



Restaurant Types and Rating : Data Analysis of London, Visakhapatnam and New York

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1. Introduction

(A).Description & Discussion of the Background

London and New York are among the largest metropolitan cities in the world with a combined population of **17.5 million** and a varied and heterogenous communities with a matching demand for gastronomic fare. However, the fact that the restaurants are spread across the cities, I decided to use areas which are mainly tourist attraction and define both the cities, I chose London Bridge and Statue of Liberty as iconic landmarks around which the different types of restaurants can be explored in detail.

I also checked a developing city from India, Visakhapatnam, to identify trends similar to the two major cities. What I found is though the number of restaurants are more or less similar in the foursquare database, most of the restaurants in Visakhapatnam are not rated and hence difficult to compare.

However, I have created maps and placed information on the restaurants and their analysis can be understood.

2. Data Description

To consider the problem I used **Foursquare API** to get the list of restaurants and their classification and rating in London, Visakhapatnam and New York.

3. Methodology

As a database, I used GitHub repository in my study. My master data which has the main components Restaurant name, *Category*, *Latitude* and *Longitude* information of the restaurants in London, New York and Visakhapatnam cities.

I utilized the Foursquare API to explore the restaurants and segment them. I gave latitude and longitude information. Here is a head of the list

restaurants name, category, latitude and longitude informations from Foursquare API.

London

	id	name	categories	referralId	hasPerk	location.address	location.crossStreet	location.lat	location.lng	
0	4b5344aef964a5200c9527e3	The Ivy Restaurant	'[{"id": "52e81612bcbc57f1066b7a05", "name": "E...'}]	v-1599740781	False	1-5 West St	Litchfield St	51.512800	-0.127981	
1	5001b8e6e4b05e79b0b3b84d	Bill's Restaurant	'[{"id": "52e81612bcbc57f1066b7a05", "name": "E...'}]	v-1599740781	False	36-44 Brewer St	Lexington St	51.511834	-0.135080	
2	4d440bf1c3e5f04d0a219620	Bill's Restaurant	'[{"id": "52e81612bcbc57f1066b7a05", "name": "E...'}]	v-1599740781	False	28 St Martin's Courtyard	Upper St Martin's Ln	51.512555	-0.126600	
3	4b9c54b8f964a520206036e3	Hung's Chinese Restaurant 美食軒	'[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	v-1599740781	False	27 Wardour St	NaN	51.511278	-0.131953	
4	4c39bcafedba9521cf6cd625	New Loon Fung Chinese Restaurant	'[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	v-1599740781	False	42-44 Gerrard St	NaN	51.512039	-0.130371	

New York

	id	name	categories	referralId	hasPerk	location.address	location.crossStreet	location.lat	location.lng	
0	49f125dcf964a52091691fe3	O'Hara's Restaurant & Pub	'[{"id": "4bf58dd8d48988d11b941735", "name": "P..."}]	v-1599742895	False	120 Cedar St	at Greenwich St	40.709894	-74.012836	
1	3fd66200f964a520d5e31ee3	Jing Fong Restaurant 金豐大酒樓	'[{"id": "4bf58dd8d48988d1f5931735", "name": "D..."}]	v-1599742895	False	20 Elizabeth St	btwn Bayard & Canal St	40.715881	-73.997209	
2	45e5c256f964a52046431fe3	Mudville Restaurant & Tap House	'[{"id": "4bf58dd8d48988d14c941735", "name": "W..."}]	v-1599742895	False	126 Chambers St	btwn W Broadway & Church St	40.715336	-74.008881	
3	3fd66200f964a520ece31ee3	Golden Unicorn Restaurant 麒麟金閣	'[{"id": "4bf58dd8d48988d1f5931735", "name": "D..."}]	v-1599742895	False	18 E Broadway	at Catherine St	40.713629	-73.997230	
4	3fd66200f964a520ceea1ee3	Deluxe Green Bo Restaurant	'[{"id": "4bf58dd8d48988d145941735", "name": "C..."}]	v-1599742895	False	66 Bayard St	btwn Elizabeth & Mott St	40.715545	-73.998137	

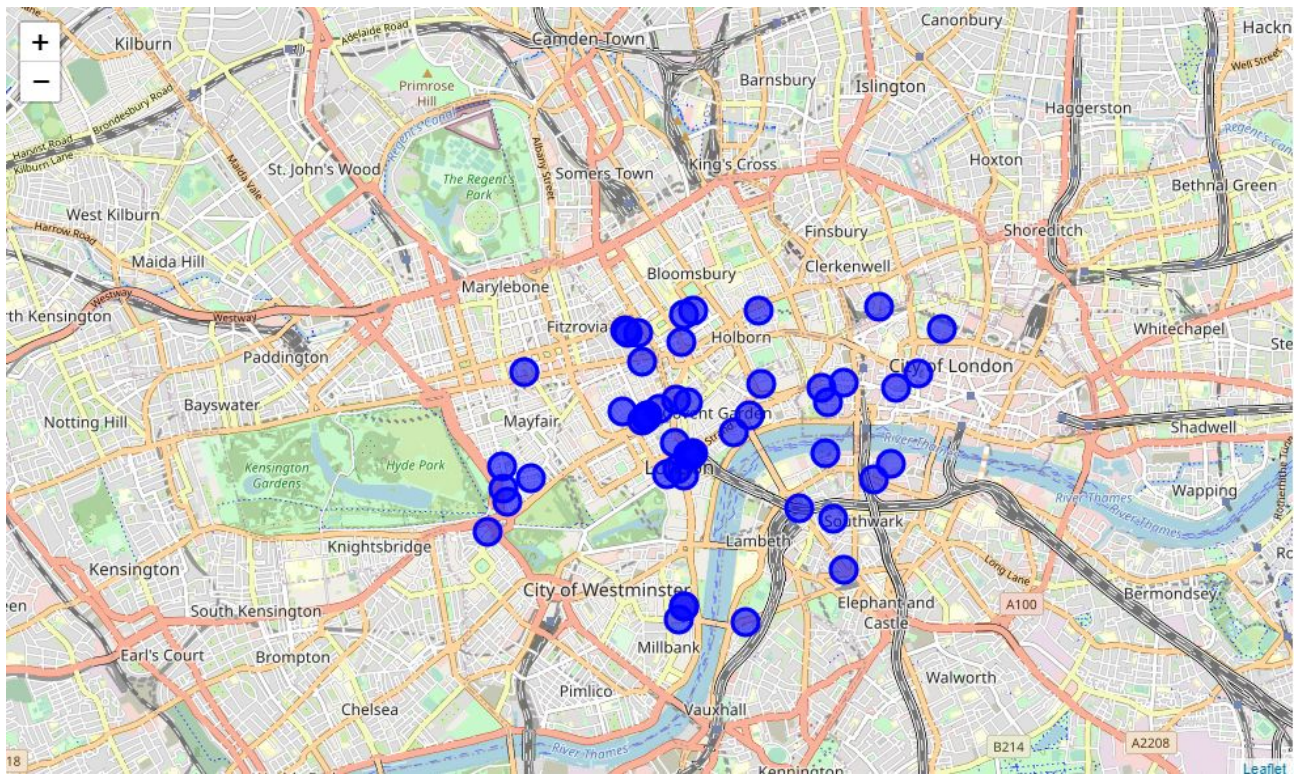
Visakhapatnam

	id	name	categories	referralId	hasPerk	location.address	location.crossStreet	location.lat	location.lng
0	4de9f57eb0fb8293f7c79117	Satyam Restaurant	'4bf58dd8d48988d10f941735', [[{'id': '1...', 'name': '1...'}]]	1599742232	False	Dwarakanagar	1st lane	17.726001	83.303001
1	4f056f0bb634a88a850f2817	Paradise Restaurant	'4bf58dd8d48988d10f941735', [[{'id': '1...', 'name': '1...'}]]	1599742232	False	NaN	NaN	17.712052	83.301600
2	4e20632b52b1f82ffb933985	Amaravathi Restaurant	'4bf58dd8d48988d10f941735', [[{'id': '1...', 'name': '1...'}]]	1599742232	False	Dabagardens	NaN	17.720437	83.303142
3	5acf505e6bd36b1c0a36834a	Helapuri Restaurant	'54135bf5e4b08f3d2429d0df', [[{'id': '1...', 'name': '1...'}]]	1599742232	False	NaN	NaN	17.726034	83.303200
4	580c6ff238fa3555d9819eb0	kanhaji family restaurant	'4bf58dd8d48988d1d3941735', [[{'id': 'V...', 'name': 'V...'}]]	1599742232	False	NaN	NaN	17.720208	83.297904

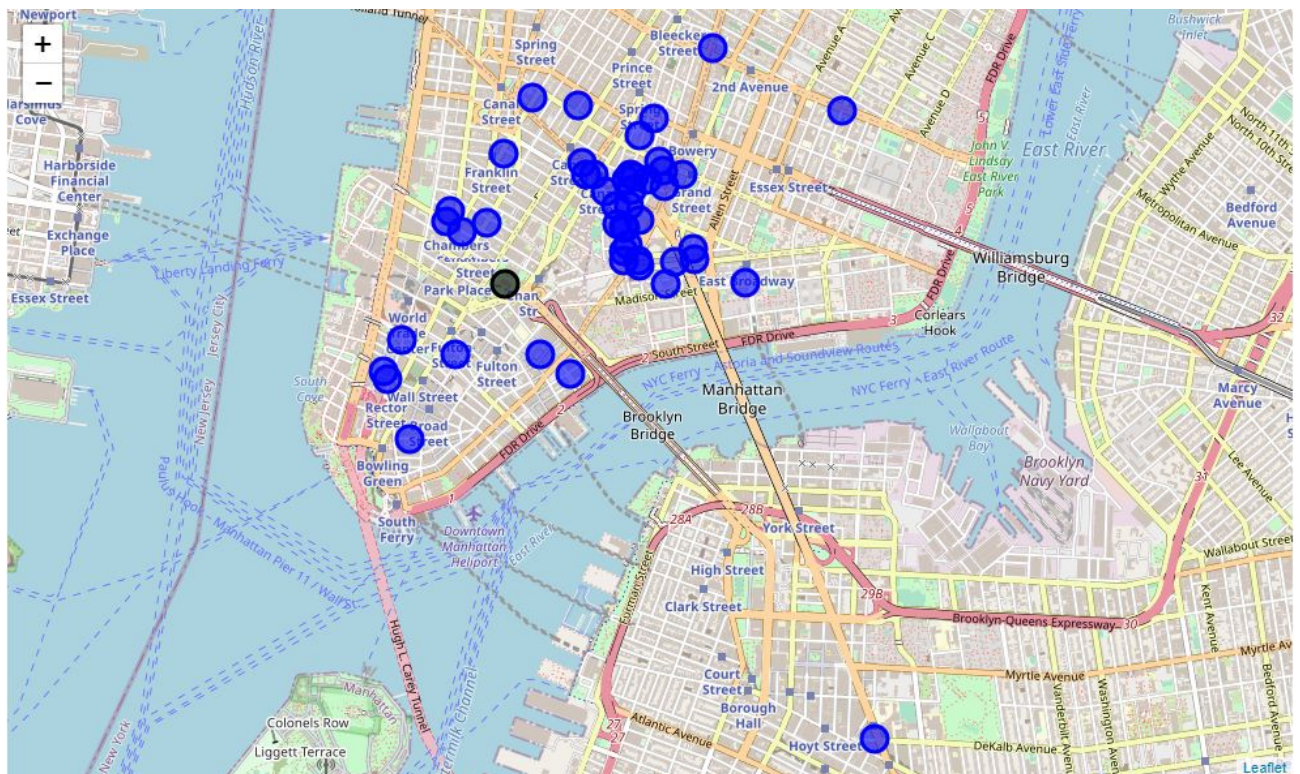
Although there were 50 restaurants that came up for each city, the number of rated restaurants was **25** for London, **24** for New York and **3** for Visakhapatnam.

I used the python **folium** library to visualize geographic details of the three cities and restaurants and I created a map of the cities with restaurant locations as markers on the respective maps. I used latitude and longitude values to get the visuals as below:

Restaurants in London

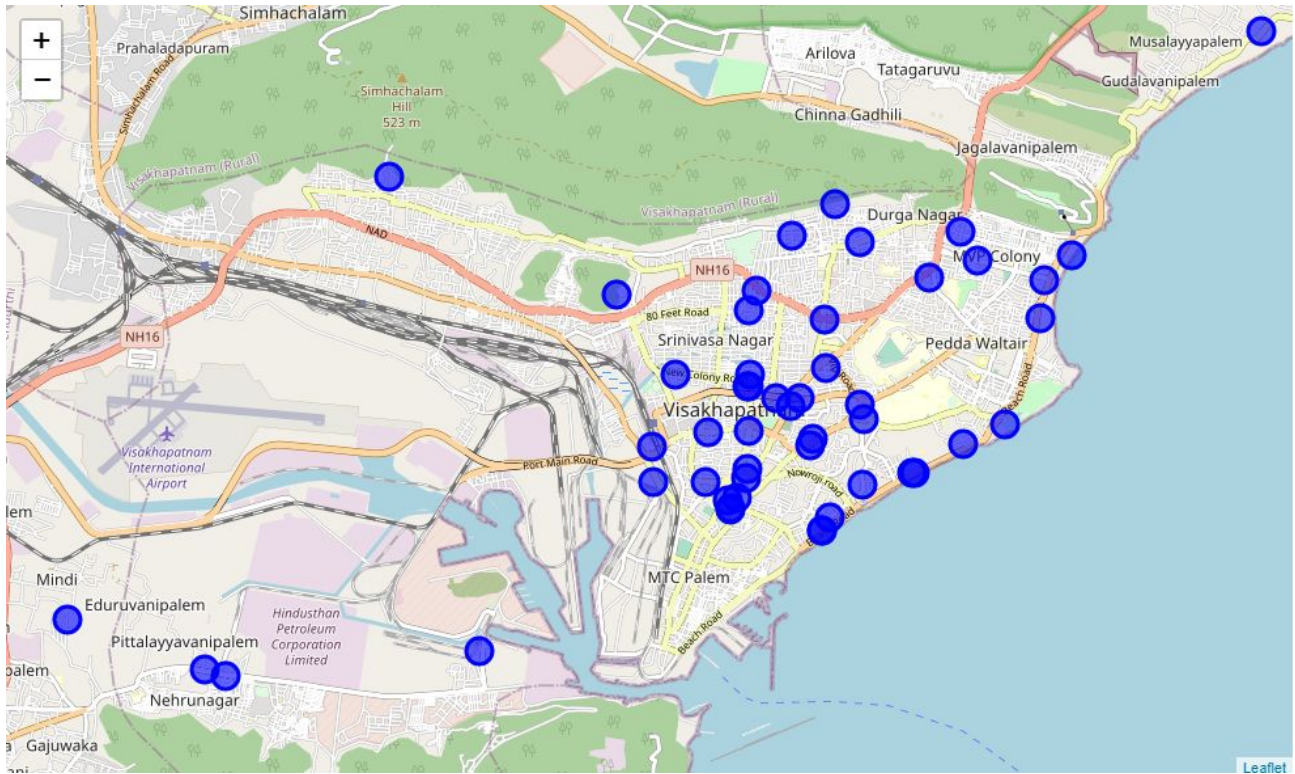


Restaurants in New York



The marker in black represents the Statue of Liberty.

Restaurants in Visakhapatnam



The result doesn't include all the restaurants in the cities, it just takes the top 3 categories of restaurants. The categories can be increased from 3 to 5 or even higher. Also, the samples can be

increased and different neighbourhood information to cover the entire cities.

