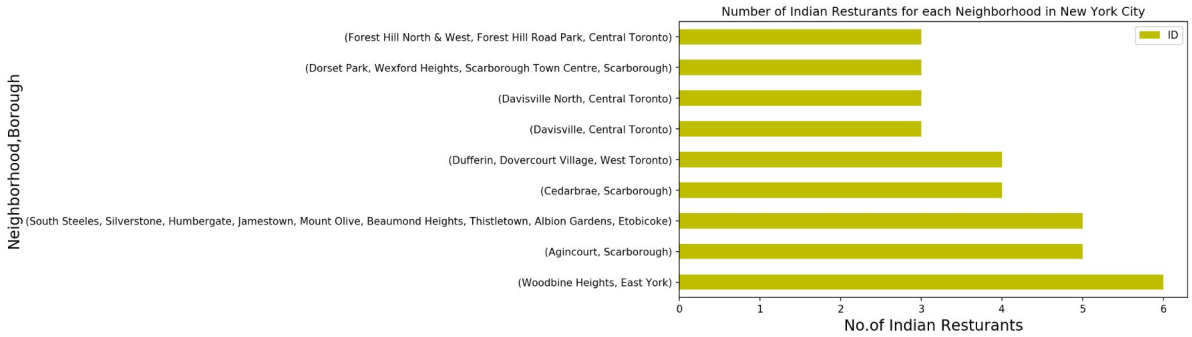
In [27]:
```
plt.figure(figsize=(9,5), dpi = 150)
# title
plt.title('Number of Indian Resturants for each Borough in Toronto')
#On x-axis
plt.xlabel('Number of Indian Resturants', fontsize = 10)
#On y-axis
plt.ylabel('Borough', fontsize=10)
#giving a bar plot
indian_rest_toronto.groupby('Borough')['ID'].count().sort_values().plot(kind='barh',color='Green')
#legend
plt.legend()
#displays the plot
plt.show()
```



Scarborough and Central Toronto has the maximum number of Indian Restaurants, while Downtown has the least.

Which Neighborhood has the highest number of Indian Restaurants?

In [28]:
```
plt.figure(figsize=(9,5), dpi = 150)
# title
plt.title('Number of Indian Resturants for each Neighborhood in New York City')
#On x-axis
plt.xlabel('No.of Indian Resturants', fontsize = 15)
#On y-axis
plt.ylabel('Neighborhood', fontsize=15)
#giving a bar plot
#indian_rest_toronto.groupby('Neighborhood')['ID'].count().nlargest(5).plot(kind
='barh', color='y')
indian_rest_toronto.groupby(['Neighborhood','Borough'])['ID'].count().nlargest
(9).plot(kind='barh', color='y')


#legend
plt.legend()
#displays the plot
plt.show()
```



We can see that Woodbine, East York has the highest number of Indian Restaurants than any other Borough of Toronto.

Now let us get the Ranking of Each Restaurant based on Likes, Ratings, Tips from the FourSquare API.

