

Segmenting and Clustering Neighborhoods of Mumbai City to find Optimal Location for Opening an Indian Restaurant

Maitri A. Prajapati – Capstone Final project



Introduction

- **Mumbai, formerly known as Bombay, is the capital city of Maharashtra. The Greater Mumbai area occupies a long, narrow peninsula in the Arabian Sea on the west coast of India. Mumbai is the most populous city in India and in the top five in the world. While the 2011 census estimated population at 12.4 million. Mumbai is the financial center, economic powerhouse, and industrial hub of India. In 2018, a report by New World Wealth ranked the city as the 12th wealthiest global city with a total private wealth of US Dollar 950 billion.**
- **The Mumbai city is one of the world's top centers of commerce in terms of financial flow. It is also home to important financial institutions, such as the Reserve Bank of India, the Bombay Stock Exchange, the National Stock Exchange of India, and corporate headquarters of many Indian companies and multinational corporations.**

Description of problem

- Mumbai is rich in its Indian cuisine. It has huge variety of Indian foods from different parts of India. Mumbai seems to be a better place for setting up an Indian restaurant. Since there are lots of restaurants in Mumbai we will try to detect locations that are not already crowded with restaurants. We are also particularly interested in areas with no Indian restaurants in vicinity.

Target Audience

- Companies or Individuals looking into opening a restaurant would be interested in prediction of optimal location in Mumbai City. This project will provide an analysis whether the venture is feasible or not.

Data acquisition

- Web scarping link:

https://en.wikipedia.org/wiki/List_of_neighbourhoods_in_Mumbai

The screenshot shows a web browser window with multiple tabs open. The active tab is the Wikipedia page titled "List of neighbourhoods in Mumbai". The browser's address bar shows the URL "en.wikipedia.org/wiki/List_of_neighbourhoods_in_Mumbai". The Wikipedia page content includes the title "List of neighbourhoods in Mumbai", a sub-header "From Wikipedia, the free encyclopedia", and a paragraph describing the city of Mumbai, its districts (Mumbai City and Mumbai Suburban), and its location. A map of Mumbai is visible on the right side of the page, showing the Arabian Sea, Thane Creek, and the city's layout. The browser's taskbar at the bottom shows various application icons and the system clock indicating 11:14:24 PM on 5/29/2021.

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List of neighbourhoods in Mumbai

From Wikipedia, the free encyclopedia

The city of **Mumbai** consists of two distinct regions: **Mumbai City district** and **Mumbai Suburban district**, which form two separate revenue districts of Maharashtra.^[1] The city district region is also commonly referred to as the *Island City* or **South Mumbai**.^[2] Mumbai Suburban district lies to the north of Mumbai City district and comprises all of Mumbai's suburbs. The western part of the Mumbai Suburban district forms the **Western Suburbs** and the eastern portion forms the **Eastern Suburbs**. The suburbs of **Chembur**, **Govandi**, **Mankhurd** and **Trombay** lie to the south-east of the Eastern Suburbs. These suburbs are generally not considered as part of the Eastern Suburbs and are sometimes referred to as the "Harbour Suburbs".

The total area of Mumbai is 603.4 km² (233 sq mi).^[3] Of this, the island city spans 67.79 km² (26 sq mi), while the suburban district spans 370 km² (143 sq mi), together accounting for 437.71 km² (169 sq mi) under the administration of **Brihanmumbai Municipal Corporation (BMC)**. The remaining area belongs to Defence, Mumbai Port Trust, Atomic Energy Commission and **Borivali National Park**, which are out of the jurisdiction of the BMC.^[4] Mumbai lies at the mouth of the **Ulhas River** on the western coast of India, in the coastal region known as the **Konkan**. It sits on **Salsette Island**, partially shared with the **Thane district**.^[5] Mumbai is bounded by the **Arabian Sea** to the west.^[6] **Borivali National Park** is located partly in the **Mumbai suburban district**, and partly in the **Thane district**, and it extends over an area of 103.09 km² (39.80 sq mi).^[7]

Contents [hide]

- 1 Western Suburbs
 - 1.1 Andheri
 - 1.2 Mira-Bhayandar
 - 1.3 Bandra

Mumbai consists of two revenue districts

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Data cleaning

- Data downloaded from Wikipedia website contains Borough, their Neighborhoods and latitude and longitude coordinates of each neighborhood. The details of data cleaning methods are given below.
- The names of some neighborhoods/borough were found wrong and therefore, such names were corrected.
- I found some wrong coordinates and therefore I verified this information using geopy package of python. Most of the coordinates received using above python package differed from the coordinates given in the website. Therefore, I replaced the coordinates of the dataframe.

Primary Dataframe after data cleaning

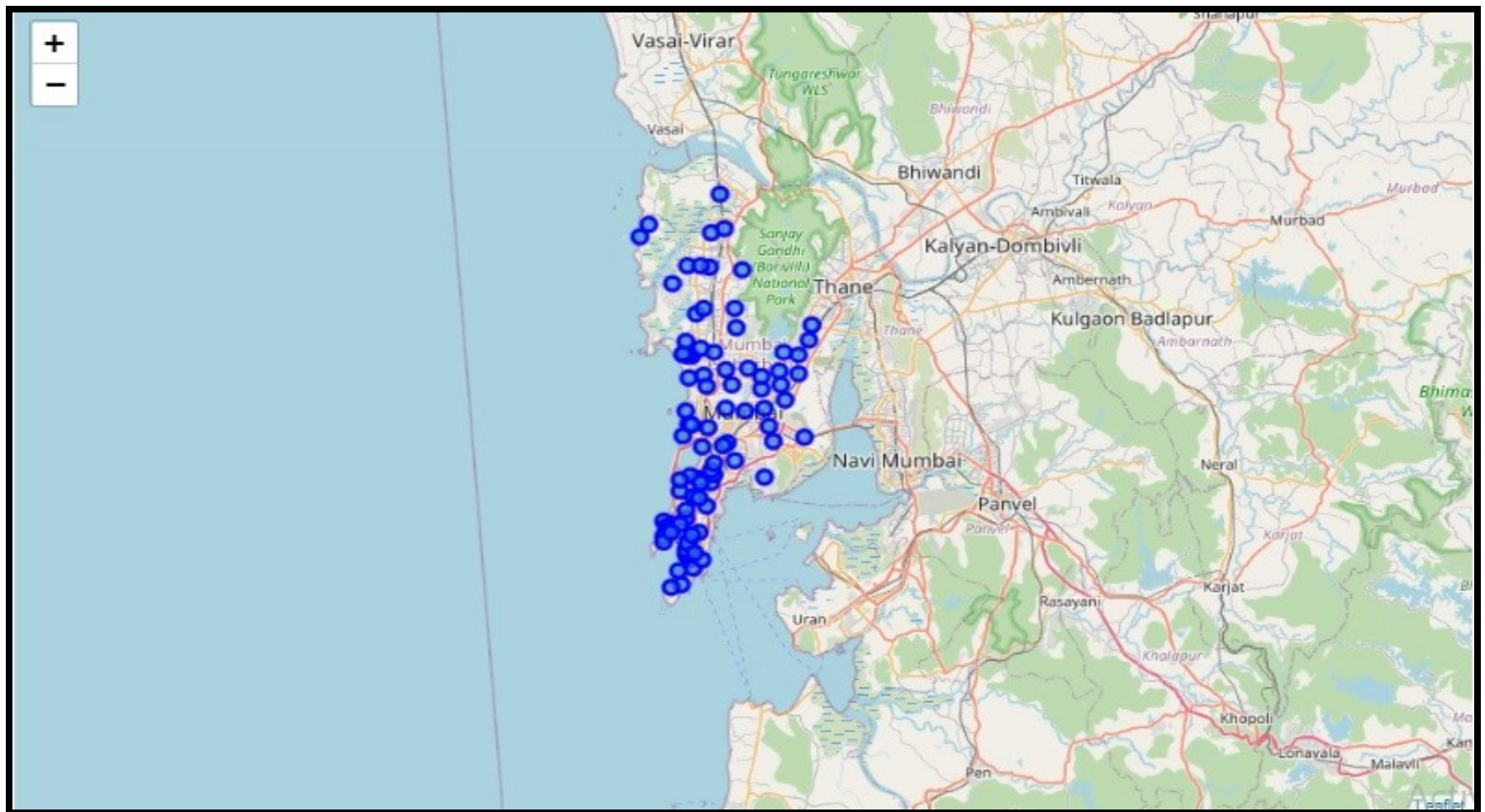
```
In [87]: Mumbai = Mumbai.assign(Latitude=latitude, Longitude=longitude)
print(Mumbai.shape)
Mumbai.head()
```

(93, 4)

Out[87]:

	Neighbourhood	Borough	Latitude	Longitude
0	Amboli	Andheri,Western Suburbs	19.07599	72.877393
1	Chakala	Andheri,Western Suburbs	19.07599	72.877393
2	D.N. Nagar	Andheri,Western Suburbs	19.07599	72.877393
3	Four Bungalows	Andheri,Western Suburbs	19.07599	72.877393
4	Lokhandwala	Andheri,Western Suburbs	19.07599	72.877393

Visualization of Mumbai Neighbourhoods



Used python folium library

Mumbai Neighborhoods Segmentation

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Amboli	19.13201	72.849864	5 Spice , Bandra	19.130421	72.847206	Chinese Restaurant
1	Amboli	19.13201	72.849864	Domino's Pizza	19.131000	72.848000	Pizza Place
2	Amboli	19.13201	72.849864	Cafe Arfa	19.128930	72.847140	Indian Restaurant
3	Amboli	19.13201	72.849864	CCD	19.129021	72.849503	Coffee Shop
4	Amboli	19.13201	72.849864	Bostan Restaurant	19.135898	72.847581	Asian Restaurant
...
1266	Thane	19.07600	72.878700	Pizza Hut	19.075984	72.877656	Pizza Place
1267	Thane	19.07600	72.878700	Sahara Restaurant	19.079532	72.880152	Mughlai Restaurant
1268	Thane	19.07600	72.878700	Nawab Sheek Corner	19.076933	72.878260	Middle Eastern Restaurant
1269	Thane	19.07600	72.878700	Mexican Olive	19.075981	72.877656	Mexican Restaurant
1270	Thane	19.07600	72.878700	Mughal Flavours	19.079761	72.880302	Indian Restaurant

1271 rows × 7 columns

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Top five most common venues of Mumbai Neighborhoods

	Neighbourhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Aarey Milk Colony	Fast Food Restaurant	Yoga Studio	Flower Shop	Fish Market	Field
1	Agripada	Bank	Platform	Coffee Shop	Athletics & Sports	Bakery
2	Altamount Road	Café	Coffee Shop	Concert Hall	Brewery	Cafeteria
3	Amboli	Pizza Place	Indian Restaurant	Asian Restaurant	Coffee Shop	Bakery
4	Amrut Nagar	Indian Restaurant	Electronics Store	Chinese Restaurant	Mediterranean Restaurant	Fast Food Restaurant
...
86	Vidyavihar	Fast Food Restaurant	Cricket Ground	Juice Bar	Comedy Club	Bar
87	Vikhroli	Café	Fast Food Restaurant	Vegetarian / Vegan Restaurant	Seafood Restaurant	Restaurant
88	Vile Parle	Indian Restaurant	Sandwich Place	Fast Food Restaurant	Market	Bakery
89	Walkeshwar	Ice Cream Shop	Food & Drink Shop	Gym	Restaurant	Park
90	Worli	Scenic Lookout	Yoga Studio	Waterfront	Indian Restaurant	Sandwich Place

91 rows × 6 columns

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165 unique categories returned by Foursquare API

Clustering of Mumbai Neighborhoods Venue Categories

	Neighbourhood	Borough	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Amboli	Andheri, Western Suburbs	19.132010	72.849864	0.0	Pizza Place	Indian Restaurant	Asian Restaurant	Coffee Shop	Bakery
1	Chakala	Andheri, Western Suburbs	19.115287	72.861808	0.0	Hotel	Restaurant	Fast Food Restaurant	Multiplex	Indian Restaurant
2	D.N. Nagar	Andheri, Western Suburbs	19.128292	72.830193	0.0	Indian Restaurant	Lounge	Yoga Studio	Chinese Restaurant	Women's Store
3	Four Bungalows	Andheri, Western Suburbs	19.128794	72.825554	0.0	Department Store	Residential Building (Apartment / Condo)	Pub	Fish Market	Market
4	Lokhandwala	Andheri, Western Suburbs	19.143189	72.824081	4.0	Indian Restaurant	Café	Donut Shop	Dessert Shop	Bakery
...
88	Parel	South Mumbai	19.009482	72.837661	0.0	Bakery	Food Court	Coffee Shop	Clothing Store	Snack Place
89	Gowalia Tank	Tardeo, South Mumbai	18.962095	72.810098	0.0	Hotel	Gastropub	Deli / Bodega	Concert Hall	Coffee Shop
90	Cama Hospital	South Mumbai	18.942041	72.832259	0.0	Bar	Coffee Shop	Fast Food Restaurant	Café	Multiplex
91	Dharavi	Mumbai	19.044463	72.858618	4.0	Boutique	Snack Place	Indian Restaurant	Café	Yoga Studio
92	Thane	Mumbai	19.076000	72.878700	4.0	Indian Restaurant	Middle Eastern Restaurant	Pizza Place	Mughlai Restaurant	Mexican Restaurant

93 rows x 10 columns

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Using K-Means Clustering Method

Examining Five Clusters

Cluster 0

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Amboli	0.0	Pizza Place	Indian Restaurant	Asian Restaurant	Coffee Shop	Bakery
1	Chakala	0.0	Hotel	Restaurant	Fast Food Restaurant	Multiplex	Indian Restaurant
2	D.N. Nagar	0.0	Indian Restaurant	Lounge	Yoga Studio	Chinese Restaurant	Women's Store
3	Four Bungalows	0.0	Department Store	Residential Building (Apartment / Condo)	Pub	Fish Market	Market
7	Seven Bungalows	0.0	Café		Chinese Restaurant	Coffee Shop	Bar
...
80	Dr.Babasaheb Ambedkar Marg	0.0	Plaza	Restaurant	Maharashtrian Restaurant	Lounge	Bar
87	Matunga	0.0	Indian Restaurant	Snack Place	Vegetarian / Vegan Restaurant	Train Station	Bar
88	Parel	0.0	Bakery	Food Court	Coffee Shop	Clothing Store	Snack Place
89	Gowalia Tank	0.0	Hotel	Gastropub	Deli / Bodega	Concert Hall	Coffee Shop
90	Cama Hospital	0.0	Bar	Coffee Shop	Fast Food Restaurant	Café	Multiplex

64 rows × 7 columns

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Examining Five Clusters

Cluster 1

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
51	Mahul	1.0	ATM	Flower Shop	Fish Market	Field	Fast Food Restaurant

Cluster 2

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
31	Naigaon	2.0	Concert Hall	Yoga Studio	Electronics Store	Fish Market	Field

Cluster 3

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
18	Aarey Milk Colony	3.0	Fast Food Restaurant	Yoga Studio	Flower Shop	Fish Market	Field
46	Vidyavihar	3.0	Fast Food Restaurant	Cricket Ground	Juice Bar	Comedy Club	Bar

Examining Five Clusters

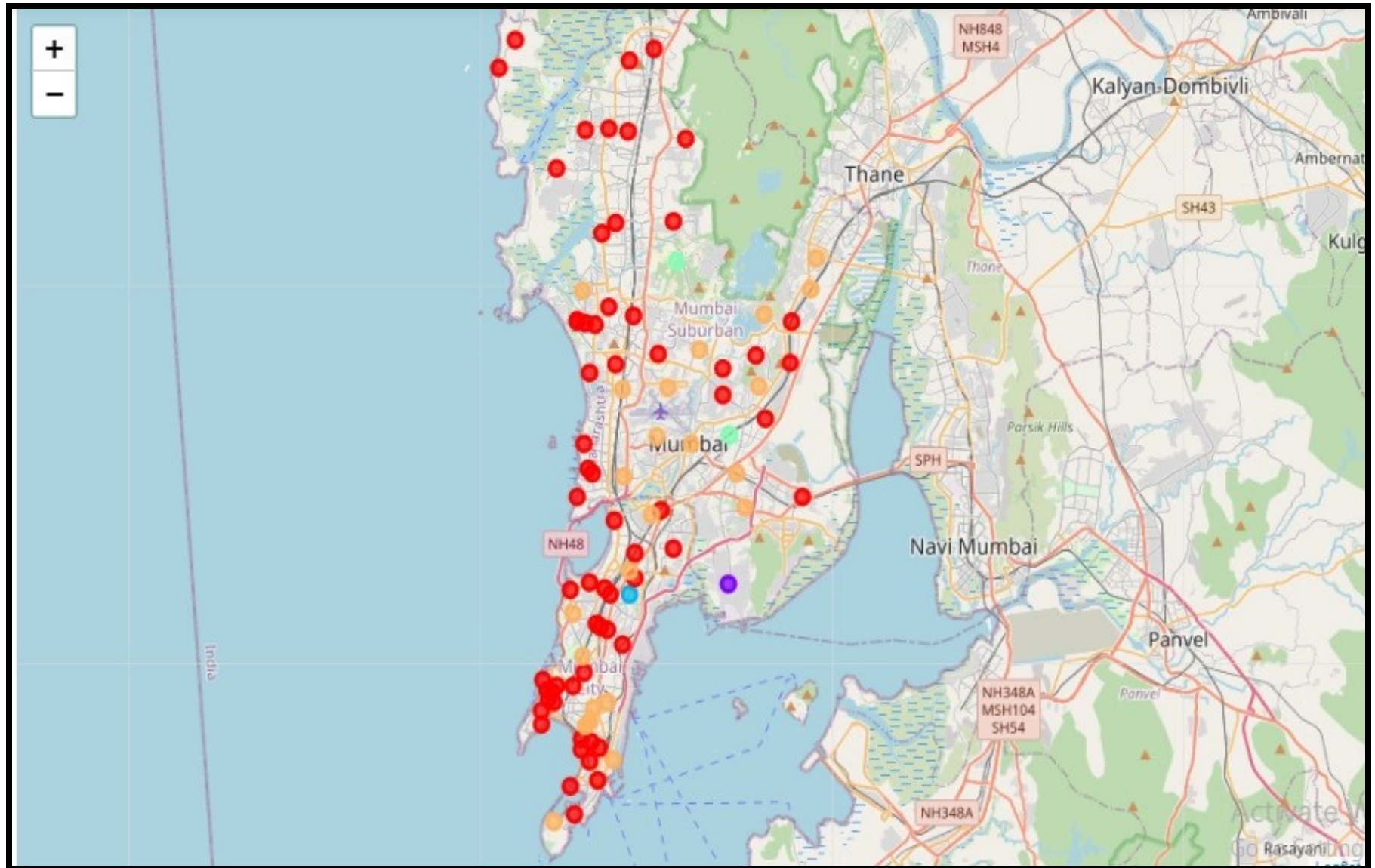
Cluster 4

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
4	Lokhandwala	4.0	Indian Restaurant	Café	Donut Shop	Dessert Shop	Bakery
5	Marol	4.0	Indian Restaurant	Snack Place	Hotel	Diner	Food
6	Sahar	4.0	Indian Restaurant	Hotel Bar	Hotel	Hockey Arena	Donut Shop
13	Kherwadi	4.0	Indian Restaurant	Café	Pizza Place	Yoga Studio	Electronics Store
30	Kalina	4.0	Food & Drink Shop	Ice Cream Shop	Indian Restaurant	Asian Restaurant	Chinese Restaurant
35	Vile Parle	4.0	Indian Restaurant	Sandwich Place	Fast Food Restaurant	Market	Bakery
36	Bhandup	4.0	Indian Restaurant	Train Station	Track Stadium	Theater	Multiplex
37	Amrut Nagar	4.0	Indian Restaurant	Electronics Store	Chinese Restaurant	Mediterranean Restaurant	Fast Food Restaurant
41	Nehru Nagar	4.0	Ice Cream Shop	Indian Restaurant	Food Court	Seafood Restaurant	Yoga Studio
42	Nahur	4.0	Indian Restaurant	Ice Cream Shop	Restaurant	Yoga Studio	Electronics Store
45	Indian Institute of Technology Bombay campus	4.0	Event Space	Indian Restaurant	Concert Hall	Coffee Shop	Café
48	Chembur	4.0	Indian Restaurant	Seafood Restaurant	Café	Vegetarian / Vegan Restaurant	Restaurant
49	Deonar	4.0	Plaza	Garden	Fast Food Restaurant	Lounge	Indian Restaurant
54	Bhuleshwar	4.0	Indian Restaurant	Arcade	Fast Food Restaurant	Coffee Shop	Food
64	Dongri	4.0	Chinese Restaurant	Indian Restaurant	Vegetarian / Vegan Restaurant	Gym	Donut Shop
68	Mahalaxmi	4.0	Indian Restaurant	Nightclub	Fast Food Restaurant	Gym	Coffee Shop
81	Navy Nagar	4.0	Garden	Yoga Studio	Electronics Store	Fish Market	Field
82	Hindu colony	4.0	Indian Restaurant	Coffee Shop	Café	Gastropub	Juice Bar
83	Ballard Estate	4.0	Indian Restaurant	Irani Cafe	Flea Market	Café	Parsi Restaurant
84	Bhuleshwar	4.0	Indian Restaurant	Arcade	Fast Food Restaurant	Coffee Shop	Food

Examining Five Clusters

We can clearly see that Cluster 0 contains highest number of neighborhoods (64), among them only D.N. Nagar and Matunga are the neighborhoods in which Indian Restaurant is first most common venue exist in this cluster. In cluster 1, There is only one neighborhood in which Indian Restaurant is third most common venue. Cluster 2 contains only one neighborhood but Indian Restaurant is not in top most five common venues. Cluster 3 contains only two neighborhoods but Indian Restaurant is not in top most five common venues. Finally, cluster 4 contains 24 neighborhoods and Indian Restaurant is the first most common venue in most of the neighborhoods i.e. 16 out of 24 (67%).

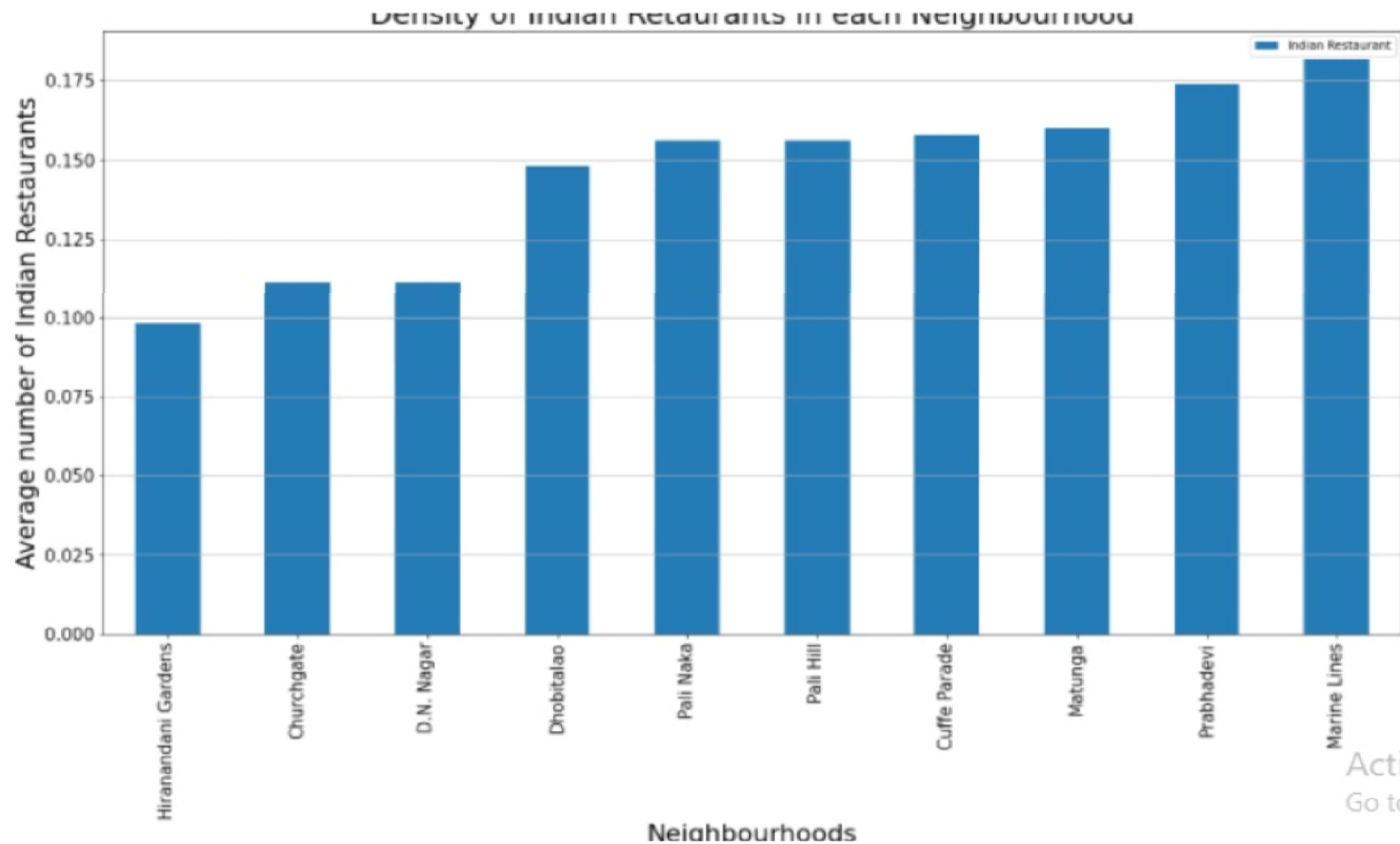
Visualized resulting clusters



10 selected neighborhoods with lowest average number of Indian Restaurants (excluding 0)

Neighbourhood	Indian Restaurant
Hiranandani Gardens	0.098039
Churchgate	0.111111
D.N. Nagar	0.111111
Dhobitalao	0.148148
Pali Naka	0.156250
Pali Hill	0.156250
Cuffe Parade	0.157895
Matunga	0.160000
Prabhadevi	0.173913
Marine Lines	0.181818

Density of Indian Restaurants in each selected neighborhood



Discussion

From the graph, we can say that the neighborhoods Prabhadevi and Marine Lines have the highest competition within the 10 selected neighborhoods for opening an Indian Restaurants in Mumbai. This indicating that it has the greatest obstacles in opening a new restaurant among the selected neighborhoods. Dhobi Talau and Pali Naka; etc. have moderate competition. Following neighborhoods have lowest competition for opening an Indian Restaurant in Mumbai, which will enable a new business to establish easily:

- Hiranandani Gardens
- Church Gate
- D.N.Nagar

Conclusion

- This project recommends some of the ideal places to open an Indian restaurant in Mumbai, India. The analysis shows there are better scopes for opening restaurant in Hiranandani Gardens, Church Gate and D.N.Bagar; Dhobi Talou and Pali Naka are also good location. This analysis can be helpful for the individuals looking for opening a restaurant or expanding business. This analysis shows the feasible venture and competition landscape of the area.
- Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location, levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.