We have some restaurants with ratings across London and New York, for this reason I used unsupervised learning. **K-means algorithm** to cluster the boroughs. K-Means algorithm is one of the most common cluster method of unsupervised learning.

I ran K-Means to cluster the ratings for London and New York into 4 clusters to get the optimum k of the K-Means. After we get the output, the groups of restaurants are

London Restaurant Categories

	lat	lng	distance
categories			
Bar	51.503061	-0.107474	1476.000000
Breakfast Spot	51.510180	-0.120549	585.000000
Business Center	51.508338	-0.126434	140.000000
Café	51.502032	-0.127928	806.000000
Chinese Restaurant	51.510529	-0.125625	791.800000
College Cafeteria	51.514102	-0.116841	1063.000000
English Restaurant	51.512625	-0.128347	1171.400000
Fast Food Restaurant	51.508467	-0.125967	172.000000
Filipino Restaurant	51.518231	-0.134451	1302.000000
Greek Restaurant	51.518270	-0.132954	1273.000000
Hotel Bar	51.517985	-0.131084	1233.000000
Indian Restaurant	51.507665	-0.122882	394.666667
Italian Restaurant	51.504508	-0.150195	1593.000000
Lebanese Restaurant	51.506434	-0.147142	1354.000000
Malay Restaurant	51.511111	-0.132445	537.000000
Modern European Restaurant	51.495918	-0.126965	1270.000000

New York Restaurant Categories

	lat	lng	distance
categories			
American Restaurant	40.720642	-74.005212	885.500000
Asian Restaurant	40.713954	-73.993579	1058.000000
Bakery	40.721385	-73.983949	2096.000000
Cantonese Restaurant	40.713875	-73.997280	748.000000
Chinese Restaurant	40.714622	-73.999593	874.176471
Dim Sum Restaurant	40.714465	-73.997568	745.000000
Diner	40.711512	-73.990929	2783.000000
Italian Restaurant	40.719110	-74.001339	1072.200000
Lounge	40.707970	-74.013779	842.000000
Malay Restaurant	40.714681	-73.998006	709.000000
Middle Eastern Restaurant	40.715789	-74.007227	355.000000
Miscellaneous Shop	40.721053	-73.994022	1386.000000
New American Restaurant	40.716380	-74.009629	508.000000
Nightclub	40.714351	-73.998213	682.000000
Pizza Place	40.716973	-74.003704	704.500000
Pub	40.709894	-74.012836	656.000000
Restaurant	40.709233	-74.003747	433.000000
Seafood Restaurant	40.719041	-73.998334	965.333333
Vietnamese Restaurant	40.717417	-73.996561	953.000000
Wings Joint	40.715336	-74.008881	377.000000

4. Results

I then took the category of the restaurant and classified the top categories of restaurants across the three cities. For London and Visakhapatnam, I took ‘Chinese’, ‘Indian’ and ‘Bars and Restaurants’ as my three top categories and for

New York I had to take ‘Chinese’, ‘Italian’ and ‘Seafood’ as the top categories based on the number of restaurants for the category. The list of the restaurants can be seen as

London Chinese Restaurants

```
# London Chinese restaurants list
```

```
lon_dataframe_chi = lon_dataframe_filtered[lon_dataframe_filtered['categories'].str.contains ('Chinese')]
lon_dataframe_chi
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
3	Hung's Chinese Restaurant 美食軒	Chinese Restaurant	27 Wardour St	NaN	51.511278	-0.131953	[{'label': 'display', 'lat': 51.511277771538517...	531	W1D 6PR	GB	London	Greater London	United Kingdom
4	New Loon Fung Chinese Restaurant	Chinese Restaurant	42-44 Gerrard St	NaN	51.512039	-0.130371	[{'label': 'display', 'lat': 51.51203891754673...	557	W1D 5QG	GB	London	Greater London	United Kingdom
8	London Chinatown Restaurant	Chinese Restaurant	27 Gerrard St	NaN	51.511507	-0.131810	[{'label': 'display', 'lat': 51.51150741274579...	547	W1D 6JN	GB	London	Greater London	United Kingdom
11	Kowloon Restaurant and Cakeshop	Chinese Restaurant	21-22 Gerrard St	NaN	51.511503	-0.131904	[{'label': 'display', 'lat': 51.51150273700102...	550	W1D 6JH	GB	Chinatown	Greater London	United Kingdom
40	Lin's Restaurant & Bar	Chinese Restaurant	134 Southwark St	Hopton St	51.506318	-0.102086	[{'label': 'display', 'lat': 51.50631776350921...	1774	SE1 0SW	GB	London	Greater London	United Kingdom

London Indian Restaurants


```
# London Indian restaurants List
```

```
lon_dataframe_Ind = lon_dataframe_filtered[lon_dataframe_filtered['categories'].str.contains("Ind")]
lon_dataframe_Ind
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
12	India India Restaurant	Indian Restaurant	8 Crane Court	NaN	51.507193	-0.127866	[{'label': 'display', 'lat': 51.50719323477933...	20	EC4A 2EJ	GB	London	Greater London	United Kingdom
13	Shapur Indian Restaurant	Indian Restaurant	149 Strand	NaN	51.511507	-0.118414	[{'label': 'display', 'lat': 51.51150689149121...	791	WC2R 1JA	GB	London	Greater London	United Kingdom
24	The Thames Restaurant	Indian Restaurant	79 Waterloo Rd	NaN	51.503948	-0.111909	[{'label': 'display', 'lat': 51.50394774265021...	1153	SE1 8UD	GB	London	Greater London	United Kingdom
27	Khan's Restaurant	Indian Restaurant	159 Lavender Hill	NaN	51.506646	-0.126997	[{'label': 'display', 'lat': 51.50664565161931...	87	SW11 5QH	GB	Battersea	Greater London	United Kingdom
42	Madhu's Restaurant	Indian Restaurant	39 South Road, Southall	NaN	51.508235	-0.126246	[{'label': 'display', 'lat': 51.50823496018339...	140	UB1 1SW	GB	London	Greater London	United Kingdom
47	Maharani Restaurant	Indian Restaurant	177 Clapham High Street, Clapham	NaN	51.508462	-0.125860	[{'label': 'display', 'lat': 51.50846199973846...	177	SW4 7TB	GB	London	Greater London	United Kingdom

London Bars Bars and Restaurants

```
# London Bar & restaurants List
```

```
lon_dataframe_Bar = lon_dataframe_filtered[lon_dataframe_filtered['categories'].str.contains("Bar")]
lon_dataframe_Bar
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
23	Bloomsbury St Bar & Restaurant	Hotel Bar	9 Bloomsbury St	NaN	51.517482	-0.127452	[{'label': 'display', 'lat': 51.51748222734402...	1131	WC1B 3LB	GB	London	Greater London	United Kingdom
29	Oscar Bar & Restaurant	Hotel Bar	15 Charlotte St	Charlotte Street Hotel	51.518488	-0.134716	[{'label': 'display', 'lat': 51.51848817973544...	1335	W1T 1RJ	GB	London	Greater London	United Kingdom
31	The Cut Bar and Restaurant	Bar	Young Vic Theatre	66 The Cut	51.503061	-0.107474	[{'label': 'display', 'lat': 51.50306103945989...	1476	SE1 8LZ	GB	Southwark	Greater London	United Kingdom
32	Jamies Wine Bar & Restaurant	Wine Bar	36 Tudor St	NaN	51.512614	-0.108156	[{'label': 'display', 'lat': 51.51261390570899...	1473	NaN	GB	London	Greater London	United Kingdom

New York Chinese Restaurants

```
# New York Chinese restaurants List
```

```
ny_dataframe_chi = ny_dataframe_filtered[ny_dataframe_filtered['categories'].str.contains("Chinese", na=False)]
ny_dataframe_chi
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
3	Deluxe Green Bo Restaurant	Chinese Restaurant	66 Bayard St	btwn Elizabeth & Mott St	40.715545	-73.998137	[{"label": "display", "lat": 40.71554491813315...	734	10013	US	New York	NY	United States
10	Bo Ky Restaurant 波記潮州小食	Chinese Restaurant	80 Bayard St	at Mott St	40.715696	-73.998667	[{"label": "display", "lat": 40.71569636637641...	702	10013	US	New York	NY	United States
13	Win Won Restaurant	Chinese Restaurant	10 Liberty Pl	Maiden Lane	40.709193	-74.009344	[{"label": "display", "lat": 40.709193, "lng":...	483	10038	US	New York	NY	United States
16	Wing Kee Restaurant 榮記飯店 (former 69)	Chinese Restaurant	69 Bayard St	Mott Street And Elizabeth Street	40.715565	-73.998258	[{"label": "display", "lat": 40.71556547601636...	726	10013	US	New York	NY	United States
17	218 Restaurant	Chinese Restaurant	218 Grand St	btwn Elizabeth & Mott St.	40.718833	-73.995895	[{"label": "display", "lat": 40.71883283355385...	1091	10013	US	New York	NY	United States
18	Sun Sai Gai Restaurant	Chinese Restaurant	220 Canal St	at Baxter St	40.717369	-73.999415	[{"label": "display", "lat": 40.71736941942955...	759	10013	US	New York	NY	United States
27	Pang Huang Restaurant Corp	Chinese Restaurant	111 Lafayette St	NaN	40.718195	-74.000697	[{"label": "display", "lat": 40.71819506160271...	756	10013	US	New York	NY	United States

New York Italian Restaurants

```
# New York Italian restaurants List
```

```
ny_dataframe_ita = ny_dataframe_filtered[ny_dataframe_filtered['categories'].str.contains("Ita", na=False)]
ny_dataframe_ita
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
6	Acqua Restaurant NYC	Italian Restaurant	21 Peck Slip	at Water St	40.708224	-74.001769	[{"label": "display", "lat": 40.70822431135818...	616	10038	US	New York	NY	United States
13	Puglia Restaurant	Italian Restaurant	189 Hester St	btwn Mott & Mulberry	40.718165	-73.997822	[{"label": "display", "lat": 40.71816511464507...	918	10013	US	New York	NY	United States
29	Galli Restaurant	Italian Restaurant	45 Mercer St	Broome & Grand Streets	40.721607	-74.001235	[{"label": "display", "lat": 40.72160721760932...	1067	10013	US	New York	NY	United States
44	Lunela Restaurant	Italian Restaurant	173 Mulberry St	NaN	40.720106	-73.997215	[{"label": "display", "lat": 40.720106, "lng":...	1107	10013	US	New York	NY	United States
48	PJ Charlton Italian Restaurant	Italian Restaurant	549 Greenwich St	NaN	40.727446	-74.008656	[{"label": "display", "lat": 40.72744633153894...	1653	10013	US	New York	NY	United States

New York Seafood Restaurants

```
# New York seafoodl restaurants List
```

```
ny_dataframe_Sea = ny_dataframe_filtered[ny_dataframe_filtered['categories'].str.contains("Seafood", na=False)]  
ny_dataframe_Sea
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
17	Canal Street Seafood Restaurant	Seafood Restaurant	266 Canal St	NaN	40.718768	-74.001015	[{"label": "display", "lat": 40.718768, "lng":	793	10013	US	New York	NY	United States
23	Dun Huang Seafood Restaurant	Seafood Restaurant	103 Mott St	btw Canal & Hester	40.717400	-73.997688	[{"label": "display", "lat": 40.71739959716797...	874	10013	US	New York	NY	United States
46	East Boat Seafood Restaurant	Seafood Restaurant	72 Kenmare St	NaN	40.720955	-73.996300	[{"label": "display", "lat": 40.72095489501953...	1229	10012	US	New York	NY	United States

Visakhapatnam Chinese Restaurants

```
# Visakhapatnam Chinese restaurants]
```

```
vsp_dataframe_Chi = vsp_dataframe_filtered[vsp_dataframe_filtered['categories'].str.contains ('Chinese', na=False)]  
vsp_dataframe_Chi
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
3	Helapuri Restaurant	Indian Chinese Restaurant	NaN	NaN	17.726034	83.303200	[{"label": "display", "lat": 17.726034, "lng":	382	530016	IN	Vizag	Andhra Pradesh	India
25	Seven eleven restaurant	Chinese Restaurant	Near Satyam and Wipro Junction	Gandhinagar	17.734334	83.313175	[{"label": "display", "lat": 17.7343338307034,....	1773	530013	IN	Vizag	Andhra Pradesh	India
31	Chinese Restaurant	Chinese Restaurant	NaN	Seethammadhara	17.744709	83.308851	[{"label": "display", "lat": 17.74470934853887...	2532	NaN	IN	Vizag	Andhra Pradesh	India
34	G Silver Spoon Restaurant	Chinese Restaurant	NaN	NaN	17.715135	83.324679	[{"label": "display", "lat": 17.715135, "lng":	2635	NaN	IN	NaN	NaN	India

Visakhapatnam Indian Restaurants


```
# Visakhapatnam Indian restaurants List
```

```
vsp_dataframe_Ind = vsp_dataframe_filtered[vsp_dataframe_filtered['categories'].str.contains("Ind", na=False)]
vsp_dataframe_Ind
```

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state
0	Satyam Restaurant	Indian Restaurant	Dwarakanagar	1st lane	17.726001	83.303001	[{"label": "display", "lat": 17.72600060803239...	368	NaN	IN	Vizag	Andhra Pradesh
1	Paradise Restaurant	Indian Restaurant	NaN	NaN	17.712052	83.301600	[{"label": "display", "lat": 17.71205177581347...	1233	NaN	IN	Vizag	Andhra Pradesh
2	Amaravathi Restaurant	Indian Restaurant	Dabagardens	NaN	17.720437	83.303142	[{"label": "display", "lat": 17.72043739654407...	358	NaN	IN	Vizag	Andhra Pradesh
3	Helapuri Restaurant	Indian Chinese Restaurant	NaN	NaN	17.726034	83.303200	[{"label": "display", "lat": 17.726034, "lng":...	382	530016	IN	Vizag	Andhra Pradesh
5	Anupama Lodging & Restaurant	Indian Restaurant	Near Diamond Park	Dwarakanagar	17.727495	83.303236	[{"label": "display", "lat": 17.72749530846722...	528	NaN	IN	Vishakhapatnam	Andhra Pradesh
6	Blue Sea Restaurant	Indian Restaurant	NaN	NaN	17.724521	83.306767	[{"label": "display", "lat": 17.72452065380642...	601	NaN	IN	NaN	NaN
9	Jollie Bee Restaurant	Indian Restaurant	#10-1-24	Velanki Plaza, Asilmetta	17.724425	83.309786	[{"label": "display", "lat": 17.72442475647363...	912	530003	IN	Vizag	Andhra Pradesh

Visakhapatnam Bars and Restaurants

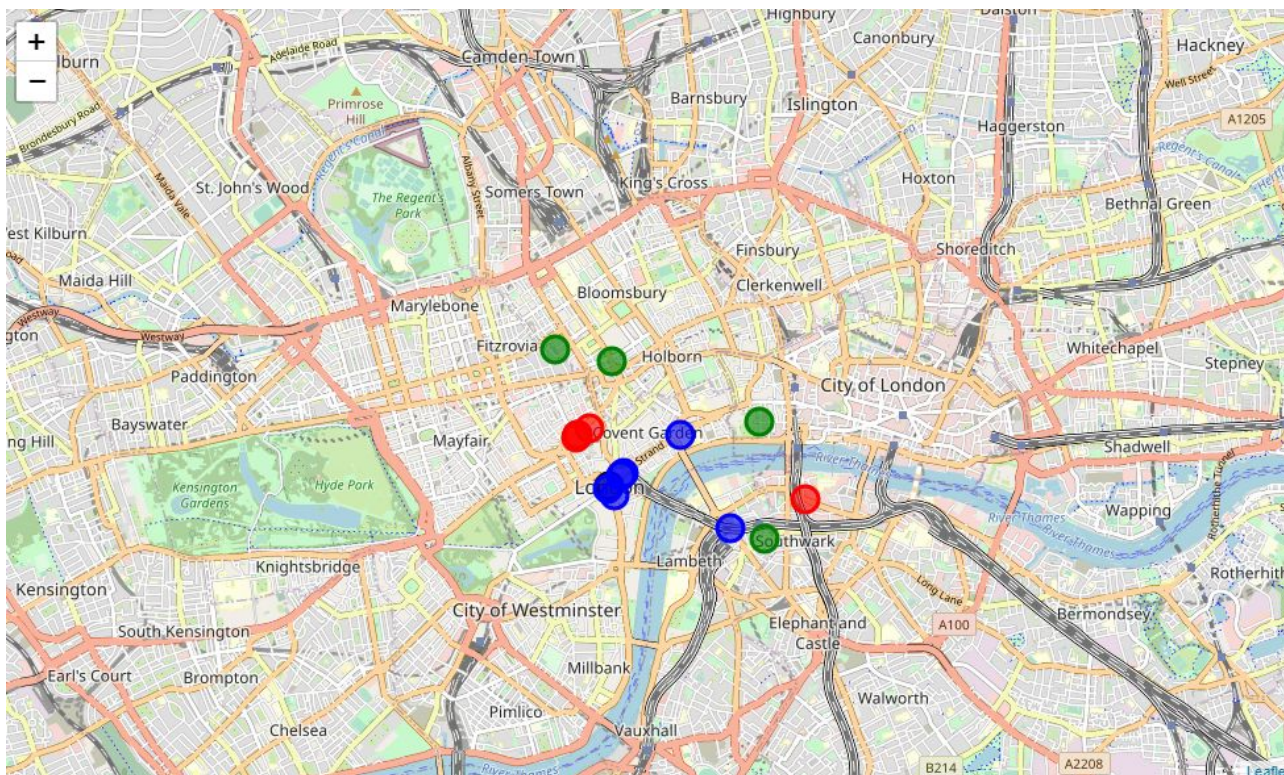
```
# Visakhapatnam Bar & restaurants List
```

```
vsp_dataframe_Bar = vsp_dataframe_filtered[vsp_dataframe_filtered['categories'].str.contains("Bar", na=False)]
vsp_dataframe_Bar
```

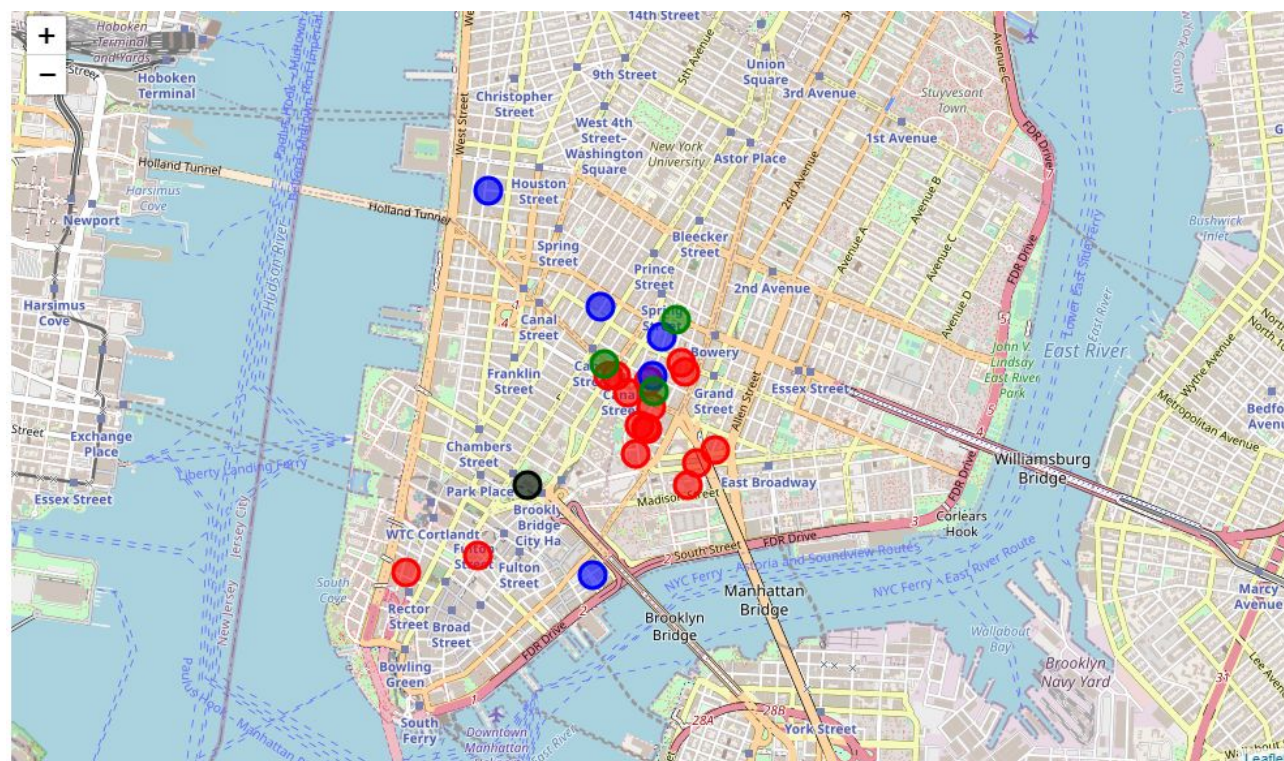
	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country
23	Sai Krishna Bar & Restaurant	Bar	NaN	NaN	17.737822	83.304115	[{"label": "display", "lat": 17.73782157897949...	1663	NaN	IN	NaN	NaN	India
38	Zoom Bar	Bar	NaN	NaN	17.707981	83.312778	[{"label": "display", "lat": 17.70798084287164...	2080	NaN	IN	Vizag	Andhra Pradesh	India

I then put the lists of categories of restaurants on the respective maps and it looked like this

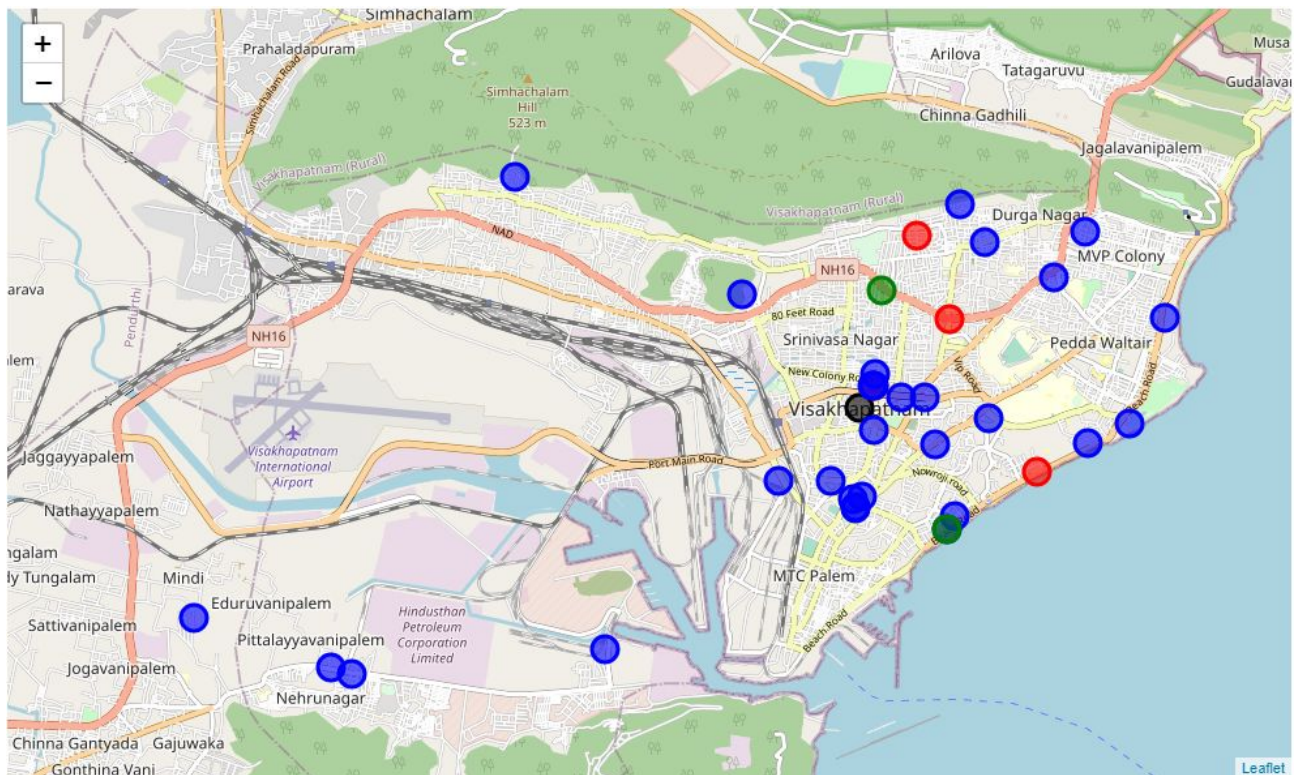
London Classified Restaurants Map



New York Classified Restaurants Map



Visakhapatnam Classified Restaurants Map



5. Discussion

As mentioned earlier, the list of restaurants is not comprehensive and there is an information gap of restaurant ratings to contend with.

As an example, the following map illustrates the availability of restaurants in the area considered but are not seen in the foursquare api database and are available in google maps or other sources but that is outside the scope of this study for now. It can be an area of future analysis or subsequent study.

I used the Kmeans algorithm as part of this clustering study. The idea was to get the rating for restaurants for classified lists and use the k-means algorithm on their ratings.

I ended the study by visualizing the data and clustering information on the city maps. In future studies, we could expand to cover entire cities or restaurant types across the world.

6. Conclusion

The study started with aiming to find out if there is a possibility of getting the tastes and preferences culminating in the restaurants of different ethnic groups and considerations of business climates.

Incomplete information from a source largely reduced the limit of the study to the end. A couple of conclusions made are 1) The area around the HSBC bank in London has a lot Chinese restaurants. 2) There are a lot for Italian restaurants near the statue of liberty due to the historical influence of Italian immigrants in New York. 3) what is counter intuitive is the high number of Chinese restaurants and missing Indian restaurants in the Foursquare database.

Aditya Panini Karri

References:

- [1] [Foursquare API](#)

- [2] [Google - London](#)
- [3] [Google - New York](#)