In [29]:
```
column_names=['Borough', 'Neighborhood', 'ID','Name','Likes','Rating','Tips']
indian_rest_stats_toronto=pd.DataFrame(columns=column_names)
count=1


for row in indian_rest_toronto.values.tolist():
    Borough,Neighborhood,ID,Name=row
    try:
        venue_details=get_venue_details(ID)
        print(venue_details)
        id,name,likes,rating,tips=venue_details.values.tolist()[0]
    except IndexError:
        print('No data available for id=',ID)
        # we will assign 0 value for these resturants as they may have been
        #recently opened or details does not exist in FourSquare Database
        id,name,likes,rating,tips=[0]*5
    print('(',count,'/',len(indian_rest_toronto),')','processed')
    indian_rest_stats_toronto = indian_rest_stats_toronto.append({'Borough': Bor
ough,
                                                'Neighborhood': Neighborhood,
                                                'ID': id,
                                                'Name' : name,
                                                'Likes' : likes,
                                                'Rating' : rating,
                                                'Tips' : tips
                                               }, ignore_index=True)
    count+=1
```

```
                          ID               Name  Likes  Rating  Tips
0  4c27cddd9fb5d13a8cab9857  Patna Kebab House      4     8.0     6
( 1 / 116 ) processed
                          ID               Name  Likes  Rating  Tips
0  4b9bccbef964a520ae2636e3  Sultan Of Samosas     29     8.6    24
( 2 / 116 ) processed
                          ID               Name  Likes  Rating  Tips
0  4c27cddd9fb5d13a8cab9857  Patna Kebab House      4     8.0     6
( 3 / 116 ) processed
                          ID                          Name  Likes  Rating  Tips
0  4af1c64ff964a5200ae321e3  Chutneys Fine Indian Cuisine      5     6.9    10
( 4 / 116 ) processed
                          ID               Name  Likes  Rating  Tips
0  4b9bccbef964a520ae2636e3  Sultan Of Samosas     29     8.6    24
( 5 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
0  507a19e5e4b0602b62f73d11  Faley Restaurant      6     6.7     4
( 6 / 116 ) processed
                          ID                        Name  Likes  Rating  Tips
0  4daf08e66e81e2dffdd4fe40  Iqbal Kebab & Sweet Centre     13     7.9     6
( 7 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
0  507a19e5e4b0602b62f73d11  Faley Restaurant      6     6.7     4
( 8 / 116 ) processed
                          ID          Name  Likes  Rating  Tips
0  4ae0c7a8f964a520638221e3  Udupi Palace     79     8.7    31
( 9 / 116 ) processed
                          ID               Name  Likes  Rating  Tips
0  4b9bccbef964a520ae2636e3  Sultan Of Samosas     29     8.6    24
( 10 / 116 ) processed
                          ID       Name  Likes  Rating  Tips
0  4afc9816f964a520312422e3  Motimahal     25     8.1    13
( 11 / 116 ) processed
                          ID                        Name  Likes  Rating  Tips
0  4daf08e66e81e2dffdd4fe40  Iqbal Kebab & Sweet Centre     13     7.9     6
( 12 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
0  4bac30a2f964a52018ea3ae3  Bombay Chowpatty      7     7.1     5
( 13 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
0  507a19e5e4b0602b62f73d11  Faley Restaurant      6     6.7     4
( 14 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
0  52418b0b7e48222eea81d2d2  Pukka Restaurant     41     9.0    26
( 15 / 116 ) processed
                          ID                   Name  Likes  Rating  Tips
0  4c62c59ce1621b8dd0332453  Roti Cuisine of India     40     8.7    19
( 16 / 116 ) processed
                          ID                                Name  Likes  \
0  5809314638faf998ad00761d  Chaska Indian Street Food Obsession     10

   Rating  Tips
0     7.0     9
( 17 / 116 ) processed
                          ID          Name  Likes  Rating  Tips
0  4ae0c7a8f964a520638221e3  Udupi Palace     79     8.7    31
( 18 / 116 ) processed
                          ID       Name  Likes  Rating  Tips
0  4afc9816f964a520312422e3  Motimahal     25     8.1    13
( 19 / 116 ) processed
                          ID          Name  Likes  Rating  Tips
0  4dcd7c6352b1f8915b7e7f7e  Delhi Bistro      6     6.9     3
( 20 / 116 ) processed
                          ID              Name  Likes  Rating  Tips
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-29-65fe3d12c109> in <module>
      7     Borough,Neighborhood,ID,Name=row
      8     try:
----> 9         venue_details=get_venue_details(ID)
     10         print(venue_details)
     11         id,name,likes,rating,tips=venue_details.values.tolist()[0]

<ipython-input-22-f11c88813679> in get_venue_details(venue_id)
     10     # get all the data
     11     results = requests.get(url).json()
---> 12     venue_data=results['response']['venue']
     13     venue_details=[]
     14     try:

KeyError: 'venue'
```

We got the rankings and ratings

In [30]:
```
print('DataFrame has :',indian_rest_stats_toronto.shape[0],'rows and', indian_re
st_stats_toronto.shape[1],'columns')
indian_rest_stats_toronto.head()
```

```
DataFrame has : 50 rows and 7 columns
```

Out[30]:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
0	North York	Parkwoods	4c27cddd9fb5d13a8cab9857	Patna Kebab House	4	8.0	6
1	North York	Victoria Village	4b9bccbef964a520ae2636e3	Sultan Of Samosas	29	8.6	24
2	North York	Victoria Village	4c27cddd9fb5d13a8cab9857	Patna Kebab House	4	8.0	6
3	Etobicoke	Islington Avenue, Humber Valley Village	4af1c64ff964a5200ae321e3	Chutneys Fine Indian Cuisine	5	6.9	10
4	East York	Parkview Hill, Woodbine Gardens	4b9bccbef964a520ae2636e3	Sultan Of Samosas	29	8.6	24

As we are using FourSquare API to fetch the details of each Indian Restaurants, it comes under Premium Call and has a Limit of 500 Calls/Day. So, let us save the DataFrame to a CSV File, and from here on we will use the CSV file for further manipulations.¶

In [31]:
```
indian_rest_stats_toronto.to_csv('indian_rest_stats_toronto.csv', index=False)
print('File Saved in your directory as indian_rest_stats_toronto.csv')
```

```
File Saved in your directory as indian_rest_stats_toronto.csv
```

Loading the file

In [32]:
```
indian_rest_stats_toronto_csv=pd.read_csv('indian_rest_stats_toronto.csv')
indian_rest_stats_toronto_csv.head()
```

Out[32]:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
0	North York	Parkwoods	4c27cddd9fb5d13a8cab9857	Patna Kebab House	4	8.0	6
1	North York	Victoria Village	4b9bccbef964a520ae2636e3	Sultan Of Samosas	29	8.6	24
2	North York	Victoria Village	4c27cddd9fb5d13a8cab9857	Patna Kebab House	4	8.0	6
3	Etobicoke	Islington Avenue, Humber Valley Village	4af1c64ff964a5200ae321e3	Chutneys Fine Indian Cuisine	5	6.9	10
4	East York	Parkview Hill, Woodbine Gardens	4b9bccbef964a520ae2636e3	Sultan Of Samosas	29	8.6	24

Indian Restaurants based on MAX Likes.

In [33]:
```
print(indian_rest_stats_toronto_csv.iloc[indian_rest_stats_toronto_csv['Likes'].
idxmax()])
```

```
Borough                 Downtown Toronto
Neighborhood                    Christie
ID              4adb969ef964a520332921e3
Name              Banjara Indian Cuisine
Likes                                142
Rating                               8.7
Tips                                  75
Name: 26, dtype: object
```

Indian restaurants based on highest ratings

In [34]:
```
print(indian_rest_stats_toronto_csv.iloc[indian_rest_stats_toronto_csv['Rating
'].idxmax()])
```

```
Borough                              York
Neighborhood          Humewood-Cedarvale
ID              52418b0b7e48222eea81d2d2
Name                    Pukka Restaurant
Likes                                 41
Rating                                 9
Tips                                  26
Name: 14, dtype: object
```

Indian restaurants based on max tips

In [35]:
```
print(indian_rest_stats_toronto_csv.iloc[indian_rest_stats_toronto_csv['Tips'].idxmax()])
```

```
Borough                 Downtown Toronto
Neighborhood                    Christie
ID              4adb969ef964a520332921e3
Name              Banjara Indian Cuisine
Likes                                142
Rating                               8.7
Tips                                  75
Name: 26, dtype: object
```

Top Borough for Indian Restaurants based on Average Ratings.

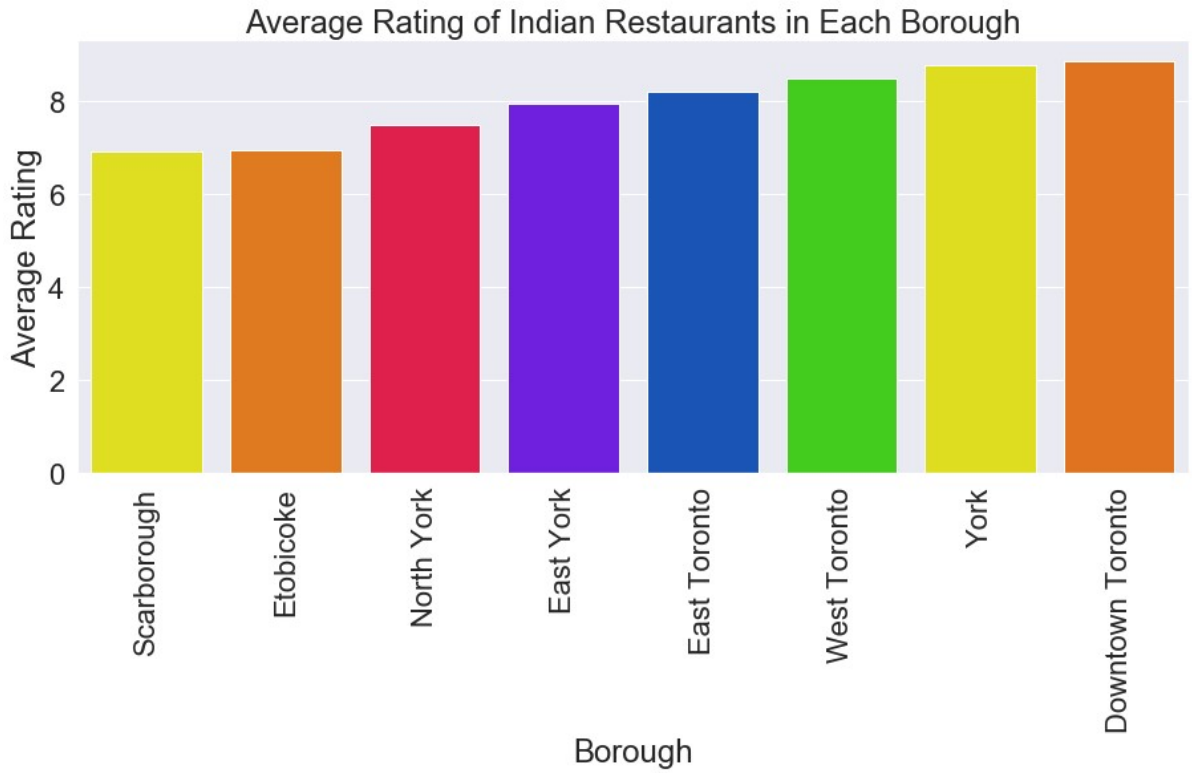
In [36]:
```
toronto_borough_stats=indian_rest_stats_toronto_csv.groupby('Borough')['Rating'].mean().reset_index()
toronto_borough_stats.columns=['Borough','Average Rating']
toronto_borough_stats.nlargest(10,'Average Rating')
```

Out[36]:

	Borough	Average Rating
0	Downtown Toronto	8.850000
7	York	8.750000
6	West Toronto	8.466667
1	East Toronto	8.200000
2	East York	7.927273
4	North York	7.475000
3	Etobicoke	6.950000
5	Scarborough	6.900000

Visualizing the best of borough

In [38]:
```
toronto_borough_stats=toronto_borough_stats.sort_values(by='Average Rating')
sns.set(style="darkgrid",font_scale=2,rc={'figure.figsize':(15,6)})
ax = sns.barplot(x="Borough", y="Average Rating", data=toronto_borough_stats, pa
lette="prism_r")
plt.title('Average Rating of Indian Restaurants in Each Borough')
plt.xticks(rotation=90)
plt.show()
```



Top Neighborhoods for Indian Restaurants based on Average Ratings.

In [39]:
```
toronto_neighborhood_stats=indian_rest_stats_toronto_csv.groupby(['Neighborhood
'])['Rating'].mean().reset_index()
toronto_neighborhood_stats.columns=['Neighborhood','Average Rating']
toronto_neighborhood_stats.sort_values(by='Average Rating',ascending=False).head
()
```

Out[39]:

	Neighborhood	Average Rating
11	Humewood-Cedarvale	8.85
4	Christie	8.85
20	The Danforth West, Riverdale	8.70
15	Little Portugal, Trinity	8.70
2	Caledonia-Fairbanks	8.65

visualizing the best of neighborhoods

Based on ratings above 8.0

In [40]:
```
avg_rating=8.0
best_toronto_neighborhood_stats=toronto_neighborhood_stats[toronto_neighborhood_
stats['Average Rating']>=avg_rating]
print(best_toronto_neighborhood_stats.shape[0],'Indian Restaurants has average r
ating of', avg_rating, 'and above. \n Check the list below.')
best_toronto_neighborhood_stats.sort_values(by='Average Rating',ascending=False)
```

```
13 Indian Restaurants has average rating of 8.0 and above.
 Check the list below.
```

Out[40]:

	Neighborhood	Average Rating
4	Christie	8.850
11	Humewood-Cedarvale	8.850
15	Little Portugal, Trinity	8.700
20	The Danforth West, Riverdale	8.700
2	Caledonia-Fairbanks	8.650
9	Golden Mile, Clairlea, Oakridge	8.600
6	Dufferin, Dovercourt Village	8.525
7	East Toronto, Broadview North (Old East York)	8.400
12	India Bazaar, The Beaches West	8.400
21	Victoria Village	8.300
1	Brockton, Parkdale Village, Exhibition Place	8.000
14	Leaside	8.000
17	Parkwoods	8.000

Merging dataframes to get the coordinates

In [41]:
```
best_neighborhood_folium=pd.merge(best_toronto_neighborhood_stats,df_reqd_2,how='inner',on='Neighborhood')
best_neighborhood_folium=best_neighborhood_folium.rename(columns={'Borough_x':'Borough'})
best_neighborhood_folium=best_neighborhood_folium[['Borough','Neighborhood','Average Rating','Latitude','Longitude']]
print('We have our required DatFrame ready to be plotted on a Map.')
best_neighborhood_folium=best_neighborhood_folium.sort_values(by='Average Rating', ascending=False).reset_index(drop=True)
best_neighborhood_folium['Average Rating']=best_neighborhood_folium['Average Rating'].round(2)# set precision to 2 decimal place
best_neighborhood_folium
```

```
We have our required DatFrame ready to be plotted on a Map.
```

Out[41]:

	Borough	Neighborhood	Average Rating	Latitude	Longitude
0	Downtown Toronto	Christie	8.85	43.669542	-79.422564
1	York	Humewood-Cedarvale	8.85	43.693781	-79.428191
2	West Toronto	Little Portugal, Trinity	8.70	43.647927	-79.419750
3	East Toronto	The Danforth West, Riverdale	8.70	43.679557	-79.352188
4	York	Caledonia-Fairbanks	8.65	43.689026	-79.453512
5	Scarborough	Golden Mile, Clairlea, Oakridge	8.60	43.711112	-79.284577
6	West Toronto	Dufferin, Dovercourt Village	8.52	43.669005	-79.442259
7	East York	East Toronto, Broadview North (Old East York)	8.40	43.685347	-79.338106
8	East Toronto	India Bazaar, The Beaches West	8.40	43.668999	-79.315572
9	North York	Victoria Village	8.30	43.725882	-79.315572
10	West Toronto	Brockton, Parkdale Village, Exhibition Place	8.00	43.636847	-79.428191
11	East York	Leaside	8.00	43.709060	-79.363452
12	North York	Parkwoods	8.00	43.753259	-79.329656

Visualizing The Best of Neighborhoods based on Average Rating of 8.0 and above on Map.

In [42]:
```
best_neighborhood_avg_rating_map_2 = folium.Map(location=geo_location('Toronto
'), zoom_start=10, tiles='https://api.mapbox.com/styles/v1/explorer020/cka9yy2dn
14l51iptugr1shzf/tiles/256/{z}/{x}/{y}@2x?access_token=pk.eyJ1IjoiZXhwbG9yZXIwMj
AiLCJhIjoiY2thOXhvYjdyMHJoYzJycDRlbmw3YTg3ZiJ9.T9QjJc87oYLSknnlBH21Tg',attr='XXX
Mapbox Attribution')

# instantiate a mark cluster object for the incidents in the dataframe
incidents = plugins.MarkerCluster().add_to(best_neighborhood_avg_rating_map_2)

for lat, lng, rating, neighborhood in zip(best_neighborhood_folium['Latitude'],
best_neighborhood_folium['Longitude'],best_neighborhood_folium['Average Rating
'],best_neighborhood_folium['Neighborhood']):
    label = '{},{}'.format(rating,neighborhood)
    label = folium.Popup(label, parse_html=True)
    folium.Marker(
        [lat, lng],
        popup=label).add_to(incidents)
best_neighborhood_avg_rating_map_2.save('best_neighborhood_avg_rating_map_2.html
')
best_neighborhood_avg_rating_map_2
```

Out[42]: Make this Notebook Trusted to load map: File -> Trust Notebook

CONCLUSION

What is best location in Toronto for Indian Cuisine? Banjara Indian Cuisine, Dufferin, West Toronto has the best Indian food.

Which areas have potential Indian Restaurant Market? North York, Etobicoke has the least rated Indian restaurants. For an investor, it's an opportunity to grab to come up with high quality restaurant.

Which all areas lack Indian Restaurants? Downtown has the lowest number of Indian Restaurants but are highly rated. For an investor, to come up with variety and quality is a challenge to conquer.

Which is the best place to stay if I prefer Indian Cuisine? West and Central Toronto are the places where one should stay if they prefer Indian Cuisine. These areas have quality and variety both.

In [ ]: