# Analyzing the Neighborhoods in Mumbai to Start a New Restaurant

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## 1. Introduction

### 1.1 Background

Mumbai is India's largest city by population and also is the financial and commercial capital of the country as it generates 6.16% of the total Gross Domestic Product (GDP). It lies on the west coast of India and attracts heavy tourism from all over the globe every year. It is one of the major hubs of the world and is extremely diverse with people from various ethnicities residing there. The multi-cultural nature of the city of Mumbai has brought alongwith it numerous cuisines from all over the world. Mumbai has a variety of street food, including the Vada pav, Pav bhaji, Chaat, Idii, Dosa and the Mumbai sandwich. Thus, this project aims to study the neighbourhoods in Mumbai to determine possible locations for starting a restaurant.

### 1.2 Problem

Data that might contribute to determining if any neighbourhoods in Mumbai are most possible and efficient to start up a restaurant. This project aims to predict whether and how the new restaurant should be start up to accommodate their cultural settings.

### 1.3 Interest

This project can be useful for business owners and entrepreneurs who are looking to invest in a restaurant in Mumbai. The main objective of this project is to carefully analyze appropriate data and find recommendations for the stakeholders.

## 2. Data acquisition and cleaning

### 2.1 Data sources and cleaning

The data of the neighbourhoods in Mumbai was scraped from https://en.wikipedia.org/wiki/List_of_neighborhoods_in_Mumbai. The data is read into a pandas data frame using the read_html() method. The main reason for doing so is that the Wikipedia page provides a comprehensive and detailed table of the data which can easily be scraped using the read_html() method of pandas.

The top 10 rows of the dataframe are shown in Figure 1.

| | Neighborhood | Location | Latitude | Longitude |
|---|---|---|---|---|
| 0 | Amboli | Andheri,Western Suburbs | 19.129300 | 72.843400 |
| 1 | Chakala, Andheri | Western Suburbs | 19.111388 | 72.860833 |
| 2 | D.N. Nagar | Andheri,Western Suburbs | 19.124085 | 72.831373 |
| 3 | Four Bungalows | Andheri,Western Suburbs | 19.124714 | 72.827210 |
| 4 | Lokhandwala | Andheri,Western Suburbs | 19.130815 | 72.829270 |
| 5 | Marol | Andheri,Western Suburbs | 19.119219 | 72.882743 |
| 6 | Sahar | Andheri,Western Suburbs | 19.098889 | 72.867222 |
| 7 | Seven Bungalows | Andheri,Western Suburbs | 19.129052 | 72.817018 |
| 8 | Versova | Andheri,Western Suburbs | 19.120000 | 72.820000 |
| 9 | Mira Road | Mira-Bhayandar,Western Suburbs | 19.284167 | 72.871111 |

Figure 1: Top 10 rows of Mumbai neighbourhoods data scraped from Wikipedia.

## 2.2 Geographical Coordinates

The geographical coordinates for Mumbai have been obtained from the GeoPy library in python. This data is relevant for plotting the map of Mumbai using the Folium library in python. The code for getting the geographical coordinates of Mumbai is shown in Figure 2.

```
address = 'Mumbai, IN'
geolocator = Nominatim()
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinates of Mumbai are {}, {}.'.format(latitude, longitude))
```

```
The geograpical coordinates of Mumbai are 19.0759899, 72.8773928.
```

Figure 2: Obtaining geographical coordinates of Mumbai.

The geocoder library in python has been used to obtain latitude and longitude data for various neighbourhoods in Mumbai. The coordinates of all neighbourhoods in Mumbai are used to check the accuracy of coordinates given on Wikipedia and replace them in our data frame if the absolute difference is more than 0.001. These refined coordinates are then further used for plotting neighbourhoods using the Folium library in python. Figure 3 shows the coordinates of neighbourhoods in Mumbai obtained from Wikipedia as 'Latitude' and 'Longitude' and those obtained from geocoder as 'Latitude1' and 'Longitude1'. Furthermore, it also shows the absolute difference between the two latitude columns and the two longitude columns as 'Latdiff' and 'Longdiff', respectively. Once again only the top 10 rows are shown.

| | Neighborhood | Location | Latitude | Longitude | Latitude1 | Longitude1 | Latdiff | Longdiff |
|---|---|---|---|---|---|---|---|---|
| 0 | Amboli | Western Suburbs | 19.1293 | 72.8464 | 19.1291 | 72.8464 | 0.00024 | 0.00304 |
| 1 | Chakala, Andheri | Western Suburbs | 19.1084 | 72.8623 | 19.1084 | 72.8623 | 0.003028 | 0.001497 |
| 2 | D.N. Nagar | Western Suburbs | 19.1241 | 72.8325 | 19.1251 | 72.8325 | 0.000965 | 0.001107 |
| 3 | Four Bungalows | Western Suburbs | 19.1263 | 72.8243 | 19.1263 | 72.8243 | 0.001606 | 0.00288 |
| 4 | Lokhandwala | Western Suburbs | 19.1432 | 72.8249 | 19.1432 | 72.8249 | 0.012345 | 0.0044 |
| 5 | Marol | Western Suburbs | 19.1192 | 72.8827 | 19.1191 | 72.8828 | 0.000169 | 6.7e-05 |
| 6 | Sahar | Western Suburbs | 19.1027 | 72.8626 | 19.1027 | 72.8626 | 0.00376476 | 0.00464166 |
| 7 | Seven Bungalows | Western Suburbs | 19.1315 | 72.817 | 19.1315 | 72.8165 | 0.00240802 | 0.000558001 |
| 8 | Versova | Western Suburbs | 19.1377 | 72.8135 | 19.1377 | 72.8135 | 0.01769 | 0.00652 |
| 9 | Mira Road | Western Suburbs | 19.2657 | 72.8711 | 19.2657 | 72.8707 | 0.0184624 | 0.000418149 |

Figure 3: Absolute difference between latitude and longitude values obtained from Wikipedia and Geocoder.

Figure 4 shows the top 10 rows of the final Mumbai neighbourhoods dataframe after replacing the latitude and longitude values as mentioned before and dropping unnecessary columns.

| | Neighborhood | Location | Latitude | Longitude |
|---|---|---|---|---|
| 0 | Amboli | Western Suburbs | 19.1293 | 72.8464 |
| 1 | Chakala, Andheri | Western Suburbs | 19.1084 | 72.8623 |
| 2 | D.N. Nagar | Western Suburbs | 19.1241 | 72.8325 |
| 3 | Four Bungalows | Western Suburbs | 19.1263 | 72.8243 |
| 4 | Lokhandwala | Western Suburbs | 19.1432 | 72.8249 |
| 5 | Marol | Western Suburbs | 19.1192 | 72.8827 |
| 6 | Sahar | Western Suburbs | 19.1027 | 72.8626 |
| 7 | Seven Bungalows | Western Suburbs | 19.1315 | 72.817 |
| 8 | Versova | Western Suburbs | 19.1377 | 72.8135 |
| 9 | Mira Road | Western Suburbs | 19.2657 | 72.8711 |

Figure 4: Final Mumbai neighbourhoods dataframe.

### 2.3 Venue Data

The venue data has been extracted using the Foursquare API. This data contains venue recommendations for all neighbourhoods in Mumbai and is used to study the popular venues of different neighbourhoods as well as build the unsupervised learning model to cluster neighbourhoods. The venue recommendations of all neighbourhoods were obtained with a limit of 200, that is, a maximum of 200 venue recommendations per neighbourhood and a radius of 1 km around the neighbourhood's geographical coordinates. Figure 5 shows the top 10 rows depicting the results obtained after cleaning the data from Foursquare API.

| | Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 0 | Amboli | 19.1293 | 72.84644 | Cafe Arfa | 19.128930 | 72.847140 | Indian Restaurant |
| 1 | Amboli | 19.1293 | 72.84644 | 5 Spice , Bandra | 19.130421 | 72.847206 | Chinese Restaurant |
| 2 | Amboli | 19.1293 | 72.84644 | Shawarma Factory | 19.124591 | 72.840398 | Falafel Restaurant |
| 3 | Amboli | 19.1293 | 72.84644 | Jaffer Bhai's Delhi Darbar | 19.137714 | 72.845909 | Mughlai Restaurant |
| 4 | Amboli | 19.1293 | 72.84644 | Narayan Sandwich | 19.121398 | 72.850270 | Sandwich Place |
| 5 | Amboli | 19.1293 | 72.84644 | Persia Darbar | 19.136952 | 72.846822 | Indian Restaurant |
| 6 | Amboli | 19.1293 | 72.84644 | Domino's Pizza | 19.131000 | 72.848000 | Pizza Place |
| 7 | Amboli | 19.1293 | 72.84644 | Garden Court | 19.127188 | 72.837478 | Indian Restaurant |
| 8 | Amboli | 19.1293 | 72.84644 | Subway | 19.127860 | 72.844461 | Sandwich Place |
| 9 | Amboli | 19.1293 | 72.84644 | Sarvodaya Veg. Restaurant | 19.123760 | 72.850893 | Indian Restaurant |

Figure 5: Data obtained from Foursquare API after cleaning.

