CAPSTONE WEEK 5

July 28, 2021

Capstone-Project—The-Battle-of-Neighborhoods Bangalore officially known as Bengaluru, is the capital and the largest city of the Indian state of Karnataka. It has a population of more than 8 million and a metropolitan population of around 11 million, making it the third most populous city and fifth most populous urban agglomeration in India. Located in southern India on the Deccan Plateau, at a height of over 900 m (3,000 ft) above sea level, Bangalore is known for its pleasant climate throughout the year. Its elevation is the highest among the major cities of India.

The city's history dates back to around 890 CE, in a stone inscription found at the Nageshwara Temple in Begur, Bangalore. The Begur inscription is written in Halegannada (ancient Kannada), mentions 'Bengaluru Kalaga' . It was a significant turning point in the history of Bangalore as it bears the earliest reference to the name 'Bengaluru'. In 1537 CE, Kempé Gowd – a feudal ruler under the Vijayanagara Empire – established a mud fort considered to be the foundation of modern Bangalore and its oldest areas, or petes, which exist to the present day. After the fall of Vijayanagar empire in 16th century, the Mughals sold Bangalore to Chikkadevaraja Wodeyar (1673–1704), the then ruler of the Kingdom of Mysore for three lakh rupees.When Haider Ali seized control of the Kingdom of Mysore, the administration of Bangalore passed into his hands. It was captured by the British East India Company after victory in the Fourth Anglo-Mysore War (1799), who returned administrative control of the city to the Maharaja of Mysore. The old city developed in the dominions of the Maharaja of Mysore and was made capital of the Princely State of Mysore, which existed as a nominally sovereign entity of the British Raj. In 1809, the British shifted their cantonment to Bangalore, outside the old city, and a town grew up around it, which was governed as part of British India. Following India's independence in 1947, Bangalore became the capital of Mysore State, and remained capital when the new Indian state of Karnataka was formed in 1956. The two urban settlements of Bangalore – city and cantonment – which had developed as independent entities merged into a single urban centre in 1949. The existing Kannada name, Bengalru, was declared the official name of the city in 2006.

Questions that can be asked using the above mentioned datasets What is best location in Banglore City for Chinese Cuisine ? Which areas have large number of Continental Resturant Market ? Which all areas have less number of resturant ? Which is the best place to stay if I prefer Continental Cuisine ? What places are have best restaurant in Banglore?

```
In [50]: import pandas as pd
         import numpy as np
         import requests # library to handle requests
         from pandas.io.json import json_normalize # tranform 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

!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven't c
import folium # map rendering library
! pip install geocoder
import geocoder
```

```
usage: conda-script.py [-h] [-V] command ...
conda-script.py: error: unrecognized arguments: # uncomment this line if you haven't completed t
```

```
Requirement already satisfied: geocoder in c:\users\saran\anaconda3\lib\site-packages (1.38.1)
Requirement already satisfied: click in c:\users\saran\anaconda3\lib\site-packages (from geocode
Requirement already satisfied: requests in c:\users\saran\anaconda3\lib\site-packages (from geoc
Requirement already satisfied: ratelim in c:\users\saran\anaconda3\lib\site-packages (from geoco
Requirement already satisfied: six in c:\users\saran\anaconda3\lib\site-packages (from geocoder)
Requirement already satisfied: future in c:\users\saran\anaconda3\lib\site-packages (from geocod
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in c:\users\saran\anaconda3\lib\site-packag
Requirement already satisfied: idna<2.9,>=2.5 in c:\users\saran\anaconda3\lib\site-packages (fro
Requirement already satisfied: certifi>=2017.4.17 in c:\users\saran\anaconda3\lib\site-packages
Requirement already satisfied: urllib3<1.25,>=1.21.1 in c:\users\saran\anaconda3\lib\site-packag
Requirement already satisfied: decorator in c:\users\saran\anaconda3\lib\site-packages (from rat
```

In [5]:
```
df = pd.read_csv('https://raw.githubusercontent.com/contactsaranya/Capstone/main/zomato.
df.head()
```

Out[5]:

	Restaurant ID	Restaurant Name	Country Code	City	\
0	6317637	Le Petit Souffle	162	Makati City	
1	6304287	Izakaya Kikufuji	162	Makati City	
2	6300002	Heat - Edsa Shangri-La	162	Mandaluyong City	
3	6318506	Ooma	162	Mandaluyong City	
4	6314302	Sambo Kojin	162	Mandaluyong City	

	Address	\
0	Third Floor, Century City Mall, Kalayaan Avenu...	
1	Little Tokyo, 2277 Chino Roces Avenue, Legaspi...	
2	Edsa Shangri-La, 1 Garden Way, Ortigas, Mandal...	
3	Third Floor, Mega Fashion Hall, SM Megamall, O...	
4	Third Floor, Mega Atrium, SM Megamall, Ortigas...	

	Locality	\
0	Century City Mall, Poblacion, Makati City	
1	Little Tokyo, Legaspi Village, Makati City	
2	Edsa Shangri-La, Ortigas, Mandaluyong City	
3	SM Megamall, Ortigas, Mandaluyong City	
4	SM Megamall, Ortigas, Mandaluyong City	

	Locality Verbose	Longitude	Latitude	\

```
0  Century City Mall, Poblacion, Makati City, Mak...  121.027535  14.565443
1  Little Tokyo, Legaspi Village, Makati City, Ma...  121.014101  14.553708
2  Edsa Shangri-La, Ortigas, Mandaluyong City, Ma...  121.056831  14.581404
3  SM Megamall, Ortigas, Mandaluyong City, Mandal...  121.056475  14.585318
4  SM Megamall, Ortigas, Mandaluyong City, Mandal...  121.057508  14.584450

                          Cuisines  ...          Currency Has Table booking  \
0       French, Japanese, Desserts  ...  Botswana Pula(P)               Yes
1                         Japanese  ...  Botswana Pula(P)               Yes
2  Seafood, Asian, Filipino, Indian  ...  Botswana Pula(P)               Yes
3                  Japanese, Sushi  ...  Botswana Pula(P)                No
4                 Japanese, Korean  ...  Botswana Pula(P)               Yes

  Has Online delivery Is delivering now Switch to order menu Price range  \
0                  No                No                    No           3
1                  No                No                    No           3
2                  No                No                    No           4
3                  No                No                    No           4
4                  No                No                    No           4

   Aggregate rating  Rating color Rating text Votes
0               4.8    Dark Green   Excellent   314
1               4.5    Dark Green   Excellent   591
2               4.4         Green   Very Good   270
3               4.9    Dark Green   Excellent   365
4               4.8    Dark Green   Excellent   229

[5 rows x 21 columns]
```

In [6]:
```
df_india = df[df['Country Code'] == 1]
df_NDLS = df_india[df_india['City'] == 'Bangalore']
df_NDLS.reset_index(drop=True, inplace=True)
df_NDLS.head()
```

Out[6]:
```
   Restaurant ID                 Restaurant Name  Country Code       City  \
0          50943                Sultans of Spice             1  Bangalore
1          58268  The Fatty Bao - Asian Gastro Bar             1  Bangalore
2          51705                            Toit             1  Bangalore
3       18162866           Three Dots & A Dash             1  Bangalore
4       18407918              Bombay Brasserie             1  Bangalore

                                             Address  \
0  BluPetal Hotel, 60 Jyoti Nivas College Road, K...
1  610, 3rd Floor, 12th Main, Off 80 Feet Road, I...
2  298, Namma Metro Pillar 62, 100 Feet Road, Ind...
3  840/1,100 Feet Road, Metro Pillar 56-57, Indir...
4  2989/B, 12th Main Road, HAL 2nd Stage, Indiran...
```

```
                      Locality                       Locality Verbose  \
0  BluPetal Hotel, Koramangala  BluPetal Hotel, Koramangala, Bangalore
1                  Indiranagar                  Indiranagar, Bangalore
2                  Indiranagar                  Indiranagar, Bangalore
3                  Indiranagar                  Indiranagar, Bangalore
4                  Indiranagar                  Indiranagar, Bangalore

   Longitude   Latitude                  Cuisines  ...            Currency  \
0  77.615428  12.933284     North Indian, Mughlai  ...  Indian Rupees(Rs.)
1  77.645396  12.970221                    Asian  ...  Indian Rupees(Rs.)
2  77.640709  12.979166  Italian, American, Pizza  ...  Indian Rupees(Rs.)
3  77.640489  12.980410     European, Continental  ...  Indian Rupees(Rs.)
4  77.645748  12.970324             Modern Indian  ...  Indian Rupees(Rs.)

  Has Table booking Has Online delivery Is delivering now  \
0               Yes                 Yes                No
1               Yes                 Yes                No
2                No                  No                No
3               Yes                  No                No
4                No                 Yes                No

  Switch to order menu Price range  Aggregate rating  Rating color  \
0                   No           3               4.1         Green
1                   No           4               4.7    Dark Green
2                   No           4               4.8    Dark Green
3                   No           3               3.9        Yellow
4                   No           3               4.2         Green

  Rating text  Votes
0   Very Good   2416
1   Excellent   2369
2   Excellent  10934
3        Good   1354
4   Very Good    231

[5 rows x 21 columns]
```

In [7]:
```
df_Res= df_NDLS[df_NDLS.Longitude !=0.000000][['Restaurant Name','Locality','Longitude',
```

In [8]:
```
df_Res = df_Res[df_Res['Aggregate rating'] !=0.0]
```

In [9]:
```
df_Res.head()
```

Out[9]:
```
                    Restaurant Name                     Locality  Longitude  \
0                   Sultans of Spice  BluPetal Hotel, Koramangala  77.615428
1  The Fatty Bao - Asian Gastro Bar                  Indiranagar  77.645396
2                               Toit                  Indiranagar  77.640709
3               Three Dots & A Dash                  Indiranagar  77.640489
4                  Bombay Brasserie                  Indiranagar  77.645748
```

```
   Latitude                  Cuisines  Aggregate rating Rating text  Votes
0  12.933284     North Indian, Mughlai               4.1   Very Good   2416
1  12.970221                     Asian               4.7   Excellent   2369
2  12.979166  Italian, American, Pizza               4.8   Excellent  10934
3  12.980410     European, Continental               3.9        Good   1354
4  12.970324             Modern Indian               4.2   Very Good    231
```

In [10]:
```
Bangalore_Rest = folium.Map(location=[12.52, 77.85], 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
    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[10]:
```
<folium.folium.Map at 0x1d8b76d7518>
```

In [11]:
```
df_Res.head()
```

Out[11]:
```
                    Restaurant Name                    Locality  Longitude  \
0                  Sultans of Spice  BluPetal Hotel, Koramangala  77.615428
1  The Fatty Bao - Asian Gastro Bar                 Indiranagar  77.645396
2                               Toit                 Indiranagar  77.640709
3              Three Dots & A Dash                  Indiranagar  77.640489
4                 Bombay Brasserie                  Indiranagar  77.645748

   Latitude                  Cuisines  Aggregate rating Rating text  Votes  \
0  12.933284     North Indian, Mughlai               4.1   Very Good   2416
1  12.970221                     Asian               4.7   Excellent   2369
2  12.979166  Italian, American, Pizza               4.8   Excellent  10934
3  12.980410     European, Continental               3.9        Good   1354
```

```
4  12.970324            Modern Indian               4.2   Very Good    231
```

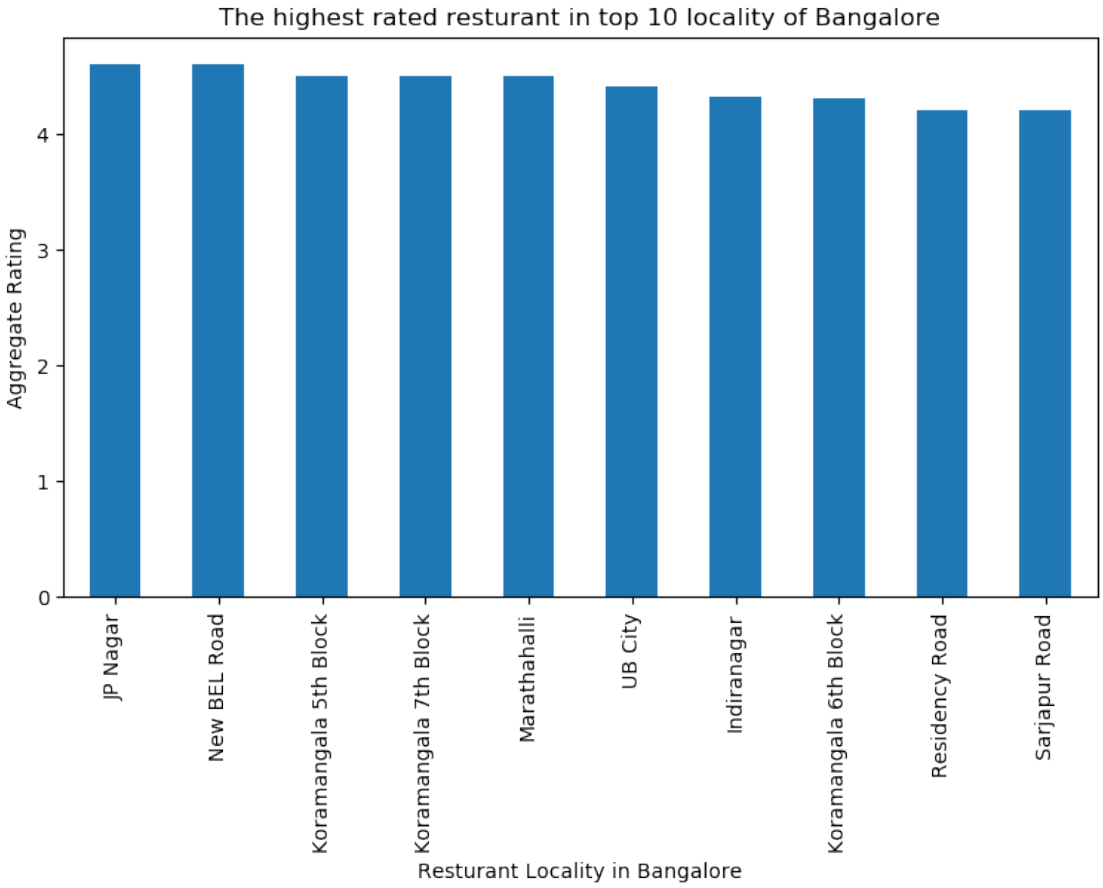
```
   Cluster
0        0
1        2
2        2
3        2
4        2
```

0.1 What places are have best restaurant in Bangalore?

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 Bangalore')
#On x-axis

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

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



The best restarants are available in JP Nagar and New BEL Road.

0.2 what places are have worst restaurants in Bangalore?

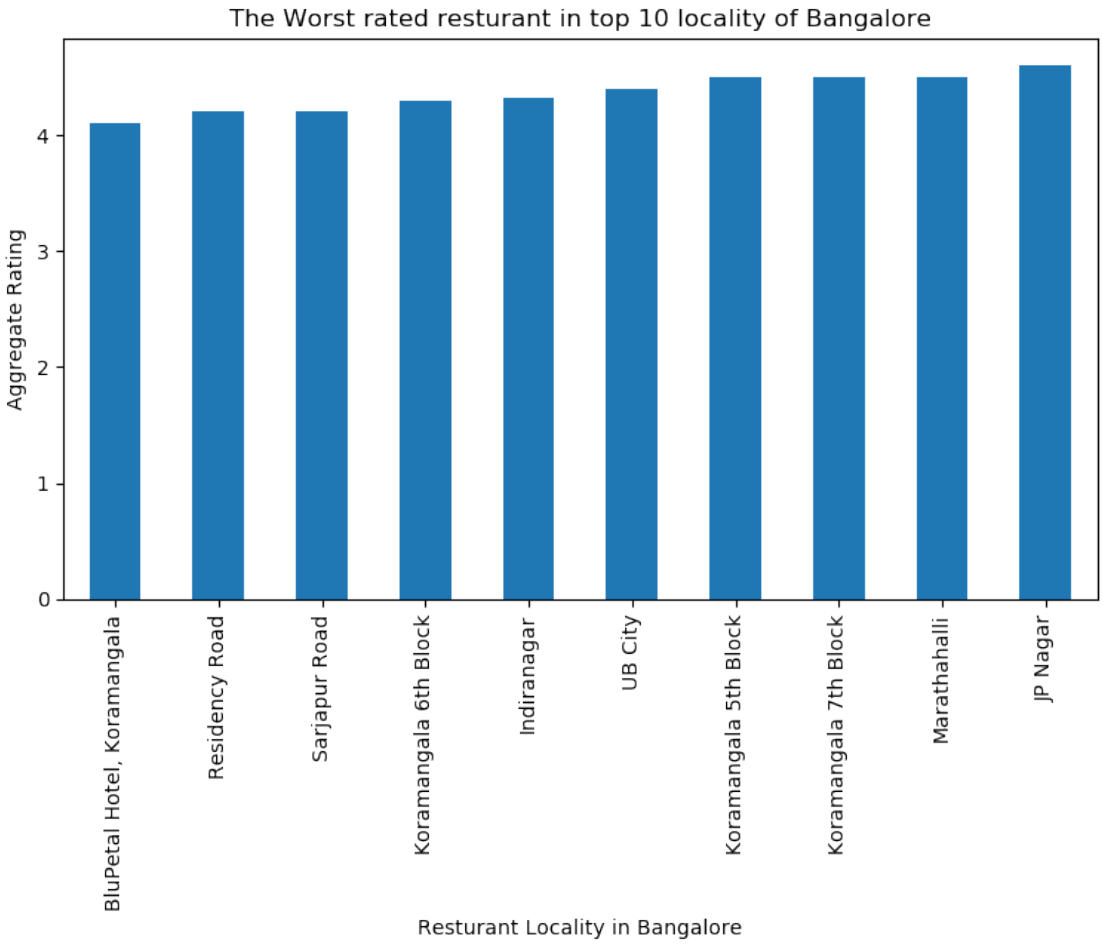
```
In [14]: import matplotlib.pyplot as plt
         plt.figure(figsize=(9,5), dpi = 100)
         # title
         plt.title('The Worst rated resturant in top 10 locality of Bangalore')
         #On x-axis

         #giving a bar plot

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

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

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



The worst restarants are available in BluePetal Hotel, Koramangala.

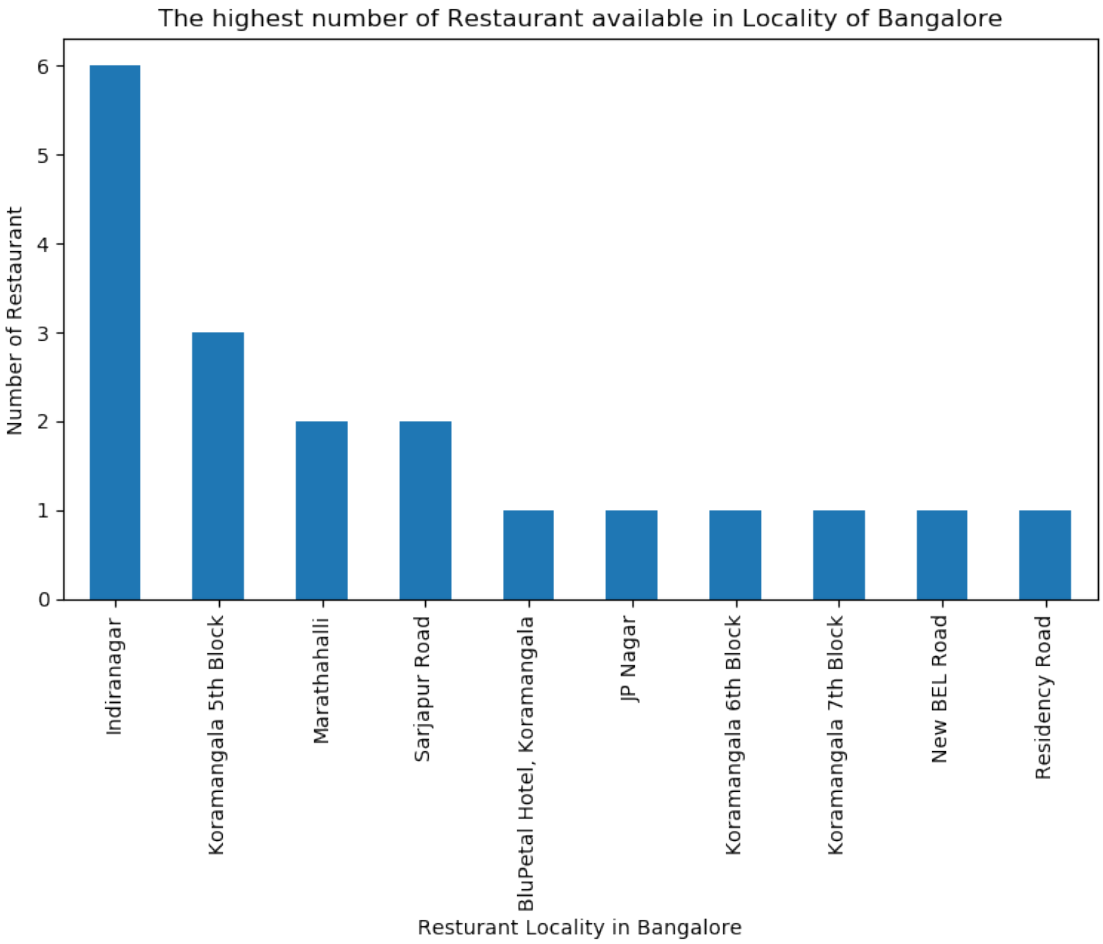
0.3 Which place are suitable for edible person in Bangalore city?

```
In [15]: import matplotlib.pyplot as plt
         plt.figure(figsize=(9,5), dpi = 100)
         # title
         plt.title('The highest number of Restaurant available in Locality of Bangalore')
         #On x-axis

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

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

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



Indiranagar is the best places for edible person to stay there.

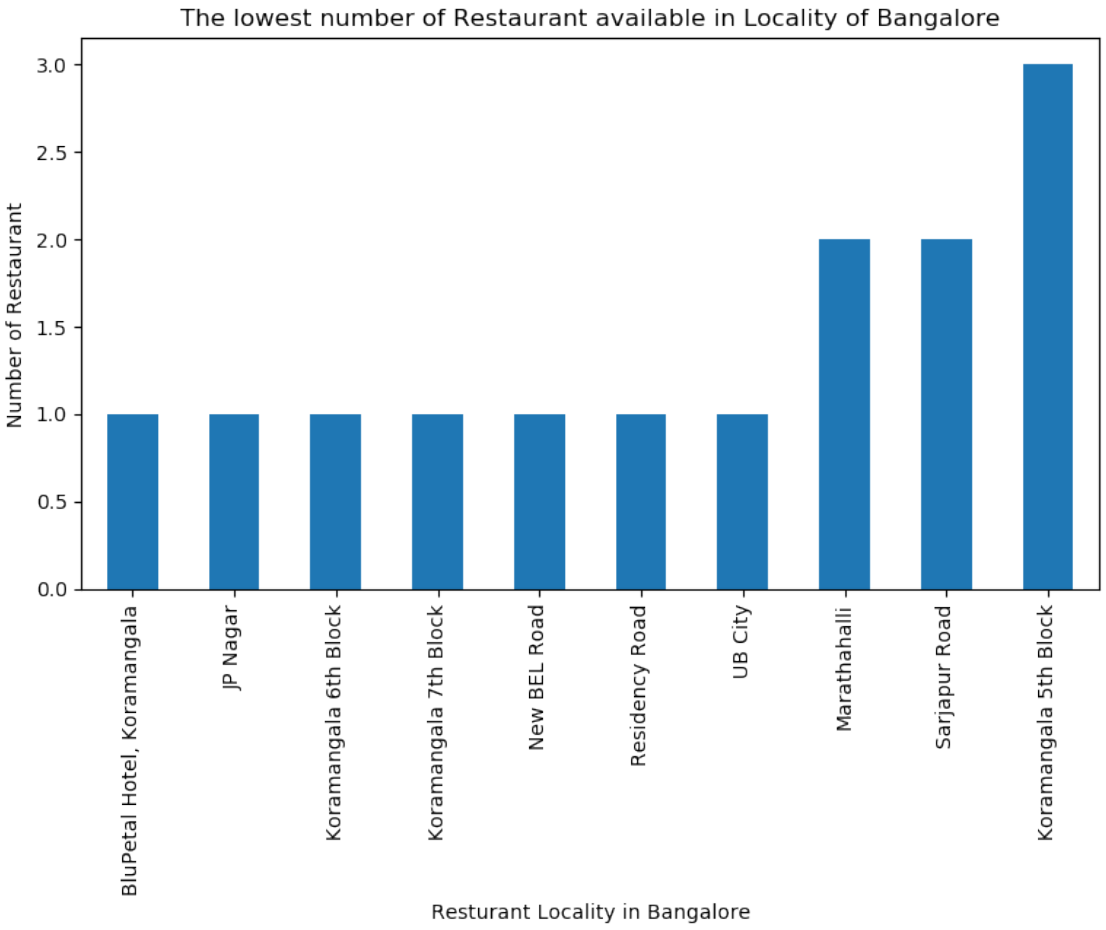
0.4 Which place are not suitable for edible person in Bangalore city?

```
In [16]: import matplotlib.pyplot as plt
         plt.figure(figsize=(9,5), dpi = 100)
         # title
         plt.title('The lowest number of Restaurant available in Locality of Bangalore')
         #On x-axis

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

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

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



BluePetal Hotel, Koramangala, JP Nagar, Koramangala 6th Block, Koramangala 7th Block, New BEL Road, Residency Road and UB City are the locality which is not suitable for edible person in Bangalore city

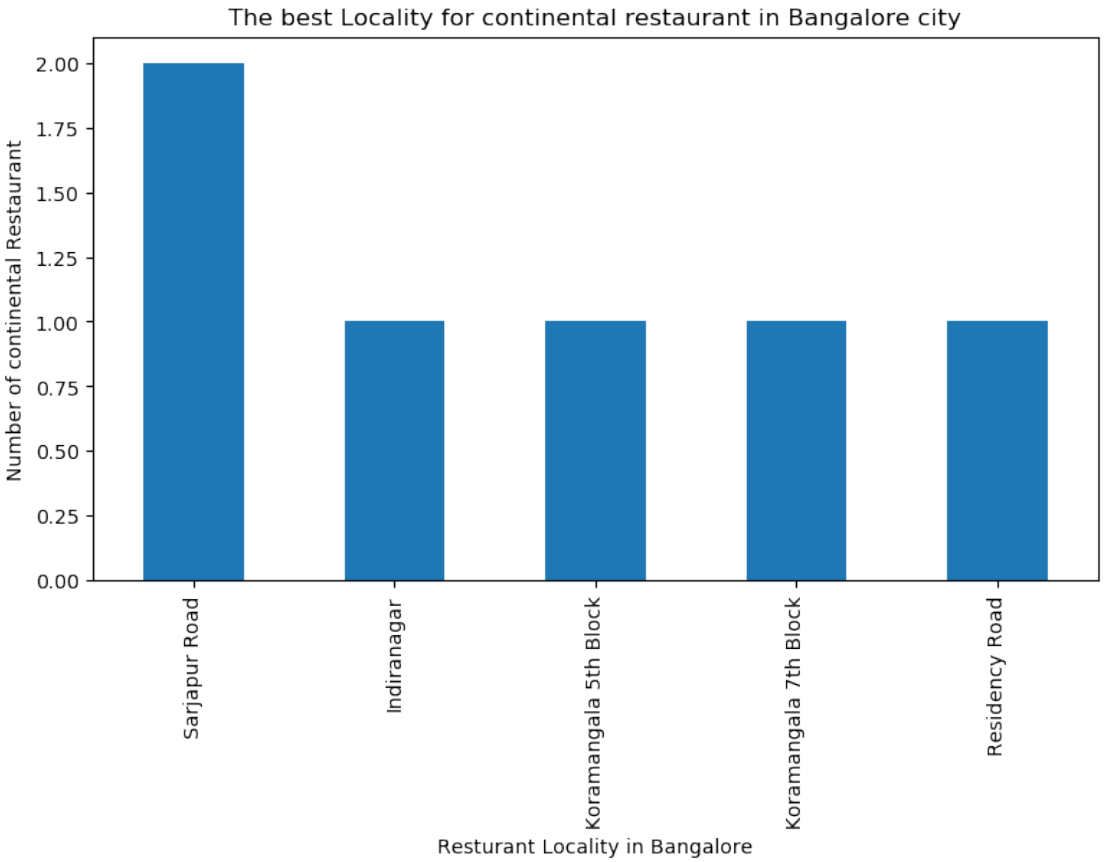
0.5 What are the best places for continental restaurant in Bangalore city

```
In [17]: import matplotlib.pyplot as plt
         plt.figure(figsize=(9,5), dpi = 100)
         # title
         plt.title('The best Locality for continental restaurant in Bangalore city')
         #On x-axis

         #giving a bar plot
         df_Res[df_Res['Cuisines'].str.contains('Continental')].groupby('Locality')['Restaurant

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

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



Sarijapur Road is the best place for Continental restaurant.

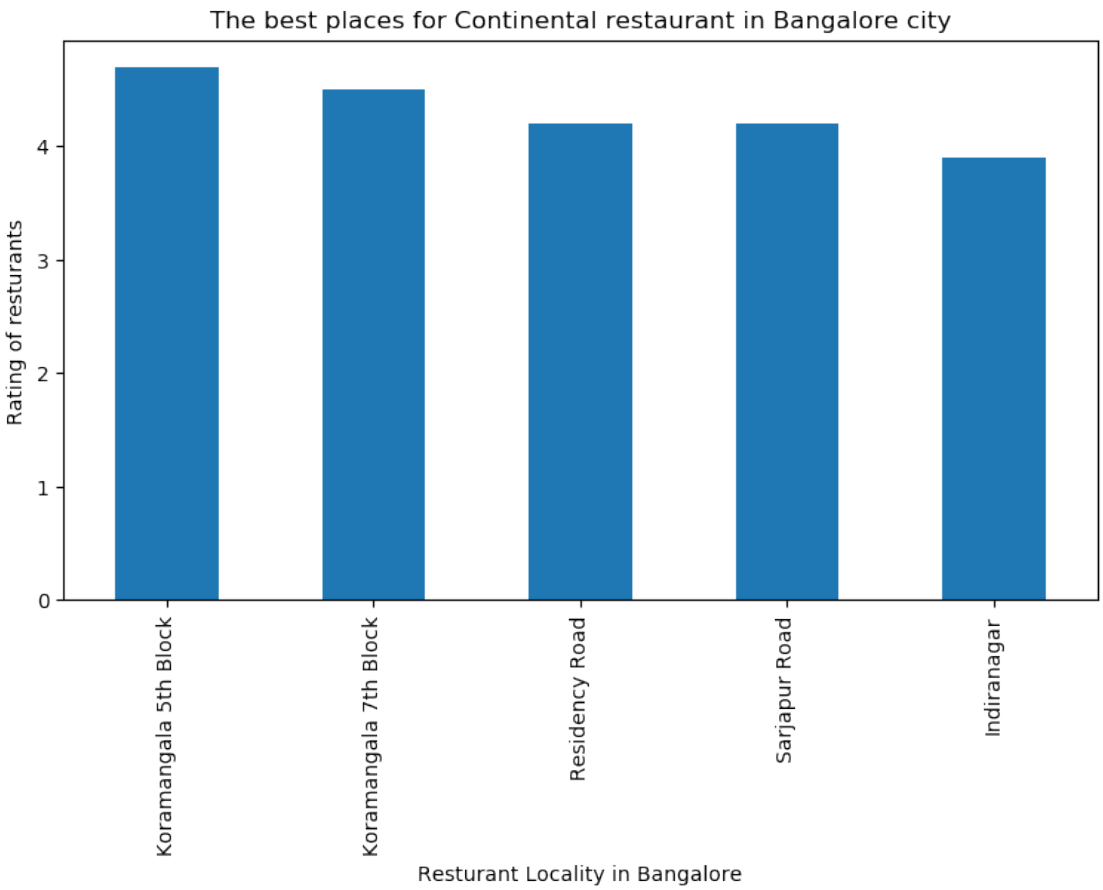
0.6 which places are the best continental resturants in Bangalore?

```
In [18]: import matplotlib.pyplot as plt
         plt.figure(figsize=(9,5), dpi = 100)
         # title
         plt.title('The best places for Continental restaurant in Bangalore city')
         #On x-axis

         #giving a bar plot
         df_Res[df_Res['Cuisines'].str.contains('Continental')].groupby('Locality')['Aggregate r

         plt.xlabel('Resturant Locality in Bangalore')
         #On y-axis
         plt.ylabel('Rating of resturants')
```

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



Koramangala 5th Block is best Continental resturants.

0.7 Data transformation

Based on Locality grouping the data

```
In [19]: df_Res_Loc =  df_Res.groupby('Locality').count()['Restaurant Name'].to_frame()
         df_Res_rating= df_Res.groupby('Locality')['Aggregate rating'].mean().to_frame()
         d_Cuisines = df_Res.groupby(['Locality'])['Cuisines'].agg(', '.join).reset_index()
         d_R = df_Res.groupby(['Locality'])['Rating text'].unique().agg(', '.join).reset_index()
         d_V = df_Res.groupby(['Locality'])['Votes'].sum().to_frame()
         d_Lat = df_Res.groupby('Locality').mean()['Latitude'].to_frame()
         d_Lng = df_Res.groupby('Locality').mean()['Longitude'].to_frame()
         df_final = pd.merge(d_Lat,d_Lng,on='Locality').merge(df_Res_Loc, on='Locality').merge(d
```

```
In [20]: df_final = df_final[df_final['Aggregate rating'] != 0.000000]
         df_final.columns =['Locality','Lat','Lng', 'No_of_Restaurant','Cusines', 'Agg_Rating','
         df_final.head()
```

Out[20]:

	Locality	Lat	Lng	No_of_Restaurant	Cusines	Agg_Rating	Comments	No_of_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

In [21]:
```
df_final.shape
```

Out[21]: (11, 8)

In [22]:
```
## Define Foursquare Credentials and Version
CLIENT_ID = 'ES3ZXR1ALGYOQOYQVMGORUMAOOOWTUNG4K1C2JN5C2JOO1AZ' # Foursquare ID
CLIENT_SECRET = 'H3VNVPRCUTEX4NP23B4ANBLXWZKKIZOVM4NKNOIQRYPYXPTW' # Foursquare Secret
VERSION = '20180605' # Foursquare API version

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

```
Your credentails:
CLIENT_ID: ES3ZXR1ALGYOQOYQVMGORUMAOOOWTUNG4K1C2JN5C2JOO1AZ
CLIENT_SECRET:H3VNVPRCUTEX4NP23B4ANBLXWZKKIZOVM4NKNOIQRYPYXPTW
```

0.7.1 create a function to repeat the same process to all the Locality in Bangalore

In [23]:
```
## create a function to repeat the same process to all the Locality in New Delhi

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
                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_
        nearby_venues.columns = ['Locality',
                      'Locality Latitude',
                      'Locality Longitude',
                      'Venue',
                      'Venue Latitude',
                      'Venue Longitude',
                      'Venue Category']

        return(nearby_venues)
```

0.7.2 find the venues in all Bangalore Locality

```
In [24]: Bangalore_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 [25]: Bangalore_venues.head()
```

Out[25]:

	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	XOOX Brewmill	12.935507	77.614982	Brewery
3	BluPetal Hotel, Koramangala	12.933284	77.615428	Khawa Karpo	12.934051	77.616640	Chinese Restaurant
4	BluPetal Hotel, Koramangala	12.933284	77.615428	Stoner	12.932759	77.614132	Ice Cream Shop

```
In [27]: Bangalore_venues.groupby('Locality').count()
```

Out[27]:

Locality	Locality Latitude	Locality Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
BluPetal Hotel, Koramangala	100	100	100	100	100	100
Indiranagar	59	59	59	59	59	59
JP Nagar	29	29	29	29	29	29
Koramangala 5th Block	100	100	100	100	100	100
Koramangala 6th Block	24	24	24	24	24	24
Koramangala 7th Block	82	82	82	82	82	82
Marathahalli	5	5	5	5	5	5
New BEL Road	34	34	34	34	34	34
Residency Road	100	100	100	100	100	100
Sarjapur Road	18	18	18	18	18	18
UB City	57	57	57	57	57	57

```
Sarjapur Road                          18              18              18
UB City                                57              57              57
```

```
In [28]: print('There are {} uniques categories.'.format(len(Bangalore_venues['Venue Category'].
```

```
There are 109 uniques categories.
```

```
In [29]: Bangalore_onehot = pd.get_dummies(Bangalore_venues[['Venue Category']], prefix="", pref

         # add Locality column back to dataframe
         Bangalore_onehot['Locality'] = Bangalore_venues['Locality']

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

         Bangalore_onehot.head()
```

Out[29]:

	Locality	Afghan Restaurant	American Restaurant	Andhra Restaurant	Arcade	Art Gallery	Arts & Crafts Store	Asian Restaurant	Bakery	Bar	...	Steakhouse	Tea Room	Tennis Stadium	Thai Restaurant	Tibetan Restaurant	Toy / Game Store	Track Stadium
0	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0
1	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0	1	...	0	0	0	0	0	0	0
2	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0
3	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0
4	BluPetal Hotel, Koramangala	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0

```
   Trail  Udupi Restaurant  Vegetarian / Vegan Restaurant
0      0                 0                             0
1      0                 0                             0
2      0                 0                             0
3      0                 0                             0
4      0                 0                             0

[5 rows x 110 columns]
```

In [30]:
```
Bangalore_grouped = Bangalore_onehot.groupby('Locality').mean().reset_index()
Bangalore_grouped
```

Out[30]:
```
                      Locality  Afghan Restaurant  American Restaurant  \
0   BluPetal Hotel, Koramangala           0.000000                 0.00
1                   Indiranagar           0.000000                 0.00
2                      JP Nagar           0.000000                 0.00
3         Koramangala 5th Block           0.000000                 0.00
4         Koramangala 6th Block           0.000000                 0.00
5         Koramangala 7th Block           0.000000                 0.00
6                  Marathahalli           0.000000                 0.00
7                  New BEL Road           0.000000                 0.00
8                Residency Road           0.000000                 0.01
9                 Sarjapur Road           0.055556                 0.00
10                      UB City           0.000000                 0.00

    Andhra Restaurant    Arcade  Art Gallery  Arts & Crafts Store  \
0                0.00  0.000000     0.000000             0.000000
1                0.00  0.016949     0.000000             0.000000
2                0.00  0.000000     0.000000             0.000000
3                0.00  0.000000     0.000000             0.000000
4                0.00  0.000000     0.000000             0.000000
5                0.00  0.000000     0.000000             0.000000
6                0.00  0.000000     0.000000             0.000000
7                0.00  0.000000     0.000000             0.000000
8                0.01  0.000000     0.000000             0.010000
9                0.00  0.000000     0.000000             0.000000
10               0.00  0.000000     0.017544             0.017544

    Asian Restaurant    Bakery       Bar  ...  Steakhouse  Tea Room  \
0           0.020000  0.020000  0.030000  ...    0.000000  0.010000
1           0.000000  0.033898  0.033898  ...    0.016949  0.000000
2           0.000000  0.068966  0.068966  ...    0.000000  0.000000
3           0.020000  0.010000  0.030000  ...    0.000000  0.010000
4           0.000000  0.000000  0.000000  ...    0.000000  0.041667
5           0.012195  0.024390  0.024390  ...    0.000000  0.012195
6           0.000000  0.000000  0.000000  ...    0.000000  0.000000
7           0.029412  0.000000  0.029412  ...    0.000000  0.000000
8           0.000000  0.010000  0.060000  ...    0.010000  0.000000
```

```
9           0.000000  0.000000  0.000000  ...    0.000000  0.000000
10          0.017544  0.017544  0.000000  ...    0.000000  0.000000

    Tennis Stadium  Thai Restaurant  Tibetan Restaurant  Toy / Game Store  \
0         0.000000             0.00            0.010000          0.000000
1         0.000000             0.00            0.000000          0.000000
2         0.000000             0.00            0.000000          0.034483
3         0.000000             0.00            0.010000          0.000000
4         0.000000             0.00            0.000000          0.041667
5         0.000000             0.00            0.012195          0.000000
6         0.000000             0.00            0.000000          0.000000
7         0.000000             0.00            0.000000          0.000000
8         0.000000             0.01            0.010000          0.000000
9         0.000000             0.00            0.000000          0.000000
10        0.017544             0.00            0.000000          0.000000

    Track Stadium     Trail  Udupi Restaurant  Vegetarian / Vegan Restaurant
0        0.000000  0.000000          0.000000                       0.000000
1        0.000000  0.000000          0.016949                       0.016949
2        0.000000  0.000000          0.000000                       0.000000
3        0.000000  0.000000          0.000000                       0.000000
4        0.000000  0.000000          0.000000                       0.041667
5        0.000000  0.000000          0.000000                       0.000000
6        0.000000  0.000000          0.000000                       0.000000
7        0.000000  0.029412          0.000000                       0.000000
8        0.000000  0.000000          0.000000                       0.010000
9        0.000000  0.000000          0.000000                       0.000000
10       0.017544  0.000000          0.000000                       0.000000

[11 rows x 110 columns]
```

```
In [31]: Bangalore_grouped.shape
```

```
Out[31]: (11, 110)
```

```
In [32]: num_top_venues = 5

         for hood in Bangalore_grouped['Locality']:
             print("----"+hood+"----")
             temp = Bangalore_grouped[Bangalore_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
             print('\n')
```

```
----BluPetal Hotel, Koramangala----
                venue  freq
```

```
0     Indian Restaurant  0.18
1  Fast Food Restaurant  0.05
2    Chinese Restaurant  0.05
3                 Café  0.05
4          Dessert Shop  0.04


----Indiranagar----
                venue  freq
0                Café  0.14
1   Indian Restaurant  0.14
2                 Pub  0.07
3              Lounge  0.05
4  Chinese Restaurant  0.05


----JP Nagar----
               venue  freq
0        Pizza Place  0.07
1  Indian Restaurant  0.07
2             Bakery  0.07
3                Bar  0.07
4        Coffee Shop  0.07


----Koramangala 5th Block----
                venue  freq
0   Indian Restaurant  0.19
1                Café  0.05
2  Chinese Restaurant  0.05
3          Restaurant  0.04
4              Lounge  0.04


----Koramangala 6th Block----
                           venue  freq
0                    Pizza Place  0.08
1                 Clothing Store  0.08
2             Seafood Restaurant  0.08
3                           Café  0.08
4  Vegetarian / Vegan Restaurant  0.04


----Koramangala 7th Block----
                venue  freq
0     Indian Restaurant  0.18
1          Dessert Shop  0.05
2                 Café  0.04
```

```
3    Chinese Restaurant  0.04
4  Fast Food Restaurant  0.04


----Marathahalli----
                        venue  freq
0           Indian Restaurant   0.6
1          Chinese Restaurant   0.2
2                       Café   0.2
3           Afghan Restaurant   0.0
4  Modern European Restaurant   0.0


----New BEL Road----
                  venue  freq
0        Ice Cream Shop  0.21
1     Indian Restaurant  0.15
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  0.05


----Sarjapur Road----
                     venue  freq
0        Indian Restaurant  0.22
1                     Café  0.11
2                  Brewery  0.11
3        Afghan Restaurant  0.06
4  South Indian Restaurant  0.06


----UB City----
                venue  freq
0  Italian Restaurant  0.09
1              Lounge  0.05
2               Café  0.05
3  Mexican Restaurant  0.05
4         Coffee Shop  0.04
```

```
In [33]: 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 [34]: 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'] = Bangalore_grouped['Locality']

         for ind in np.arange(Bangalore_grouped.shape[0]):
             Locality_venues_sorted.iloc[ind, 1:] = return_most_common_venues(Bangalore_grouped.

         Locality_venues_sorted
```

Out[34]:

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
0	BluPetal Hotel, Koramangala	Indian Restaurant	Café	Fast Food Restaurant	Chinese Restaurant
1	Indiranagar	Café	Indian Restaurant	Pub	Pizza Place
2	JP Nagar	Indian Restaurant	Coffee Shop	Café	Pizza Place
3	Koramangala 5th Block	Indian Restaurant	Café	Chinese Restaurant	Fast Food Restaurant
4	Koramangala 6th Block	Clothing Store	Café		
5	Koramangala 7th Block	Indian Restaurant	Dessert Shop		
6	Marathahalli	Indian Restaurant	Chinese Restaurant		
7	New BEL Road	Ice Cream Shop	Indian Restaurant		
8	Residency Road	Café	Indian Restaurant		
9	Sarjapur Road	Indian Restaurant	Café		
10	UB City	Italian Restaurant	Lounge		

```
4            Pizza Place             Seafood Restaurant
5   Fast Food Restaurant                      Bookstore
6                  Café  Vegetarian / Vegan Restaurant
7   Fast Food Restaurant             Chinese Restaurant
8                    Pub                            Bar
9                Brewery             Afghan Restaurant
10    Mexican Restaurant                           Café

             5th Most Common Venue 6th Most Common Venue 7th Most Common Venue  \
0                           Lounge          Dessert Shop            Restaurant
1               Chinese Restaurant                Lounge         Dessert Shop
2                           Bakery                   Bar        Shopping Mall
3                           Lounge          Dessert Shop            Restaurant
4   Vegetarian / Vegan Restaurant    Bengali Restaurant  Gym / Fitness Center
5                           Lounge                 Café   Chinese Restaurant
6             Fast Food Restaurant              Creperie         Cupcake Shop
7                     Pizza Place           Coffee Shop     German Restaurant
8                           Lounge           Coffee Shop   Chinese Restaurant
9         South Indian Restaurant           Coffee Shop        Grocery Store
10                     Restaurant           Coffee Shop       Clothing Store

   8th Most Common Venue 9th Most Common Venue 10th Most Common Venue
0              Bookstore                   Bar            Snack Place
1                 Bakery                   Bar              Boutique
2              Multiplex        Clothing Store       Department Store
3              Bookstore                   Bar             Donut Shop
4            Food Court        Ice Cream Shop      Indian Restaurant
5          Shopping Mall                   Bar            Snack Place
6          Deli / Bodega      Department Store          Dessert Shop
7     Mexican Restaurant          Burger Joint         Sandwich Place
8              Bookstore        Clothing Store            Pizza Place
9            Pizza Place                   Pub             Restaurant
10     Electronics Store                 Hotel                 Museum
```

In [35]:
```
kclusters = 5

Bangalore_clustering = Bangalore_grouped.drop('Locality', 1)

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

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

Out[35]:
```
(11,)
```

In [41]:
```
# add clustering labels
Bangalore_merged = df_final.head(240)
```

```
Bangalore_merged['Cluster Labels'] = kmeans.labels_


Bangalore_merged = Bangalore_merged.join(Locality_venues_sorted.set_index('Locality'),

Bangalore_merged.head()
```

```
C:\Users\saran\Anaconda3\lib\site-packages\ipykernel_launcher.py:4: 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: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
  after removing the cwd from sys.path.
```

Out[41]:

	Locality	Lat	Lng	No_of_Restaurant	Cusines	Agg_Rating	Comments	No_of_Votes	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
0	BluPetal Hotel, Koramangala	12.933284	77.615428	1	North Indian, Mughlai	4.100000	Very Good	2416	0	Indian Restaurant	Café	Fast Food Restaurant	Chinese Restaurant	Lounge	Dessert Shop
1	Indiranagar	12.976278	77.642775	6	Asian, Italian, American, Pizza, European, Con...	4.316667	Excellent, Good, Very Good	19834	0	Café	Indian Restaurant	Pub	Pizza Place	Chinese Restaurant	Lounge
2	JP Nagar	12.906229	77.596791	1	Pizza, Cafe, Italian	4.600000	Excellent	781	0	Indian Restaurant	Coffee Shop	Café	Pizza Place	Bakery	Bar
3	Koramangala 5th Block	12.933947	77.615415	3	Continental, American, Italian, North Indian, ...	4.500000	Excellent, Very Good	15328	0	Indian Restaurant	Café	Chinese Restaurant	Fast Food Restaurant	Lounge	Dessert Shop
4	Koramangala 6th Block	12.939496	77.625999	1	North Indian, Chinese, Italian, Street Food, D...	4.300000	Very Good	753	3	Clothing Store	Café	Pizza Place			

```
4    Seafood Restaurant  Vegetarian / Vegan Restaurant    Bengali Restaurant

  7th Most Common Venue 8th Most Common Venue 9th Most Common Venue  \
0            Restaurant             Bookstore                   Bar
1          Dessert Shop                Bakery                   Bar
2         Shopping Mall             Multiplex        Clothing Store
3            Restaurant             Bookstore                   Bar
4  Gym / Fitness Center            Food Court        Ice Cream Shop

  10th Most Common Venue
0            Snack Place
1               Boutique
2       Department Store
3             Donut Shop
4      Indian Restaurant
```

In [43]:
```
# 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(Bangalore_merged['Lat'], Bangalore_merged['Lng'], Ban
    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[43]:
```
<folium.folium.Map at 0x1d8b8adbd68>
```

In [45]:
```
Bangalore_merged.loc[Bangalore_merged['Cluster Labels'] == 0, Bangalore_merged.columns[
```

Out[45]:
```
         Lat  Agg_Rating                   Comments  No_of_Votes  \
0  12.933284    4.100000                  Very Good         2416
1  12.976278    4.316667  Excellent, Good, Very Good        19834
2  12.906229    4.600000                  Excellent          781
```

```
3  12.933947    4.500000        Excellent, Very Good        15328
5  12.935662    4.500000                   Excellent         1288
8  12.972532    4.200000                   Very Good          334

   Cluster Labels 1st Most Common Venue 2nd Most Common Venue  \
0               0     Indian Restaurant                  Café
1               0                 Café     Indian Restaurant
2               0     Indian Restaurant           Coffee Shop
3               0     Indian Restaurant                  Café
5               0     Indian Restaurant          Dessert Shop
8               0                 Café     Indian Restaurant

  3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue  \
0  Fast Food Restaurant    Chinese Restaurant                Lounge
1                   Pub          Pizza Place    Chinese Restaurant
2                 Café           Pizza Place                Bakery
3    Chinese Restaurant  Fast Food Restaurant                Lounge
5  Fast Food Restaurant             Bookstore                Lounge
8                   Pub                   Bar                Lounge

  6th Most Common Venue 7th Most Common Venue 8th Most Common Venue  \
0          Dessert Shop            Restaurant             Bookstore
1                Lounge         Dessert Shop                Bakery
2                   Bar        Shopping Mall             Multiplex
3          Dessert Shop            Restaurant             Bookstore
5                 Café    Chinese Restaurant         Shopping Mall
8           Coffee Shop    Chinese Restaurant             Bookstore

  9th Most Common Venue 10th Most Common Venue
0                   Bar            Snack Place
1                   Bar               Boutique
2        Clothing Store       Department Store
3                   Bar             Donut Shop
5                   Bar            Snack Place
8        Clothing Store            Pizza Place
```

```
In [46]: Bangalore_merged.loc[Bangalore_merged['Cluster Labels'] == 1, Bangalore_merged.columns[
```

```
Out[46]:         Lat  Agg_Rating         Comments  No_of_Votes  Cluster Labels  \
9  12.913652         4.2  Excellent, Good         6110               1

  1st Most Common Venue 2nd Most Common Venue 3rd Most Common Venue  \
9     Indian Restaurant                 Café               Brewery

  4th Most Common Venue    5th Most Common Venue 6th Most Common Venue  \
9     Afghan Restaurant  South Indian Restaurant           Coffee Shop

  7th Most Common Venue 8th Most Common Venue 9th Most Common Venue  \
```

```
9         Grocery Store           Pizza Place                   Pub

  10th Most Common Venue
9             Restaurant
```

```
In [47]: Bangalore_merged.loc[Bangalore_merged['Cluster Labels'] == 2, Bangalore_merged.columns[
```

```
Out[47]:          Lat  Agg_Rating             Comments  No_of_Votes  Cluster Labels  \
6  12.962655         4.5  Excellent, Very Good         7890               2

  1st Most Common Venue 2nd Most Common Venue 3rd Most Common Venue  \
6     Indian Restaurant    Chinese Restaurant                  Café

           4th Most Common Venue 5th Most Common Venue 6th Most Common Venue  \
6  Vegetarian / Vegan Restaurant  Fast Food Restaurant              Creperie

  7th Most Common Venue 8th Most Common Venue 9th Most Common Venue  \
6          Cupcake Shop         Deli / Bodega      Department Store

  10th Most Common Venue
6           Dessert Shop
```

```
In [48]: Bangalore_merged.loc[Bangalore_merged['Cluster Labels'] ==3 , Bangalore_merged.columns[
```

```
Out[48]:           Lat  Agg_Rating   Comments  No_of_Votes  Cluster Labels  \
4   12.939496         4.3  Very Good          753               3
10  12.972161         4.4  Very Good          754               3

   1st Most Common Venue 2nd Most Common Venue 3rd Most Common Venue  \
4         Clothing Store                  Café           Pizza Place
10    Italian Restaurant                Lounge    Mexican Restaurant

   4th Most Common Venue          5th Most Common Venue 6th Most Common Venue  \
4     Seafood Restaurant  Vegetarian / Vegan Restaurant    Bengali Restaurant
10                 Café                     Restaurant           Coffee Shop

   7th Most Common Venue 8th Most Common Venue 9th Most Common Venue  \
4    Gym / Fitness Center            Food Court        Ice Cream Shop
10        Clothing Store     Electronics Store                 Hotel

   10th Most Common Venue
4       Indian Restaurant
10                Museum
```

```
In [49]: Bangalore_merged.loc[Bangalore_merged['Cluster Labels'] == 4, Bangalore_merged.columns[
```

```
Out[49]:          Lat  Agg_Rating   Comments  No_of_Votes  Cluster Labels  \
7  13.029198         4.6  Excellent          627               4
```

```
  1st Most Common Venue 2nd Most Common Venue 3rd Most Common Venue  \
7        Ice Cream Shop     Indian Restaurant  Fast Food Restaurant

  4th Most Common Venue 5th Most Common Venue 6th Most Common Venue  \
7    Chinese Restaurant           Pizza Place           Coffee Shop

  7th Most Common Venue 8th Most Common Venue 9th Most Common Venue  \
7     German Restaurant    Mexican Restaurant          Burger Joint

  10th Most Common Venue
7         Sandwich Place
```

0.7.3 Conclusion

Koramangala 5th Block is best Continental resturants. The best restarants are available in JP Nagar and New BEL Road. Sarijapur Road is the best place for Continental restaurant. BluePetal Hotel, Koramangala, JP Nagar, Koramangala 6th Block, Koramangala 7th Block, New BEL Road, Residency Road and UB City are the locality which is not suitable for edible person in Bangalore city

Cluster 1: It is most recommended for Indian Restaurants. #### Cluster 2: It is most recommended for Hotels and nightclub. #### Cluster 3 and Cluster 5: It is most recommended for Fast food. #### Cluster 4: It is most recommended for the cafe and pizza.

In [ ]: