

Capstone Project — The Battle of Neighbourhoods_Bengaluru

Introduction

Bengaluru is the Silicon city of India. It is a part of the city of Karnataka 4 districts. The city itself has a population of 84.3 lakhs.

The center of Indias high-tech industry, the city is also known for its parks and nightlife.

By Cubbon Park, Vidhana Soudha is a Neo-Dravidian legislative building. Former royal residences include 19th-century Bangalore Palace, modeled after England's Windsor Castle, and Tipu Sultan's Summer Palace, an 18th-century teak

Bangalore is nicknamed the "Garden City" for its gardens and parks and was once called a Pensioner's Paradise. Located on the Deccan Plateau in the south-eastern part of Karnataka, Bangalore is India's third most populated city and the fifth most populated urban agglomeration.

The official language of Bengaluru and the one that is most widely spoken is Kannada. However, English is also spoken as a formal language within businesses and government agencies. Over last decades it is continuously grow because of the city's important role in government and commercial business.

With it's diverse culture , comes diverse food items. There are many restaurants in Banglore City, each belonging to different categories like Chinese , Italian , French etc. So as part of this project , we will list and visualise all major parts of New Delhi City .

Questions that can be asked using the above mentioned datasets

- 1) What is best location in Bengaluru City for Chinese Cuisine ?
- 2) Which areas have large number of North Indian Resturant Market ?

- 3) Which all areas have less number of restaurant ?
- 4) Which is the best place to stay if I prefer Chinese Cuisine ?
- 5) What places are have best restaurant in Bengaluru ?

Data

For this project we need the following data :

- New Delhi Restaurants data that contains list Locality, Restaurant name, Rating along with their latitude and longitude.

* Data source : Zomato kaggle dataset

* Description : This data set contains the required information. And we will use this data set to explore various locality of Bengaluru city.

- Nearby places in each locality of new delhi city

* Data source : Fousquare API

* Description : By using this api we will get all the venues in each neighborhood

Approach

- Collect the new delhi city data from Zomato kaggle dataset
- Using FourSquare API we will find all venues for each neighborhood.
- Filter out all venues that are nearby by locality.
- Using aggregative rating for each restaurant to find the best places.
- Visualize the Ranking of neighborhoods using folium library python

```
In [2]: import pandas as pd
import numpy as np
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 k-means from clustering stage
from sklearn.cluster import KMeans

! pip install geocoder
import geocoder
```

Collecting geocoder

Downloading geocoder-1.38.1-py2.py3-none-any.whl (98 kB)

|██| 98 kB 9.4 MB/s eta 0:00:01

Collecting ratelim

Downloading ratelim-0.1.6-py2.py3-none-any.whl (4.0 kB)

Requirement already satisfied: six in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (1.15.0)

Requirement already satisfied: future in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (0.18.2)

Requirement already satisfied: click in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (7.1.2)

Requirement already satisfied: requests in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (2.24.0)

Requirement already satisfied: decorator in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from ratelim->geocoder) (4.4.2)

Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2.9)

Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (3.0.4)

Requirement already satisfied: urllib3!=1.25.0,!>=1.25.1,<1.26,>=1.21.1 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (1.25.9)

Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2020.12.5)

Installing collected packages: ratelim, geocoder

Successfully installed geocoder-1.38.1 ratelim-0.1.6

```
In [3]: get_ipython().system('pip install folium')
```

```
Collecting folium
  Downloading folium-0.12.0-py2.py3-none-any.whl (94 kB)
    |████████████████████████████████████████| 94 kB 5.6 MB/s eta 0:00:01
Requirement already satisfied: requests in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (2.24.0)
Requirement already satisfied: numpy in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (1.18.5)
Collecting branca>=0.3.0
  Downloading branca-0.4.2-py3-none-any.whl (24 kB)
Requirement already satisfied: Jinja2>=2.9 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (2.11.2)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (2020.12.5)
Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (3.0.4)
Requirement already satisfied: urllib3!=1.25.0,!>=1.25.1,<1.26,>=1.21.1 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (1.25.9)
Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (2.9)
Requirement already satisfied: MarkupSafe>=0.23 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from Jinja2>=2.9->folium) (1.1.1)
Installing collected packages: branca, folium
Successfully installed branca-0.4.2 folium-0.12.0
```

```
In [4]: import folium
```

```
In [5]: ! pip install geocoder
import geocoder
```

```
Requirement already satisfied: geocoder in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (1.38.1)
Requirement already satisfied: six in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (1.15.0)
Requirement already satisfied: requests in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (2.24.0)
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Requirement already satisfied: future in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (0.18.2)
Requirement already satisfied: ratelim in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (0.1.6)
Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2.9)
Requirement already satisfied: urllib3!=1.25.0,!>=1.25.1,<1.26,>=1.21.1 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (1.25.9)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2020.12.5)
Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (3.0.4)
Requirement already satisfied: decorator in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from ratelim->geocoder) (4.4.2)
```

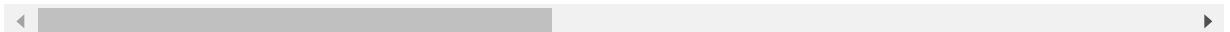
Read the zomato restaurant data from csv file

```
In [6]: df = pd.read_csv('https://raw.githubusercontent.com/peddareddynaresh/Applied-c
apstone-project/main/zomato.csv',encoding='ISO-8859-1')
df.head()
```

Out[6]:

	Restaurant ID	Restaurant Name	Country Code	City	Address	Locality	Locality Verbose	Longitu
0	6317637	Le Petit Souffle	162	Makati City	Third Floor, Century City Mall, Kalayaan Avenu...	Century City Mall, Poblacion, Makati City	Century City Mall, Poblacion, Makati City, Mak...	121.0275
1	6304287	Izakaya Kikufuji	162	Makati City	Little Tokyo, 2277 Chino Roces Avenue, Legaspi...	Little Tokyo, Legaspi Village, Makati City	Little Tokyo, Legaspi Village, Makati City, Ma...	121.0141
2	6300002	Heat - Edsa Shangri-La	162	Mandaluyong City	Edsa Shangri-La, 1 Garden Way, Ortigas, Mandal...	Edsa Shangri-La, Ortigas, Mandaluyong City	Edsa Shangri-La, Ortigas, Mandaluyong City, Ma...	121.0568
3	6318506	Ooma	162	Mandaluyong City	Third Floor, Mega Fashion Hall, SM Megamall, O...	SM Megamall, Ortigas, Mandaluyong City	SM Megamall, Ortigas, Mandaluyong City, Mandal...	121.0564
4	6314302	Sambo Kojin	162	Mandaluyong City	Third Floor, Mega Atrium, SM Megamall, Ortigas...	SM Megamall, Ortigas, Mandaluyong City	SM Megamall, Ortigas, Mandaluyong City, Mandal...	121.0575

5 rows × 21 columns

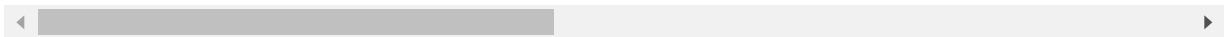


```
In [7]: df_india = df[df['Country Code'] == 1]
df_BLR = df_india[df_india['City'] == 'Bangalore']
df_BLR.reset_index(drop=True, inplace=True)
df_BLR.head()
```

Out[7]:

	Restaurant ID	Restaurant Name	Country Code	City	Address	Locality	Locality Verbose	Longitude
0	50943	Sultans of Spice	1	Bangalore	BluPetal Hotel, 60 Jyoti Nivas College Road, K...	BluPetal Hotel, Koramangala	BluPetal Hotel, Koramangala, Bangalore	77.615428
1	58268	The Fatty Bao - Asian Gastro Bar	1	Bangalore	610, 3rd Floor, 12th Main, Off 80 Feet Road, I...	Indiranagar	Indiranagar, Bangalore	77.645396
2	51705	Toit	1	Bangalore	298, Namma Metro Pillar 62, 100 Feet Road, Ind...	Indiranagar	Indiranagar, Bangalore	77.640709
3	18162866	Three Dots & A Dash	1	Bangalore	840/1, 100 Feet Road, Metro Pillar 56-57, Indir...	Indiranagar	Indiranagar, Bangalore	77.640489
4	18407918	Bombay Brasserie	1	Bangalore	2989/B, 12th Main Road, HAL 2nd Stage, Indiran...	Indiranagar	Indiranagar, Bangalore	77.645748

5 rows × 21 columns



Data cleaning

remove the unwanted columns and rows from dataset

```
In [8]: df_Res= df_BLR[df_BLR.Longitude !=0.000000][['Restaurant Name','Locality','Longitude', 'Latitude', 'Cuisines', 'Aggregate rating', 'Rating text', 'Votes']]
```

```
In [9]: df_Res = df_Res[df_Res['Aggregate rating'] !=0.0]
```

```
In [10]: df_Res.head()
```

Out[10]:

	Restaurant Name	Locality	Longitude	Latitude	Cuisines	Aggregate rating	Rating text	Votes
0	Sultans of Spice	BluPetal Hotel, Koramangala	77.615428	12.933284	North Indian, Mughlai	4.1	Very Good	2416
1	The Fatty Bao - Asian Gastro Bar	Indiranagar	77.645396	12.970221	Asian	4.7	Excellent	2369
2	Toit	Indiranagar	77.640709	12.979166	Italian, American, Pizza	4.8	Excellent	10934
3	Three Dots & A Dash	Indiranagar	77.640489	12.980410	European, Continental	3.9	Good	1354
4	Bombay Brasserie	Indiranagar	77.645748	12.970324	Modern Indian	4.2	Very Good	231

```
In [11]: df_Res.shape
```

Out[11]: (20, 8)

```
In [12]: Bangalore_Rest = folium.Map(location=[12.9, 77.6], zoom_start=12)

X = df_Res['Latitude']
Y = df_Res['Longitude']
Z = np.stack((X, Y), axis=1)

kmeans = KMeans(n_clusters=5, random_state=0).fit(Z)

clusters = kmeans.labels_
colors = ['red', 'green', 'blue', 'yellow', 'orange']
df_Res['Cluster'] = clusters

for latitude, longitude, Locality, cluster in zip(df_Res['Latitude'], df_Res[
'Longitude'], df_Res['Locality'], df_Res['Cluster']):
    label = folium.Popup(Locality, parse_html=True)
    folium.CircleMarker(
        [latitude, longitude],
        radius=5,
        popup=label,
        color='black',
        fill=True,
        fill_color=colors[cluster],
        fill_opacity=0.7).add_to(Bangalore_Rest)

Bangalore_Rest
```

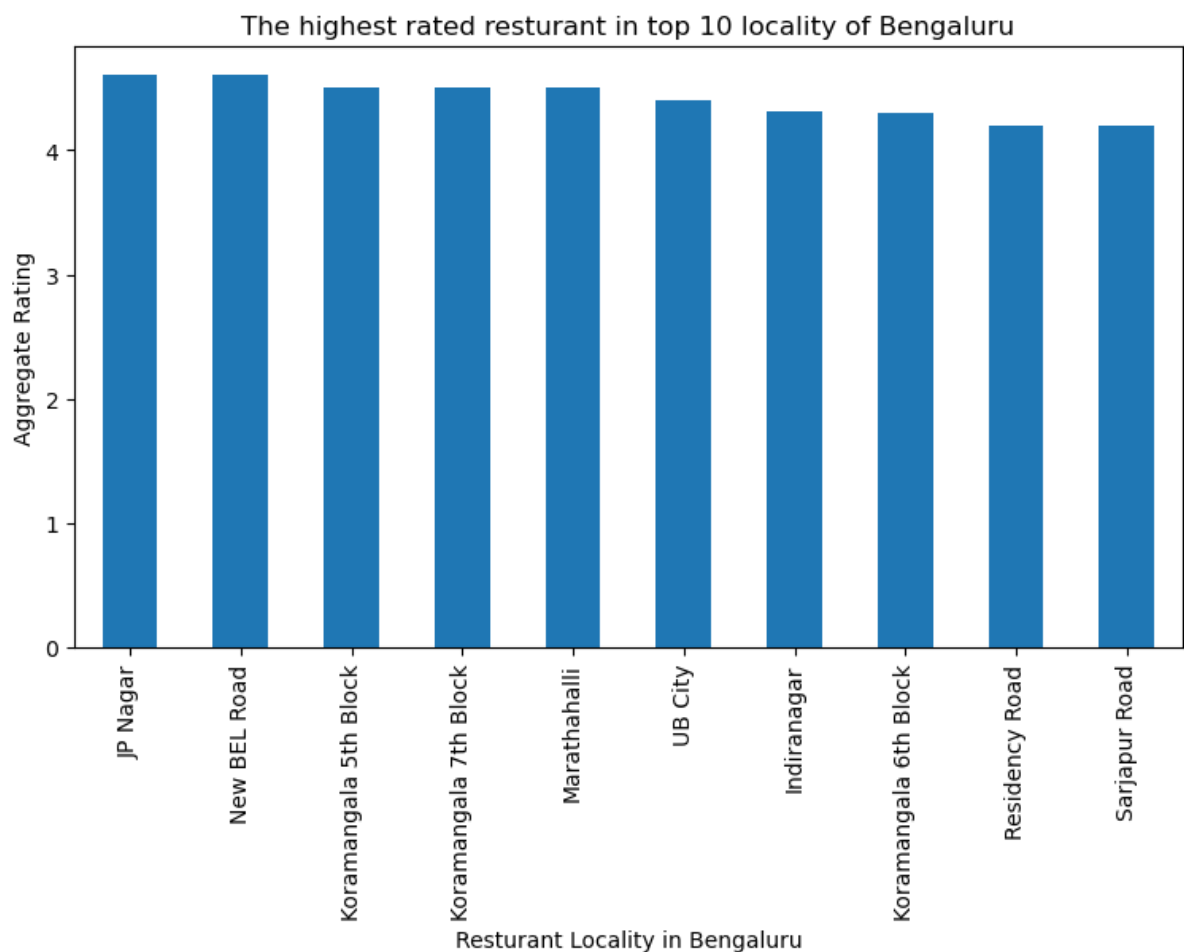
Out[12]: Make this Notebook Trusted to load map: File -> Trust Notebook

What places are have best restaurant in Bengaluru?


```
In [13]: import matplotlib.pyplot as plt
plt.figure(figsize=(9,5), dpi = 100)
# title
plt.title('The highest rated resturant in top 10 locality of Bengaluru')
#On x-axis

#giving a bar plot
df_Res.groupby('Locality')['Aggregate rating'].mean().nlargest(10).plot(kind='bar')

plt.xlabel('Resturant Locality in Bengaluru')
#On y-axis
plt.ylabel('Aggregate Rating')
#displays the plot
plt.show()
```



The Bangalore has Best restaurents in the JP Nagar and New BEL Road

what places are have worst restaurants in Bengaluru?

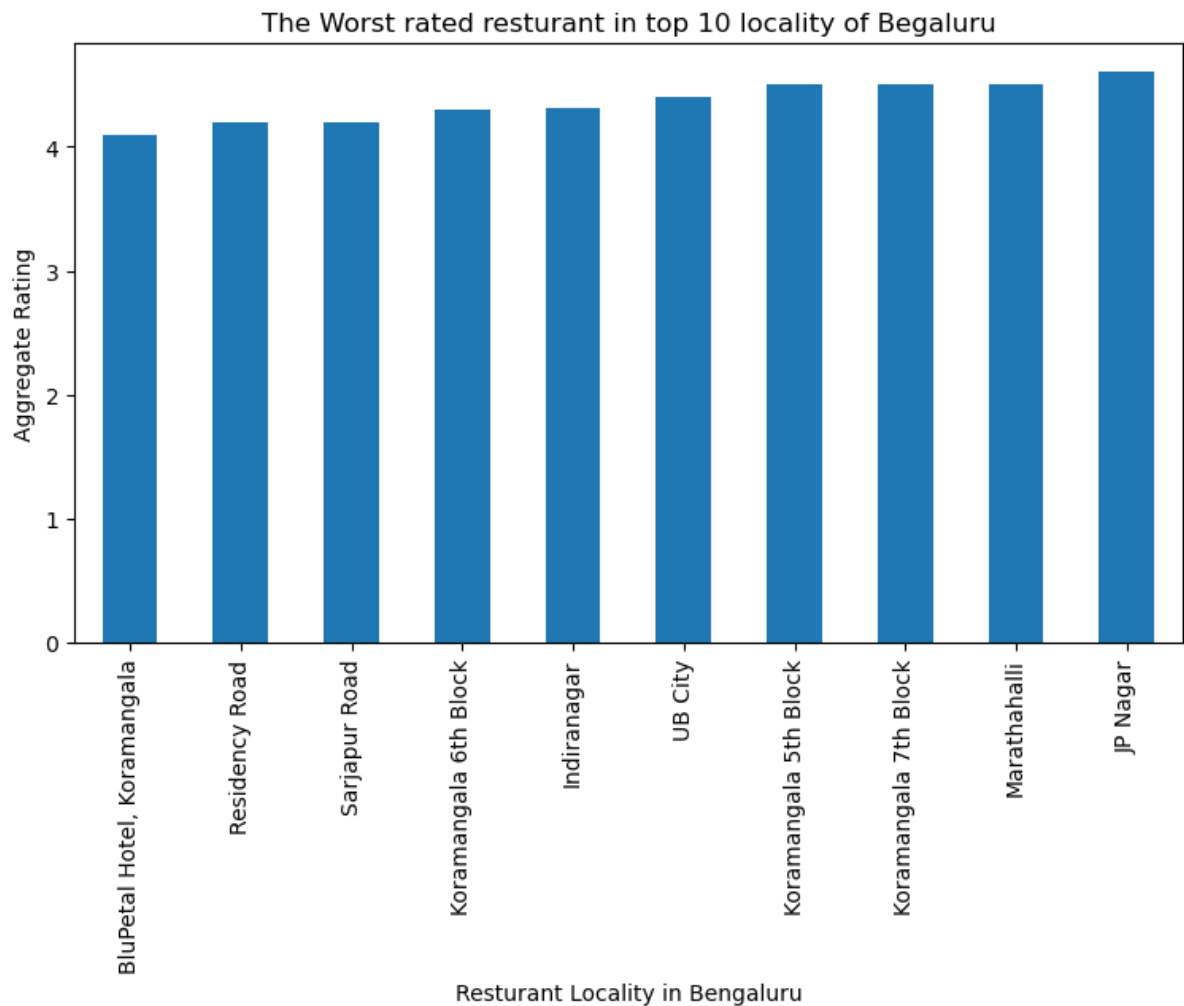
```
In [15]: import matplotlib.pyplot as plt
plt.figure(figsize=(9,5), dpi = 100)
# title
plt.title('The Worst rated resturant in top 10 locality of Begaluru')
#On x-axis

#giving a bar plot

df_Res.groupby('Locality')['Aggregate rating'].mean().nsmallest(10).plot(kind=
'bar')

plt.xlabel('Resturant Locality in Bengaluru')
#On y-axis
plt.ylabel('Aggregate Rating')

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



The Bengaluru has the worst restaurents in Koramangala,Residency Road.

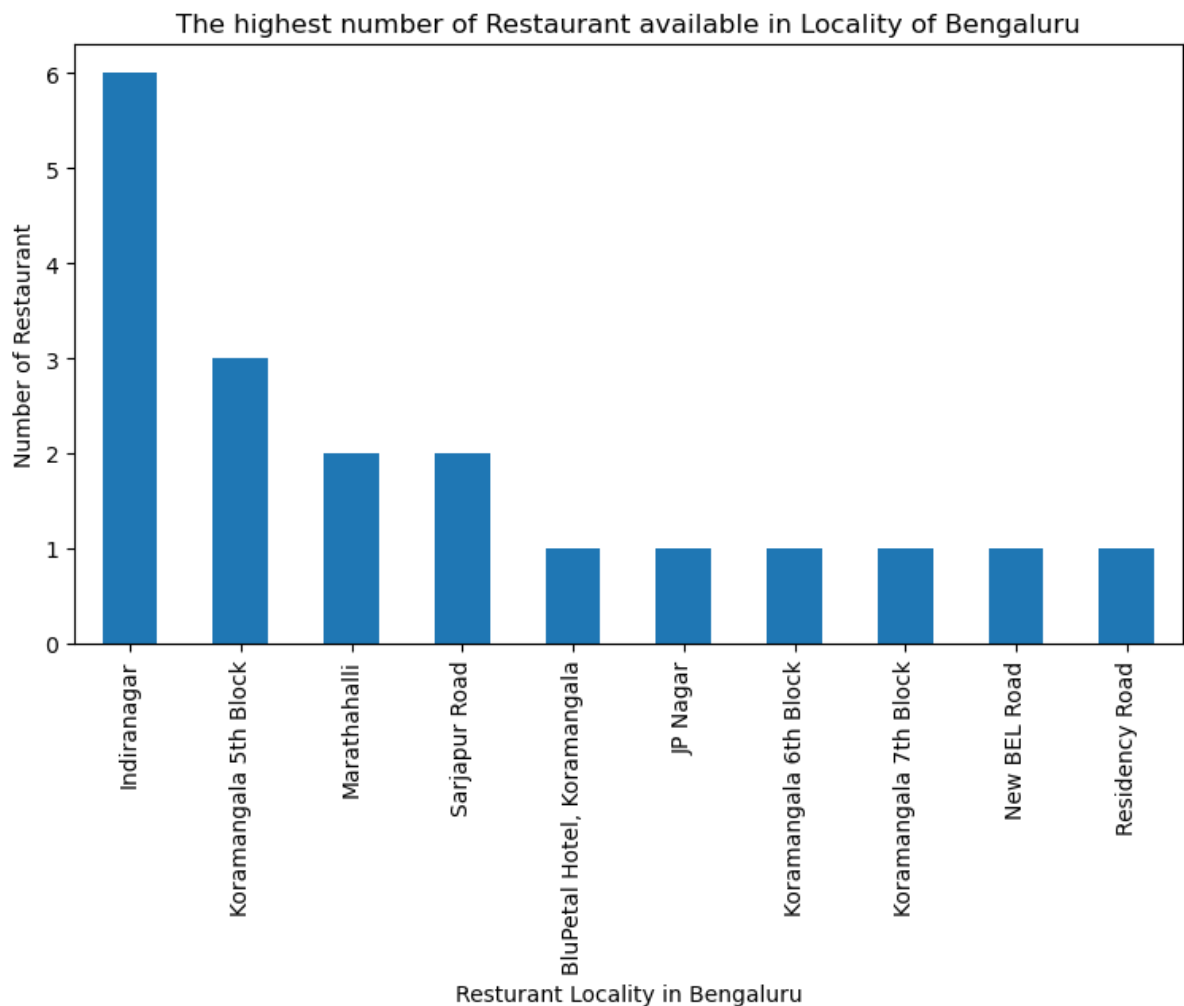
Which place are suitable for edible person in Bengaluru city?

```
In [17]: import matplotlib.pyplot as plt
plt.figure(figsize=(9,5), dpi = 100)
# title
plt.title('The highest number of Restaurant available in Locality of Bengaluru')
#On x-axis

#giving a bar plot
df_Res.groupby('Locality')['Restaurant Name'].count().nlargest(10).plot(kind='bar')

plt.xlabel('Resturant Locality in Bengaluru')
#On y-axis
plt.ylabel('Number of Restaurant')

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



Indiranagar has the best place for edible person to stay here

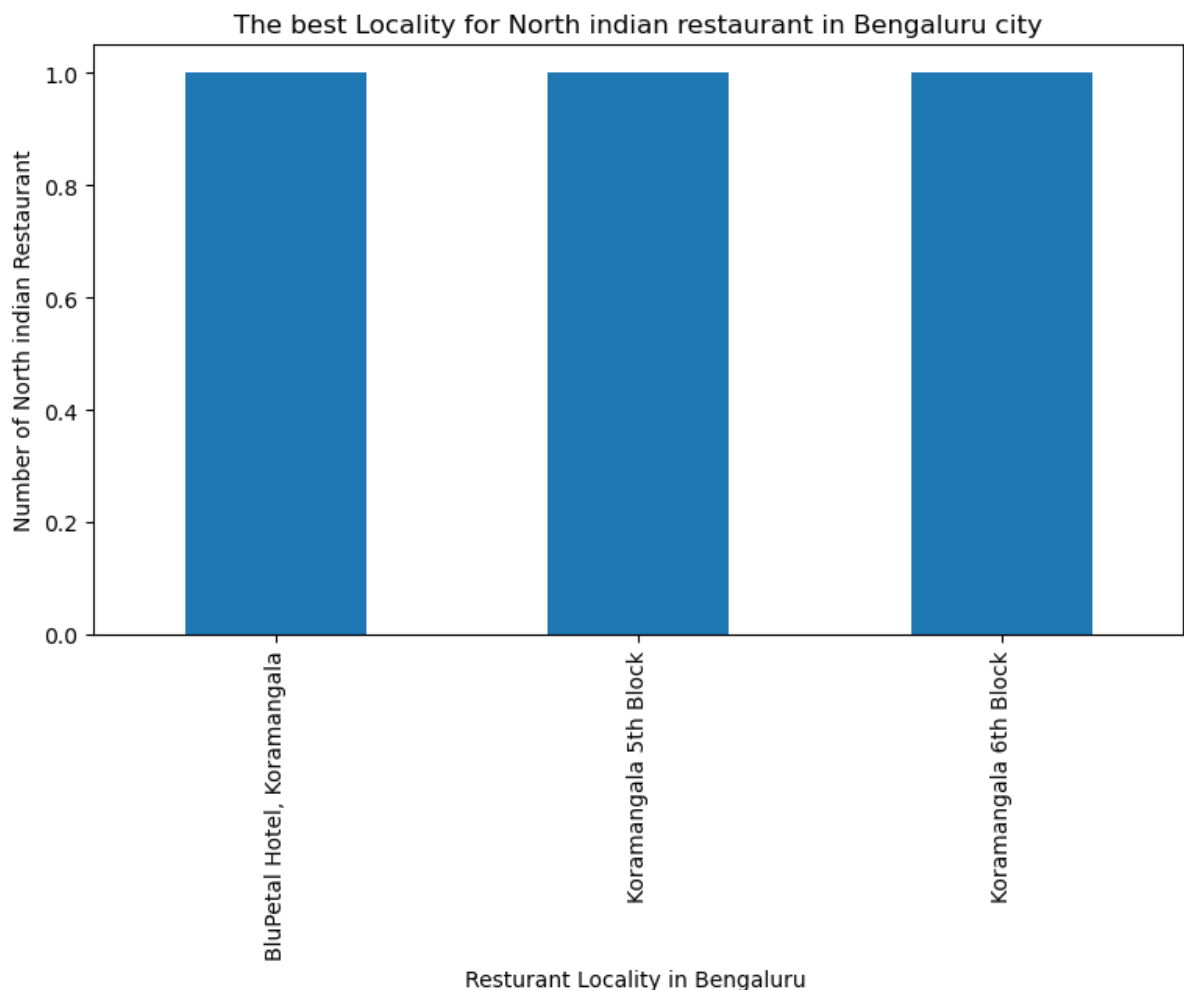
What are the best places for North Indian restaurant in Bengaluru city ?

```
In [24]: import matplotlib.pyplot as plt
plt.figure(figsize=(9,5), dpi = 100)
# title
plt.title('The best Locality for North indian restaurant in Bengaluru city')
#On x-axis

#giving a bar plot
df_Res[df_Res['Cuisines'].str.startswith('North')].groupby('Locality')['Restau
rant Name'].count().nlargest(5).plot(kind='bar')

plt.xlabel('Resturant Locality in Bengaluru ')
#On y-axis
plt.ylabel('Number of North indian Restaurant')

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



Koramangala has the almost all the North Indian restaurents

Data transformation

Based on Locality grouping the data

```
In [26]: df_Res_Loc = df_Res.groupby('Locality').count()['Restaurant Name'].to_frame()  
df_Res_Loc
```

Out[26]:

	Restaurant Name
Locality	
BluPetal Hotel, Koramangala	1
Indiranagar	6
JP Nagar	1
Koramangala 5th Block	3
Koramangala 6th Block	1
Koramangala 7th Block	1
Marathahalli	2
New BEL Road	1
Residency Road	1
Sarjapur Road	2
UB City	1

```
In [28]: df_Res_rating= df_Res.groupby('Locality')['Aggregate rating'].mean().to_frame()
df_Res_rating
```

Out[28]:

	Aggregate rating
Locality	
BluPetal Hotel, Koramangala	4.100000
Indiranagar	4.316667
JP Nagar	4.600000
Koramangala 5th Block	4.500000
Koramangala 6th Block	4.300000
Koramangala 7th Block	4.500000
Marathahalli	4.500000
New BEL Road	4.600000
Residency Road	4.200000
Sarjapur Road	4.200000
UB City	4.400000

```
In [29]: d_Cuisines = df_Res.groupby(['Locality'])['Cuisines'].agg(', '.join).reset_index()
d_Cuisines
```

Out[29]:

	Locality	Cuisines
0	BluPetal Hotel, Koramangala	North Indian, Mughlai
1	Indiranagar	Asian, Italian, American, Pizza, European, Con...
2	JP Nagar	Pizza, Cafe, Italian
3	Koramangala 5th Block	Continental, American, Italian, North Indian, ...
4	Koramangala 6th Block	North Indian, Chinese, Italian, Street Food, D...
5	Koramangala 7th Block	Continental, American
6	Marathahalli	European, Mediterranean, North Indian, Asian, ...
7	New BEL Road	Pizza, Cafe, Italian
8	Residency Road	Continental
9	Sarjapur Road	Finger Food, North Indian, Italian, Continenta...
10	UB City	Modern Indian

```
In [30]: d_R = df_Res.groupby(['Locality'])['Rating text'].unique().agg(', '.join).reset_index()
d_R
```

Out[30]:

	Locality	Rating text
0	BluPetal Hotel, Koramangala	Very Good
1	Indiranagar	Excellent, Good, Very Good
2	JP Nagar	Excellent
3	Koramangala 5th Block	Excellent, Very Good
4	Koramangala 6th Block	Very Good
5	Koramangala 7th Block	Excellent
6	Marathahalli	Excellent, Very Good
7	New BEL Road	Excellent
8	Residency Road	Very Good
9	Sarjapur Road	Excellent, Good
10	UB City	Very Good

```
In [31]: d_V = df_Res.groupby(['Locality'])['Votes'].sum().to_frame()
d_V
```

Out[31]:

	Votes
Locality	
BluPetal Hotel, Koramangala	2416
Indiranagar	19834
JP Nagar	781
Koramangala 5th Block	15328
Koramangala 6th Block	753
Koramangala 7th Block	1288
Marathahalli	7890
New BEL Road	627
Residency Road	334
Sarjapur Road	6110
UB City	754

```
In [34]: d_Lat = df_Res.groupby('Locality').mean()['Latitude'].to_frame()  
d_Lat
```

Out[34]:

	Latitude
Locality	
BluPetal Hotel, Koramangala	12.933284
Indiranagar	12.976278
JP Nagar	12.906229
Koramangala 5th Block	12.933947
Koramangala 6th Block	12.939496
Koramangala 7th Block	12.935662
Marathahalli	12.962655
New BEL Road	13.029198
Residency Road	12.972532
Sarjapur Road	12.913652
UB City	12.972161

```
In [35]: d_Lng = df_Res.groupby('Locality').mean()['Longitude'].to_frame()  
d_Lng
```

Out[35]:

	Longitude
Locality	
BluPetal Hotel, Koramangala	77.615428
Indiranagar	77.642775
JP Nagar	77.596791
Koramangala 5th Block	77.615415
Koramangala 6th Block	77.625999
Koramangala 7th Block	77.614130
Marathahalli	77.698025
New BEL Road	77.570997
Residency Road	77.608179
Sarjapur Road	77.680818
UB City	77.596014


```
In [38]: df_final = pd.merge(d_Lat,d_Lng,on='Locality').merge(df_Res_Loc, on='Locality')
        ).merge(d_Cuisines, on='Locality').merge(df_Res_rating,on ='Locality').merge(d
        _R, on ='Locality').merge(d_V, on ='Locality')
        df_final
```

Out[38]:

	Locality	Latitude	Longitude	Restaurant Name	Cuisines	Aggregate rating	Rating text	Votes
0	BluPetal Hotel, Koramangala	12.933284	77.615428	1	North Indian, Mughlai	4.100000	Very Good	2416
1	Indiranagar	12.976278	77.642775	6	Asian, Italian, American, Pizza, European, Con...	4.316667	Excellent, Good, Very Good	19834
2	JP Nagar	12.906229	77.596791	1	Pizza, Cafe, Italian	4.600000	Excellent	781
3	Koramangala 5th Block	12.933947	77.615415	3	Continental, American, Italian, North Indian, ...	4.500000	Excellent, Very Good	15328
4	Koramangala 6th Block	12.939496	77.625999	1	North Indian, Chinese, Italian, Street Food, D...	4.300000	Very Good	753
5	Koramangala 7th Block	12.935662	77.614130	1	Continental, American	4.500000	Excellent	1288
6	Marathahalli	12.962655	77.698025	2	European, Mediterranean, North Indian, Asian, ...	4.500000	Excellent, Very Good	7890
7	New BEL Road	13.029198	77.570997	1	Pizza, Cafe, Italian	4.600000	Excellent	627
8	Residency Road	12.972532	77.608179	1	Continental	4.200000	Very Good	334
9	Sarjapur Road	12.913652	77.680818	2	Finger Food, North Indian, Italian, Continenta...	4.200000	Excellent, Good	6110
10	UB City	12.972161	77.596014	1	Modern Indian	4.400000	Very Good	754

```
In [39]: df_final = df_final[df_final['Aggregate rating'] != 0.000000]
df_final.columns = ['Locality', 'Lat', 'Lng', 'No_of_Restaurant', 'Cusines', 'Agg_Rating', 'Comments', 'No_of_Votes']
df_final.head()
```

Out[39]:

	Locality	Lat	Lng	No_of_Restaurant	Cusines	Agg_Rating	Comments	N
0	BluPetal Hotel, Koramangala	12.933284	77.615428	1	North Indian, Mughlai	4.100000	Very Good	
1	Indiranagar	12.976278	77.642775	6	Asian, Italian, American, Pizza, European, Con...	4.316667	Excellent, Good, Very Good	
2	JP Nagar	12.906229	77.596791	1	Pizza, Cafe, Italian	4.600000	Excellent	
3	Koramangala 5th Block	12.933947	77.615415	3	Continental, American, Italian, North Indian, ...	4.500000	Excellent, Very Good	
4	Koramangala 6th Block	12.939496	77.625999	1	North Indian, Chinese, Italian, Street Food, D...	4.300000	Very Good	

```
In [40]: df_final.shape
```

Out[40]: (11, 8)

Define Foursquare Credentials and Version

```
In [41]: ## Define Foursquare Credentials and Version
CLIENT_ID = 'V15VJH4C11YCNPTRLFDCZUL2IEEGHLMKPM0YMSXPN3S2S0' # Foursquare ID
CLIENT_SECRET = '0SAKTUAD3VRKCJPX3DDBMRSYHISYLC1NZ3FIPKUVGGGNGYPQ' # Foursquare Secret
VERSION = '20180605' # Foursquare API version

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

Your credentails:

CLIENT_ID: V15VJH4C11YCNPTRLFDCZUL2IEEGHLMKPM0YMSXPN3S2S0

CLIENT_SECRET: 0SAKTUAD3VRKCJPX3DDBMRSYHISYLC1NZ3FIPKUVGGGNGYPQ

create a function to repeat the same process to all the Locality in Bengaluru

```
In [42]: def getNearbyVenues(names, latitudes, longitudes, radius=500,LIMIT = 100):

    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 = ['Locality',
                            'Locality Latitude',
                            'Locality Longitude',
                            'Venue',
                            'Venue Latitude',
                            'Venue Longitude',
                            'Venue Category']

    return(nearby_venues)
```

find the venues in all Bengaluru Locality

```
In [50]: # find the venues in all New Delhi Locality
BLR_venues = getNearbyVenues(names=df_final['Locality'],
                              latitudes=df_final['Lat'],
                              longitudes=df_final['Lng']
                              )
```

BluPetal Hotel, Koramangala
 Indiranagar
 JP Nagar
 Koramangala 5th Block
 Koramangala 6th Block
 Koramangala 7th Block
 Marathahalli
 New BEL Road
 Residency Road
 Sarjapur Road
 UB City

```
In [51]: BLR_venues.head()
```

Out[51]:

	Locality	Locality Latitude	Locality Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	BluPetal Hotel, Koramangala	12.933284	77.615428	Truffles Ice & Spice	12.933443	77.614265	Burger Joint
1	BluPetal Hotel, Koramangala	12.933284	77.615428	Gilly's Rest- O-Bar	12.932987	77.614755	Bar
2	BluPetal Hotel, Koramangala	12.933284	77.615428	Stoner	12.932759	77.614132	Ice Cream Shop
3	BluPetal Hotel, Koramangala	12.933284	77.615428	Khawa Karpoo	12.934051	77.616640	Chinese Restaurant
4	BluPetal Hotel, Koramangala	12.933284	77.615428	XOOX Brewmill	12.935507	77.614982	Brewery

In [52]: `BLR_venues.groupby('Locality').count()`

Out[52]:

	Locality Latitude	Locality Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Locality						
BluPetal Hotel, Koramangala	100	100	100	100	100	100
Indiranagar	59	59	59	59	59	59
JP Nagar	30	30	30	30	30	30
Koramangala 5th Block	100	100	100	100	100	100
Koramangala 6th Block	23	23	23	23	23	23
Koramangala 7th Block	85	85	85	85	85	85
Marathahalli	6	6	6	6	6	6
New BEL Road	34	34	34	34	34	34
Residency Road	100	100	100	100	100	100
Sarjapur Road	16	16	16	16	16	16
UB City	62	62	62	62	62	62

In [54]: `print('There are {} uniques categories.'.format(len(BLR_venues['Venue Category'].unique())))`

There are 109 uniques categories.

```
In [55]: ## Analyze Each Locality

# one hot encoding
BLR_onehot = pd.get_dummies(BLR_venues[['Venue Category']], prefix="", prefix_sep="")

# add Locality column back to dataframe
BLR_onehot['Locality'] = BLR_venues['Locality']

# move Locality column to the first column
column_list = BLR_onehot.columns.tolist()
column_number = int(column_list.index('Locality'))
column_list = [column_list[column_number]] + column_list[:column_number] + column_list[column_number+1:]
BLR_onehot = BLR_onehot[column_list]

BLR_onehot.head()
```

Out[55]:

	Locality	Afghan Restaurant	American Restaurant	Andhra Restaurant	Arcade	Art Gallery	Arts & Crafts Store	Asian Restaurant	Bakery
0	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0
1	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0
2	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0
3	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0
4	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0

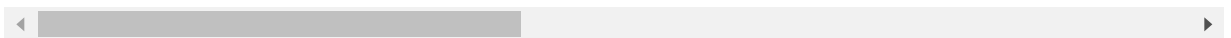
5 rows × 110 columns

```
In [57]: BLR_grouped = BLR_onehot.groupby('Locality').mean().reset_index()
BLR_grouped
```

Out[57]:

	Locality	Afghan Restaurant	American Restaurant	Andhra Restaurant	Arcade	Art Gallery	Arts & Crafts Store	Asian Restaurant
0	BluPetal Hotel, Koramangala	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.020000
1	Indiranagar	0.0000	0.00	0.00	0.016949	0.000000	0.000000	0.000000
2	JP Nagar	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.000000
3	Koramangala 5th Block	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.020000
4	Koramangala 6th Block	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.000000
5	Koramangala 7th Block	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.023529
6	Marathahalli	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.000000
7	New BEL Road	0.0000	0.00	0.00	0.000000	0.000000	0.000000	0.029412
8	Residency Road	0.0000	0.01	0.01	0.000000	0.000000	0.010000	0.000000
9	Sarjapur Road	0.0625	0.00	0.00	0.000000	0.000000	0.000000	0.000000
10	UB City	0.0000	0.00	0.00	0.000000	0.016129	0.016129	0.016129

11 rows × 110 columns



```
In [58]: BLR_grouped.shape
```

Out[58]: (11, 110)

```
In [59]: num_top_venues = 5

for hood in BLR_grouped['Locality']:
    print("-----"+hood+"-----")
    temp = BLR_grouped[BLR_grouped['Locality'] == hood].T.reset_index()
    temp.columns = ['venue', 'freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')
```


----BluPetal Hotel, Koramangala----

	venue	freq
0	Indian Restaurant	0.17
1	Café	0.06
2	Chinese Restaurant	0.05
3	Fast Food Restaurant	0.04
4	Restaurant	0.04

----Indiranagar----

	venue	freq
0	Café	0.15
1	Indian Restaurant	0.14
2	Pub	0.07
3	Lounge	0.05
4	Pizza Place	0.05

----JP Nagar----

	venue	freq
0	Café	0.07
1	Bakery	0.07
2	Bar	0.07
3	Coffee Shop	0.07
4	Clothing Store	0.07

----Koramangala 5th Block----

	venue	freq
0	Indian Restaurant	0.18
1	Chinese Restaurant	0.05
2	Café	0.05
3	Dessert Shop	0.04
4	Lounge	0.04

----Koramangala 6th Block----

	venue	freq
0	Pizza Place	0.09
1	Clothing Store	0.09
2	Seafood Restaurant	0.09
3	Café	0.09
4	Vegetarian / Vegan Restaurant	0.04

----Koramangala 7th Block----

	venue	freq
0	Indian Restaurant	0.16
1	Dessert Shop	0.05
2	Café	0.05
3	Bookstore	0.05
4	Lounge	0.04

----Marathahalli----

	venue	freq
0	Indian Restaurant	0.50

```

1 Chinese Restaurant 0.17
2   Clothing Store 0.17
3   Pizza Place 0.17
4   Juice Bar 0.00

```

----New BEL Road----

```

          venue freq
0   Ice Cream Shop 0.21
1   Indian Restaurant 0.18
2   Fast Food Restaurant 0.12
3   Chinese Restaurant 0.12
4   Pizza Place 0.06

```

----Residency Road----

```

          venue freq
0   Café 0.15
1   Indian Restaurant 0.10
2   Pub 0.08
3   Bar 0.06
4   Lounge 0.04

```

----Sarjapur Road----

```

          venue freq
0   Brewery 0.12
1   Café 0.12
2   Afghan Restaurant 0.06
3   Supermarket 0.06
4   Restaurant 0.06

```

----UB City----

```

          venue freq
0   Italian Restaurant 0.08
1   Hotel 0.05
2   Mexican Restaurant 0.05
3   Lounge 0.05
4   Café 0.05

```

```

In [60]: ## put that into a pandas dataframe
         ## First, write a function to sort the venues in descending order.

def return_most_common_venues(row, num_top_venues):
    row_categories = row.iloc[1:]
    row_categories_sorted = row_categories.sort_values(ascending=False)

    return row_categories_sorted.index.values[0:num_top_venues]

```

```
In [63]: num_top_venues = 10

indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues
columns = ['Locality']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind
]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

# create a new dataframe
Locality_venues_sorted = pd.DataFrame(columns=columns)
Locality_venues_sorted['Locality'] = BLR_grouped['Locality']

for ind in np.arange(BLR_grouped.shape[0]):
    Locality_venues_sorted.iloc[ind, 1:] = return_most_common_venues(BLR_group
ed.iloc[ind, :], num_top_venues)

Locality_venues_sorted
```

Out[63]:

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue
0	BluPetal Hotel, Koramangala	Indian Restaurant	Café	Chinese Restaurant	Fast Food Restaurant	Lounge	Restaurant	Dessert Shop
1	Indiranagar	Café	Indian Restaurant	Pub	Lounge	Pizza Place	Dessert Shop	Bar
2	JP Nagar	Clothing Store	Café	Bakery	Bar	Coffee Shop	Pizza Place	Snack Place
3	Koramangala 5th Block	Indian Restaurant	Chinese Restaurant	Café	Lounge	Dessert Shop	Fast Food Restaurant	Restaurant
4	Koramangala 6th Block	Clothing Store	Pizza Place	Café	Seafood Restaurant	South Indian Restaurant	Gastropub	Gym / Fitness Center
5	Koramangala 7th Block	Indian Restaurant	Bookstore	Dessert Shop	Café	Chinese Restaurant	Restaurant	Lounge
6	Marathahalli	Indian Restaurant	Pizza Place	Clothing Store	Chinese Restaurant	Fast Food Restaurant	Creperie	Cupcake Shop
7	New BEL Road	Ice Cream Shop	Indian Restaurant	Fast Food Restaurant	Chinese Restaurant	Pizza Place	Coffee Shop	Burger Joint
8	Residency Road	Café	Indian Restaurant	Pub	Bar	Coffee Shop	Lounge	Chinese Restaurant
9	Sarjapur Road	Brewery	Café	Vegetarian / Vegan Restaurant	Restaurant	Coffee Shop	Eastern European Restaurant	Ice Cream Shop
10	UB City	Italian Restaurant	Café	Hotel	Mexican Restaurant	Lounge	Electronics Store	Restaurant

In [64]:

```

## Cluster Locality
## Run k-means to cluster the Locality into 5 clusters.

# set number of clusters
kclusters = 5

BLR_clustering = BLR_grouped.drop('Locality', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(BLR_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
kmeans.labels_.shape

```

Out[64]: (11,)

```
In [67]: BLR_merged = df_final.head(240)
BLR_merged['Cluster Labels'] = kmeans.labels_

# merge New_Delhi_grouped with df_Chinese to add Latitude/Longitude for each Locality
BLR_merged = BLR_merged.join(Locality_venues_sorted.set_index('Locality'), on='Locality')

BLR_merged.head()
```

/opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages/ipykernel/__main__.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
from ipykernel import kernelapp as app

Out[67]:

	Locality	Lat	Lng	No_of_Restaurant	Cusines	Agg_Rating	Comments	N
0	BluPetal Hotel, Koramangala	12.933284	77.615428	1	North Indian, Mughlai	4.100000	Very Good	
1	Indiranagar	12.976278	77.642775	6	Asian, Italian, American, Pizza, European, Con...	4.316667	Excellent, Good, Very Good	
2	JP Nagar	12.906229	77.596791	1	Pizza, Cafe, Italian	4.600000	Excellent	
3	Koramangala 5th Block	12.933947	77.615415	3	Continental, American, Italian, North Indian, ...	4.500000	Excellent, Very Good	
4	Koramangala 6th Block	12.939496	77.625999	1	North Indian, Chinese, Italian, Street Food, D...	4.300000	Very Good	

```
In [68]: # create final map
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=10)

# set color scheme for the clusters
x = np.arange(kclusters)
ys = [i+x+(i*x)**2 for i in range(kclusters)]
#colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
#rainbow = [colors.rgb2hex(i) for i in colors_array]
colors = ['red', 'green', 'blue', 'yellow', 'orange']

# add markers to the map
markers_colors = []
for lat, lon, poi, cluster in zip(BLR_merged['Lat'], BLR_merged['Lng'], BLR_merged['Locality'], BLR_merged['Cluster Labels']):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color='black',
        fill=True,
        fill_color=colors[cluster],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters
```

Out[68]: Make this Notebook Trusted to load map: File -> Trust Notebook

```
In [69]: ## Cluster 1
BLR_merged.loc[BLR_merged['Cluster Labels'] == 0, BLR_merged.columns[[1] + list(range(5, BLR_merged.shape[1]))]]
```

Out[69]:

	Lat	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	
0	12.933284	4.100000	Very Good	2416	0	Indian Restaurant	Café	Chinese Restaurant	F
1	12.976278	4.316667	Excellent, Good, Very Good	19834	0	Café	Indian Restaurant	Pub	
3	12.933947	4.500000	Excellent, Very Good	15328	0	Indian Restaurant	Chinese Restaurant	Café	
5	12.935662	4.500000	Excellent	1288	0	Indian Restaurant	Bookstore	Dessert Shop	
8	12.972532	4.200000	Very Good	334	0	Café	Indian Restaurant	Pub	

```
In [70]: ## Examine Clusters

## Cluster 2
BLR_merged.loc[BLR_merged['Cluster Labels'] == 1, BLR_merged.columns[[1] + list(range(5, BLR_merged.shape[1]))]]
```

Out[70]:

	Lat	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	
2	12.906229	4.6	Excellent	781	1	Clothing Store	Café	Bakery	
4	12.939496	4.3	Very Good	753	1	Clothing Store	Pizza Place	Café	Ri
10	12.972161	4.4	Very Good	754	1	Italian Restaurant	Café	Hotel	Ri

```
In [72]: ## Examine Clusters

## Cluster 3
BLR_merged.loc[BLR_merged['Cluster Labels'] == 2, BLR_merged.columns[[1] + list(range(5, BLR_merged.shape[1]))]]
```

Out[72]:

	Lat	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
6	12.962655	4.5	Excellent, Very Good	7890	2	Indian Restaurant	Pizza Place	Clothing Store	Res

```
In [73]: ## Examine Clusters

## Cluster 4
BLR_merged.loc[BLR_merged['Cluster Labels'] == 3, BLR_merged.columns[[1] + list(range(5, BLR_merged.shape[1]))]]
```

Out[73]:

	Lat	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
9	12.913652	4.2	Excellent, Good	6110	3	Brewery	Café	Vegetarian / Vegan Restaurant	Res

```
In [74]: ## Examine Clusters

## Cluster 5
BLR_merged.loc[BLR_merged['Cluster Labels'] == 4, BLR_merged.columns[[1] + list(range(5, BLR_merged.shape[1]))]]
```

Out[74]:

	Lat	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
7	13.029198	4.6	Excellent	627	4	Ice Cream Shop	Indian Restaurant	Fast Food Restaurant	Res

Conclusion

- 1) The Bangalore has Best restaurents in the JP Nagar and New BEL Road.
- 2) The Bengaluru has the worst restaurents in Koramangla,Residency Road.
- 3) Indiranagar has the best place for edible person to stay here.
- 4) Kormangala has the almost all the North Indian restaurents.
- 5) ##### Cluster 1: It is most recommended for Indian Restaurants.
- 6) ##### Cluster 2: It is most recommended for Cafeteria.
- 7) ##### Cluster 3 and Cluster 5: It is most recommended for Fast food.
- 8) ##### Cluster 4: It is most recommended for the cafe and Vegan Restaurant.