# 3. Exploratory Data Analysis

## 3.1 Data Visualization

To understand the data obtained for Mumbai neighbourhoods, basic visualization was carried out. Figure 6 shows a bar plot depicting the number of neighbourhoods in each location in Mumbai.

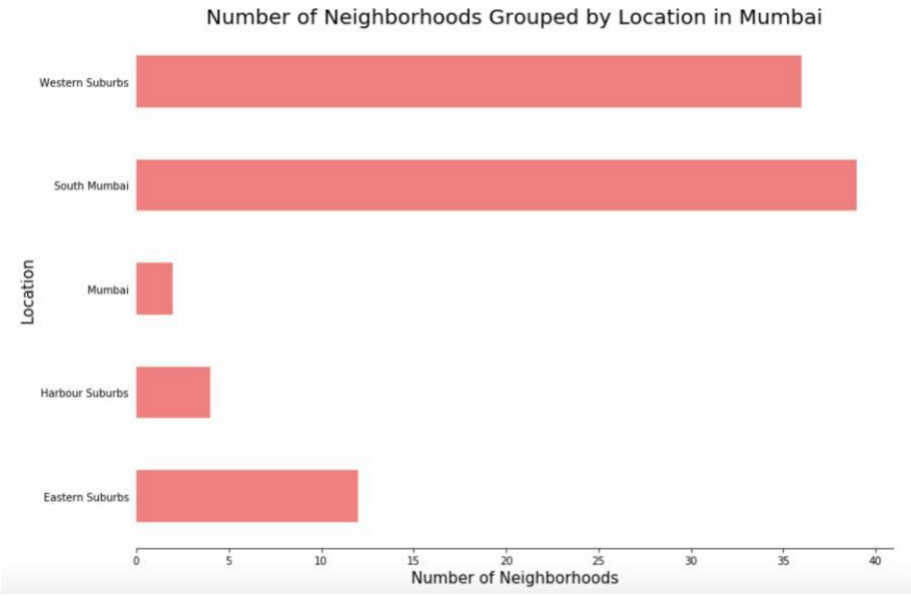


Figure 6: Number of neighbourhoods grouped by location.

It is evident from Figure 6 that South Mumbai and Western Suburbs have the most number of neighbourhoods. Notice how we see one of the locations as Mumbai itself? This is because the neighbourhoods contained in this location are located at the outskirts of the city and thus have been termed as just Mumbai.

Using folium, a map was plotted to show how the different neighbourhoods are spread all across Mumbai. This is shown in Figure 7.

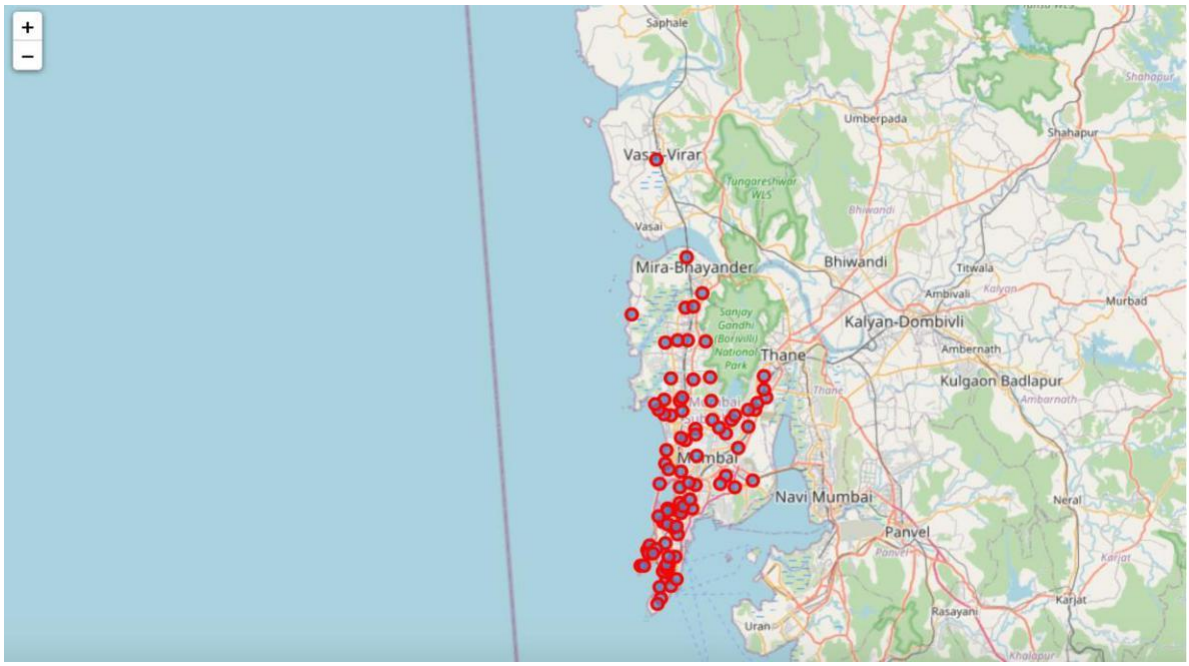


Figure 7: Depicting the neighbourhood spread across Mumbai.

# 4. Predictive Modeling

## 4.1 Unsupervised Learning

K-means unsupervised learning technique was used to cluster the neighbourhoods based on the category of venues near the neighbourhoods. One important aspect of the k-means model is to determine the number of clusters to use in model development. This was determined by the Silhouette score which was calculated for a range of clusters from 2 to 15. The resulting number of clusters and their respective Silhouette scores are shown in Figure 10.

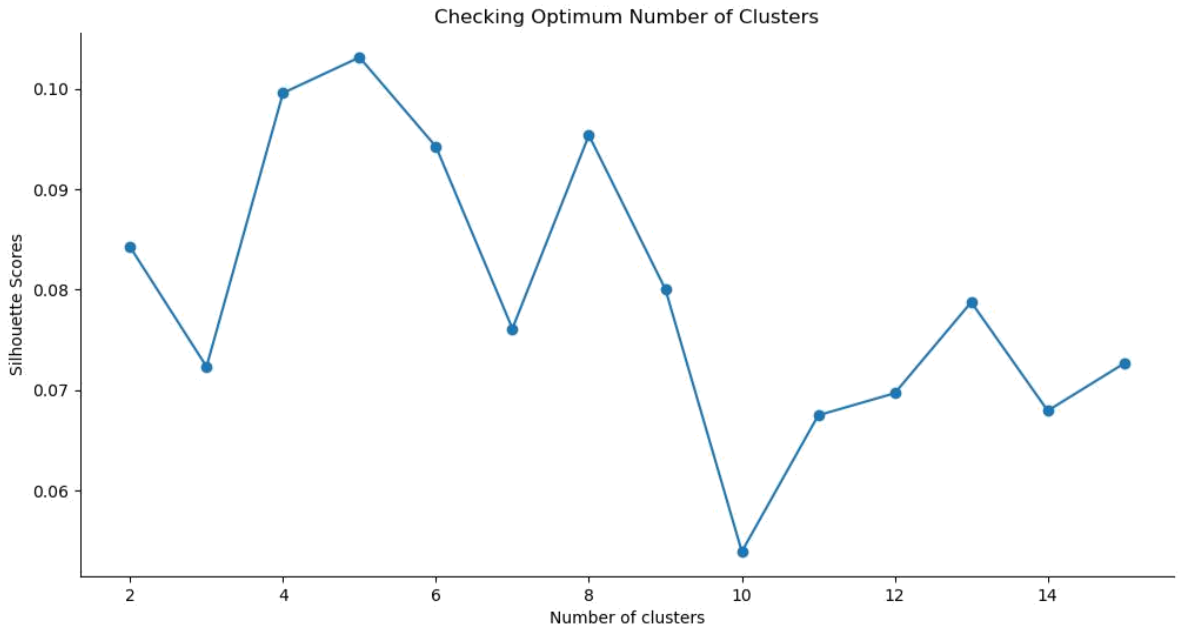


Figure 10: Silhouette scores for different clusters.

The Silhouette scores are not very high even as the number of clusters increases. This means that the inter-cluster distance is not very high over the range of k-values. Despite this, the data will be clustered to the best possible extent. For this, 5 clusters will be used for the k-means clustering model since it provides the highest silhouette score as seen in Figure 10.

### 4.2 Results

The clustering model then clusters the neighbourhoods in Mumbai and provides a label for each neighbourhood that is representative of the cluster it belongs to.

Location, Latitude, and Longitude columns to provide a complete summary of the clustering. The top 10 rows are shown in Figure 11.

| | Neighborhood | Location | Latitude | Longitude | 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 | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Amboli | Western Suburbs | 19.1293 | 72.8464 | 1 | Indian Restaurant | Coffee Shop | Bakery | Bar | Asian Restaurant | Pizza Place | Sandwich Place | Bowling Alley | Bus Station | Bike Rental / Bike Share |
| 1 | Chakala, Andheri | Western Suburbs | 19.1084 | 72.8623 | 1 | Hotel | Indian Restaurant | Café | Fast Food Restaurant | Pizza Place | Asian Restaurant | Hotel Bar | Vegetarian / Vegan Restaurant | Restaurant | Gym |
| 2 | D.N. Nagar | Western Suburbs | 19.1241 | 72.8325 | 0 | Bar | Indian Restaurant | Pub | Gym / Fitness Center | Pizza Place | Lounge | Coffee Shop | Vegetarian / Vegan Restaurant | Snack Place | Gym |
| 3 | Four Bungalows | Western Suburbs | 19.1263 | 72.8243 | 0 | Pub | Café | Indian Restaurant | Gym / Fitness Center | Chinese Restaurant | Bar | Seafood Restaurant | Lounge | Vegetarian / Vegan Restaurant | Coffee Shop |
| 4 | Lokhandwala | Western Suburbs | 19.1432 | 72.8249 | 0 | Indian Restaurant | Chinese Restaurant | Café | Pub | Bakery | Bar | Italian Restaurant | Gym / Fitness Center | Coffee Shop | Asian Restaurant |
| 5 | Marol | Western Suburbs | 19.1192 | 72.8827 | 1 | Indian Restaurant | Hotel | Diner | Bakery | Dance Studio | Ice Cream Shop | Chinese Restaurant | Fast Food Restaurant | Restaurant | Lounge |
| 6 | Sahar | Western Suburbs | 19.1027 | 72.8626 | 0 | Hotel | Café | Indian Restaurant | Lounge | Gym | Asian Restaurant | Pizza Place | Seafood Restaurant | Restaurant | Falafel Restaurant |
| 7 | Seven Bungalows | Western Suburbs | 19.1315 | 72.817 | 0 | Café | Pub | Seafood Restaurant | Chinese Restaurant | Pizza Place | Coffee Shop | Bar | Ice Cream Shop | Asian Restaurant | Bistro |
| 8 | Versova | Western Suburbs | 19.1377 | 72.8135 | 0 | Café | Ice Cream Shop | Beach | Pizza Place | Coffee Shop | Chinese Restaurant | Salon / Barbershop | Frozen Yogurt Shop | Bistro | Sandwich Place |
| 9 | Mira Road | Western Suburbs | 19.2657 | 72.8711 | 1 | Indian Restaurant | Convenience Store | Coffee Shop | Mexican Restaurant | Fast Food Restaurant | Food Truck | Motorcycle Shop | Movie Theater | Basketball Court | Bar |

Figure 11: Clustering neighbourhoods in Mumbai.

Furthermore, neighbourhoods in each cluster can be extracted using cluster labels and thus the details of specific clusters can be seen. This is done below for all clusters with only 10 rows for clusters that contain a high number of neighbourhoods.

| | Neighborhood | Location | 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 | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Chakala, Andheri | Western Suburbs | Hotel | Indian Restaurant | Café | Hotel Bar | Asian Restaurant | Pizza Place | Vegetarian / Vegan Restaurant | Restaurant | Burger Joint | Multiplex |
| 6 | Sahar | Western Suburbs | Hotel | Indian Restaurant | Restaurant | Gym | Asian Restaurant | Bar | Coffee Shop | Café | Italian Restaurant | Pub |
| 27 | Khar Danda | Western Suburbs | Hotel | Clothing Store | Park | Coffee Shop | Dessert Shop | Bookstore | Bistro | French Restaurant | Boutique | Pool |
| 40 | Kanjurmarg | Eastern Suburbs | Train Station | Gym | Hotel | Gift Shop | Chinese Restaurant | French Restaurant | Asian Restaurant | Multiplex | Donut Shop | Electronics Store |
| 70 | Malabar Hill | South Mumbai | Gym | Hotel | Park | Convenience Store | Lighthouse | Coffee Shop | Dessert Shop | Indian Restaurant | Cupcake Shop | Cosmetics Shop |
| 77 | Walkeshwar | South Mumbai | Gym | Park | Hotel | Convenience Store | Food & Drink Shop | Food Truck | Lighthouse | Restaurant | Dessert Shop | Coffee Shop |

Figure 12: Cluster 1.

| | Neighborhood | Location | 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 | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Amboli | Western Suburbs | Indian Restaurant | Pizza Place | Sandwich Place | Bar | Bakery | Athletics & Sports | Metro Station | Burger Joint | Bike Rental / Bike Share | Mughlai Restaurant |
| 2 | D.N. Nagar | Western Suburbs | Pub | Bar | Indian Restaurant | Pizza Place | Gym / Fitness Center | Women's Store | Vegetarian / Vegan Restaurant | Juice Bar | Snack Place | Hotel Bar |
| 3 | Four Bungalows | Western Suburbs | Pub | Lounge | Chinese Restaurant | Indian Restaurant | Seafood Restaurant | Vegetarian / Vegan Restaurant | Pizza Place | Café | Coffee Shop | Ice Cream Shop |
| 4 | Lokhandwala | Western Suburbs | Indian Restaurant | Café | Coffee Shop | Chinese Restaurant | Bar | Pub | Italian Restaurant | Fast Food Restaurant | Asian Restaurant | Seafood Restaurant |
| 7 | Seven Bungalows | Western Suburbs | Café | Pub | Bar | Chinese Restaurant | Indian Restaurant | Seafood Restaurant | Pizza Place | Ice Cream Shop | Vegetarian / Vegan Restaurant | Coffee Shop |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 83 | Ballard Estate | South Mumbai | Indian Restaurant | Café | Coffee Shop | Seafood Restaurant | Bar | Parsi Restaurant | Lounge | Train Station | Irani Cafe | Dessert Shop |
| 88 | Parel | South Mumbai | Coffee Shop | Playground | Indian Restaurant | Chinese Restaurant | Plaza | Restaurant | Rest Area | Maharashtrian Restaurant | Bar | Vegetarian / Vegan Restaurant |
| 89 | Gowalia Tank | South Mumbai | Indian Restaurant | Fast Food Restaurant | Coffee Shop | Bakery | Electronics Store | Café | Sandwich Place | Vegetarian / Vegan Restaurant | Snack Place | Ice Cream Shop |
| 90 | Dava Bazaar | South Mumbai | Train Station | Indian Restaurant | Fish Market | Hotel | French Restaurant | Fast Food Restaurant | Café | Coffee Shop | Clothing Store | Asian Restaurant |
| 91 | Dharavi | Mumbai | Indian Restaurant | Paper / Office Supplies Store | Café | Fast Food Restaurant | Shoe Store | Seafood Restaurant | Sandwich Place | Luggage Store | Diner | Bus Station |

Figure 13: Cluster 2.

| | Neighborhood | Location | 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 | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 92 | Thane | Mumbai | Platform | Pizza Place | Performing Arts Venue | Dessert Shop | Fish & Chips Shop | Field | Fast Food Restaurant | Falafel Restaurant | Event Space | Electronics Store |

Figure 14: Cluster 3.

| | Neighborhood | Location | 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 | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Marol | Western Suburbs | Indian Restaurant | Chinese Restaurant | Hotel | Coffee Shop | Bakery | Restaurant | Lounge | Department Store | Dance Studio | Diner |
| 9 | Mira Road | Western Suburbs | Indian Restaurant | Mexican Restaurant | Bar | Coffee Shop | Fast Food Restaurant | Movie Theater | Basketball Court | Convenience Store | Gym / Fitness Center | Dhaba |
| 11 | Uttan | Western Suburbs | Convenience Store | Indian Restaurant | Whisky Bar | Restaurant | Zoo | Dhaba | Fish Market | Fish & Chips Shop | Field | Fast Food Restaurant |
| 20 | Jogeshwari West | Western Suburbs | Indian Restaurant | Restaurant | Gym | Café | Business Service | Bus Station | Men's Store | Mughlai Restaurant | Ice Cream Shop | Chinese Restaurant |
| 36 | Bhandup | Eastern Suburbs | Train Station | Indian Restaurant | Fast Food Restaurant | Asian Restaurant | Zoo | Dim Sum Restaurant | Flea Market | Fish Market | Fish & Chips Shop | Field |
| 37 | Amrut Nagar | Eastern Suburbs | Indian Restaurant | Ice Cream Shop | Pharmacy | Train Station | Café | Multiplex | Bus Station | Mughlai Restaurant | Restaurant | Plaza |
| 39 | Pant Nagar | Eastern Suburbs | Indian Restaurant | Coffee Shop | Shopping Mall | Café | Vegetarian / Vegan Restaurant | Bakery | Platform | Fast Food Restaurant | Bus Station | Diner |
| 43 | Chandivali | Eastern Suburbs | Indian Restaurant | Fast Food Restaurant | Restaurant | Seafood Restaurant | Brewery | Café | Food | Lounge | Chinese Restaurant | Pub |
| 46 | Vidyavihar | Eastern Suburbs | Indian Restaurant | Fast Food Restaurant | Juice Bar | Playground | Chinese Restaurant | Dessert Shop | Ice Cream Shop | Vegetarian / Vegan Restaurant | Train Station | Bar |
| 48 | Chembur | Harbour Suburbs | Indian Restaurant | Pizza Place | Café | Fast Food Restaurant | Vegetarian / Vegan Restaurant | Dessert Shop | Asian Restaurant | Bar | Seafood Restaurant | Garden |
| 51 | Mahul | Harbour Suburbs | Indian Restaurant | Fast Food Restaurant | Smoke Shop | Hotel | Pizza Place | Cosmetics Shop | Ice Cream Shop | Vegetarian / Vegan Restaurant | Pool | Bar |
| 54 | Bhuleshwar | South Mumbai | Indian Restaurant | Bakery | Chinese Restaurant | Market | Café | Ice Cream Shop | Dessert Shop | Multiplex | Fast Food Restaurant | Rest Area |
| 57 | Cavel | South Mumbai | Indian Restaurant | Bakery | Café | Chinese Restaurant | Market | Restaurant | Ice Cream Shop | Fast Food Restaurant | Multiplex | Arcade |
| 63 | Dhobitalao | South Mumbai | Indian Restaurant | Coffee Shop | Café | Bar | Multiplex | Flea Market | Chinese Restaurant | Train Station | Bakery | Market |
| 64 | Dongri | South Mumbai | Indian Restaurant | Dessert Shop | Chinese Restaurant | Convenience Store | Garden | Restaurant | Market | Café | BBQ Joint | Boat or Ferry |
| 68 | Mahalaxmi | South Mumbai | Indian Restaurant | Café | Chinese Restaurant | Multiplex | Bakery | Fast Food Restaurant | Ice Cream Shop | Bar | Snack Place | Jewelry Store |
| 69 | Mahim | South Mumbai | Indian Restaurant | Fast Food Restaurant | Bakery | Chinese Restaurant | Dessert Shop | Café | Clothing Store | Breakfast Spot | Coffee Shop | Asian Restaurant |
| 71 | Marine Drive | South Mumbai | Indian Restaurant | Bakery | Multiplex | Ice Cream Shop | Chinese Restaurant | Fast Food Restaurant | Café | Train Station | Cheese Shop | Market |
| 78 | Worli | South Mumbai | Indian Restaurant | Scenic Lookout | Playground | Café | Garden | Diner | Thai Restaurant | Sandwich Place | Food | Gourmet Shop |
| 84 | Chira Bazaar | South Mumbai | Indian Restaurant | Café | Bakery | Multiplex | Ice Cream Shop | Chinese Restaurant | Fast Food Restaurant | Gym | Juice Bar | Flea Market |
| 85 | Fanas Wadi | South Mumbai | Indian Restaurant | Café | Fast Food Restaurant | Chinese Restaurant | Market | Ice Cream Shop | Juice Bar | Dessert Shop | Train Station | Coffee Shop |
| 86 | Chor Bazaar | South Mumbai | Indian Restaurant | Dessert Shop | Middle Eastern Restaurant | Arts & Crafts Store | Rest Area | Café | BBQ Joint | Market | Chinese Restaurant | Fast Food Restaurant |
| 87 | Matunga | South Mumbai | Indian Restaurant | Fast Food Restaurant | Café | Snack Place | Ice Cream Shop | Gym | Miscellaneous Shop | Chinese Restaurant | Vegetarian / Vegan Restaurant | Train Station |

Figure 15: Cluster 4.

| | Neighborhood | Location | 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 | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | Cotton Green | South Mumbai | Plaza | Pizza Place | Fast Food Restaurant | Train Station | Bakery | Dhaba | Fish Market | Fish & Chips Shop | Field | Falafel Restaurant |

Figure 16: Cluster 5.

Based on the clusters shown above, the neighbourhoods can once again be plotted on a map of Mumbai, however, this time with different colour markers to distinguish between different clusters.

## 5. Discussion

By analyzing the five clusters obtained we can see that some of the clusters are more suited for restaurants and hotels, whereas, other clusters are less suited. Neighbourhoods in clusters 3, 4, and 5 contain a small percentage of restaurants, hotels, cafes and pubs in their top 10 common venues. These clusters contain a higher degree of other venues like the train station, bus station, fish market, gym, performing arts venue and smoke shop, to name a few. Thus, they are not well suited for opening a new restaurant. On the other hand, neighbourhoods in clusters 1 and 2 contain a much higher degree of restaurants, hotels, multiplex, cafes, bars and other food joints. Thus, the neighbourhoods in these clusters would be well suited for opening a new restaurant.

Comparing clusters 1 and 2, neighbourhoods in cluster 1 seem to be more suited for starting a restaurant since they contain a larger percentage of food joints in the top 10 most common venues than cluster 2. The neighbourhoods in cluster 1 contain a variety of food joints like restaurants, tea rooms, bakeries, cafes, steakhouses and pubs and also contain very diverse cuisines like Japanese, Indian, Chinese, Italian and seafood restaurants. Most neighbourhoods in cluster 2 seem to have Indian Restaurant as their topmost common venue; however, on careful analysis, we can see that neighbourhoods in cluster 2 also contain other venues like a soccer field, flea market, smoke shop, gym, train station, dance studio, music

store, cosmetics shop and so on. Thus, it is recommended that the new restaurant can be opened in the neighbourhoods belonging to cluster 1. This neighbourhood can be further plotted on a map as shown below in Figure 18.

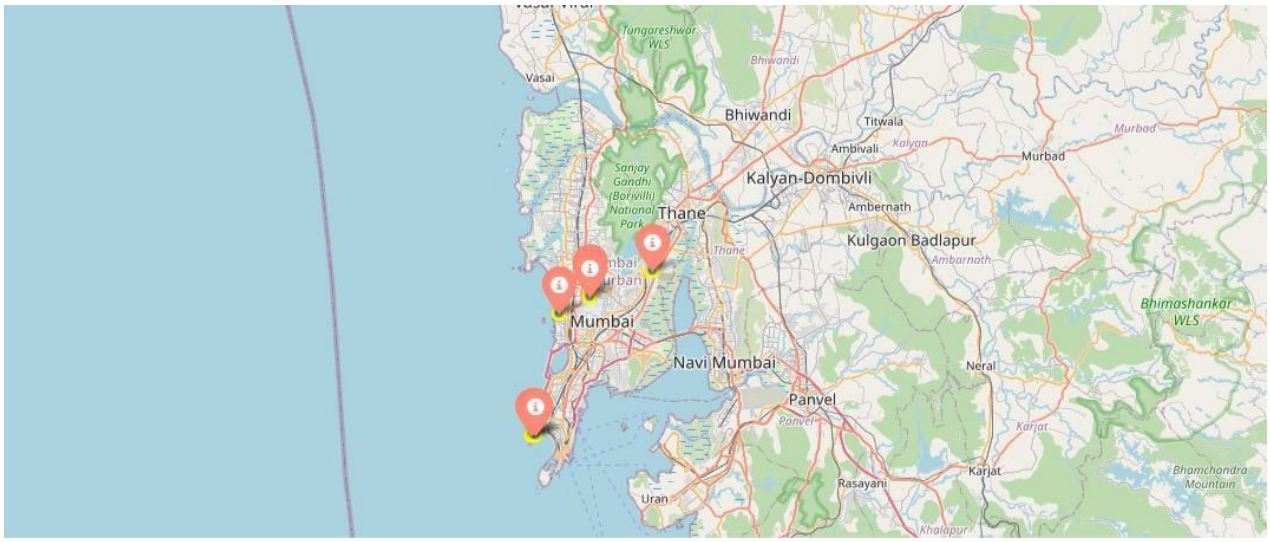


Figure 17: Neighborhoods most suited for starting a new restaurant.

## 6. Conclusion

In this project, the neighbourhoods in Mumbai, India have been successfully analyzed for determining which would be the best neighbourhoods for opening a new restaurant. Based on the analysis carried out, neighbourhoods in cluster 1 are recommended as locations for the new restaurant. The stakeholders and investors can further tune this by considering various other factors like transport, legal requirements, and costs associated. These were out of the scope for this project and thus were not considered.

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