

# Analysing Restaurants in Mumbai for food supply during Covid-19 Lockdown

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May 11, 2020

## 1 Introduction

### 1.1 Background

Mumbai, “The City of Dreams” as they say, is indeed one of the most magnificently alluring and beautiful cities of all times. Two things that truly define this city are realization of dreams and the Bollywood.

The world is fighting against a huge virus that has affected the whole world as a whole: COVID-19 or the dreaded ”Corona Virus”. Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. India as a nation has suffered a lot due to this outbreak, but tackled it by imposing lockdown at earliest stages of spreading of the disease. In these times of staying home, the sector that has been most explored by people at home is ”FOOD”.

### 1.2 Problem Description

In this project, we will be exploring the restaurants around Mumbai city and analyse the cuisine served, delivery options and ratings of the restaurants in Mumbai, one of the prime locations in India. This will talk about the vast array of options and how they operate in these times, marking best neighbourhoods in terms of good rating restaurants.

### 1.3 Audience and Interest groups

This project will help anyone staying in Mumbai to get a descriptive reading of neighbourhoods to obtain the range of cuisines available and what all places are available and working during this lockdown.

## 2 Data

### 2.1 Sources

Data is the most fundamental part of undertaking a project. To utilize the capabilities of Data Science, we will be requiring a data set which has:

- Restaurant data in Mumbai filtering on ratings, location and delivery options
- Source link: ZOMATO KAGGLE DATA
- Data Storage: Every Restaurant contains the following variables
  1. Restaurant Id: Unique id of every restaurant across various cities of the world
  2. Restaurant Name: Name of the restaurant
  3. Country Code: Country in which restaurant is located
  4. City: City in which restaurant is located
  5. Address: Address of the restaurant
  6. Locality: Location in the city
  7. Locality Verbose: Detailed description of the locality
  8. Longitude: Longitude coordinate of the restaurant's location
  9. Latitude: Latitude coordinate of the restaurant's location
  10. Cuisines: Cuisines offered by the restaurant
  11. Average Cost for two: Cost for two people in different currencies
  12. Currency: Currency of the country
  13. Has Table booking: yes/no
  14. Has Online delivery: yes/ no
  15. Is delivering: yes/ no
  16. Switch to order menu: yes/no
  17. Price range: range of price of food
  18. Aggregate Rating: Average rating out of 5
  19. Rating color: depending upon the average rating color
  20. Rating text: text on the basis of rating o rating
  21. Votes: Number of ratings casted by people
- Location data source: FOURSQUARE API

## 2.2 Approach

- Acquire Mumbai restaurant data from Zomato Kaggle data
- Utilize Foursquare to view location and neighbourhood grouping
- Analyze based on ratings, delivery status and locality
- Visualize obtained data

## 2.3 Preprocessing

```
df = pd.read_csv('Downloads\zomato-restaurants-data\zomato.csv',encoding='ISO-8859-1')
df_india = df[df['Country Code'] == 1]
#Mumbai
df_Mum = df_india[df_india['City'] == 'Mumbai']

df_Mum.reset_index(drop=True, inplace=True)
df_Mum.head()
```

	Restaurant ID	Restaurant Name	Country Code	City	Address	Locality	Locality Verbose	Longitude	Latitude	Cuisines ...	Currency	Has Table booking	Has Online delivery	Is delivering now
0	35217	Joey's Pizza	1	Mumbai	6 & 7, Upvan Building, Near Indian Oil Colony,...	Azad Nagar	Azad Nagar, Mumbai	72.829976	19.126630	Pizza ...	Indian Rupees(Rs.)	No	No	No
1	18447068	Cafe Hydro	1	Mumbai	Esspee Tower, Rajendra Nagar, Dattapada Road, ...	Borivali East	Borivali East, Mumbai	72.862381	19.221315	Asian ...	Indian Rupees(Rs.)	No	No	No
2	18458563	The American Joint	1	Mumbai	The Ahcl Homes Tower, Chikuwadi New Link Road,...	Borivali West	Borivali West, Mumbai	72.841347	19.223840	Healthy Food, American, Burger, Salad ...	Indian Rupees(Rs.)	Yes	No	No
3	18075122	The Fusion Kitchen	1	Mumbai	Shop 1, Opposite Veda Building, Near Bhavdevi ...	Borivali West	Borivali West, Mumbai	72.848923	19.254567	North Indian, Italian, Chinese, Mexican ...	Indian Rupees(Rs.)	Yes	Yes	No
4	18233317	145 Kala Ghoda	1	Mumbai	145, Kala Ghoda, Fort, Mumbai	Fort	Fort, Mumbai	72.832585	18.927584	Fast Food, Beverages, Desserts ...	Indian Rupees(Rs.)	No	No	No

5 rows x 21 columns

Figure 1: Importing and viewing data

The cleaning is done by eliminating unnecessary attributes and formatting the numerical data in a specific format as can be viewed in latitude and longitude values along with Aggregate Ratings.

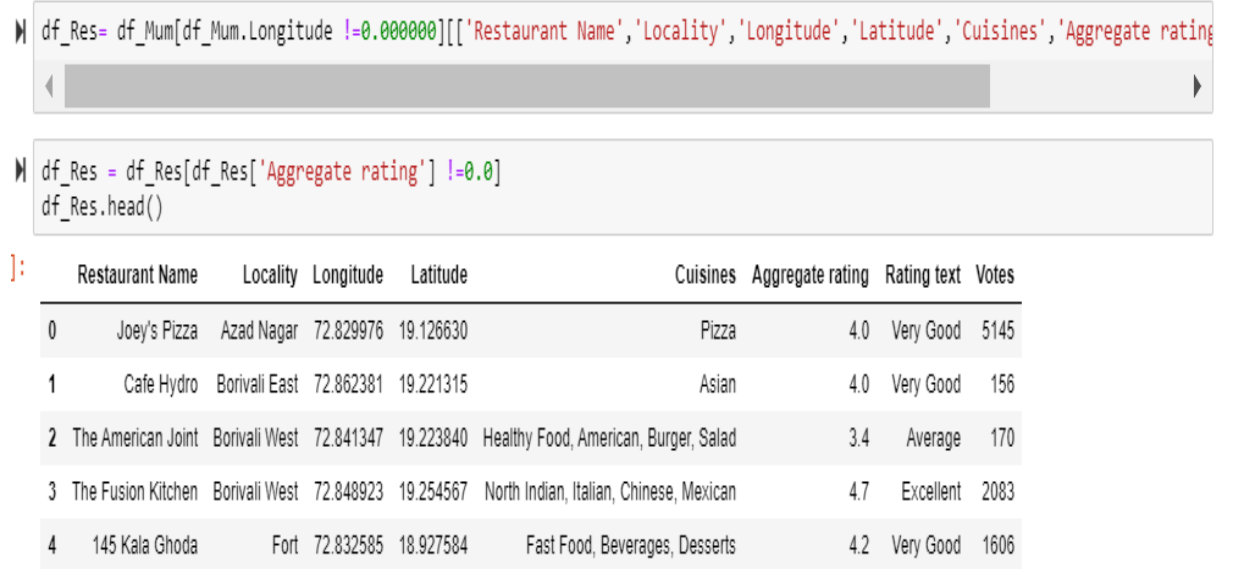
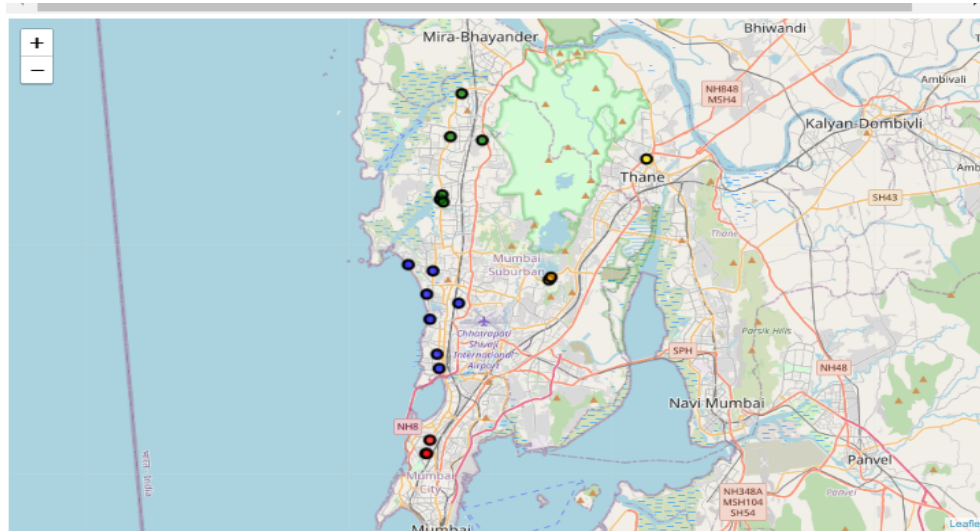


Figure 2: Cleaning data

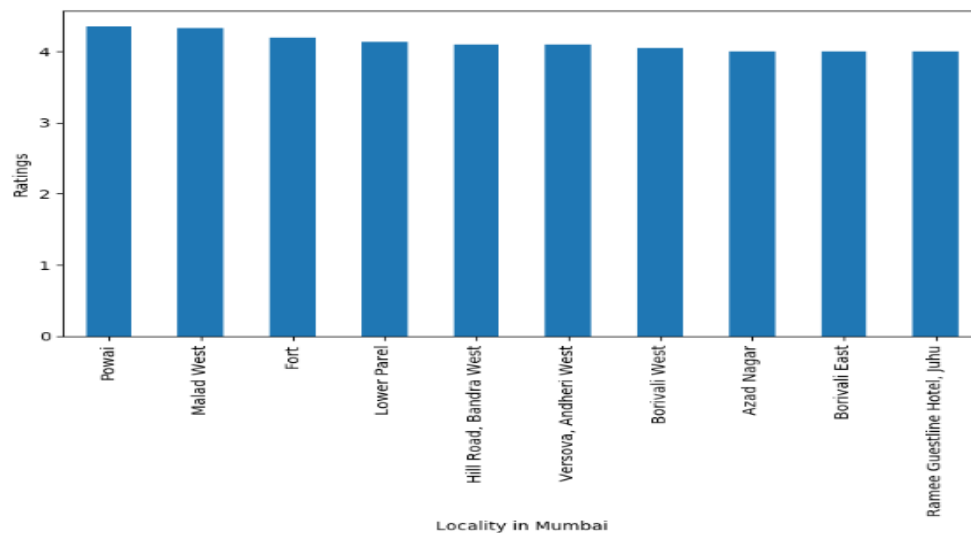
## 3 Methodology

### 3.1 Exploratory Data Analysis

Initially we will be viewing the clusters in Mumbai based on location of the restaurants.



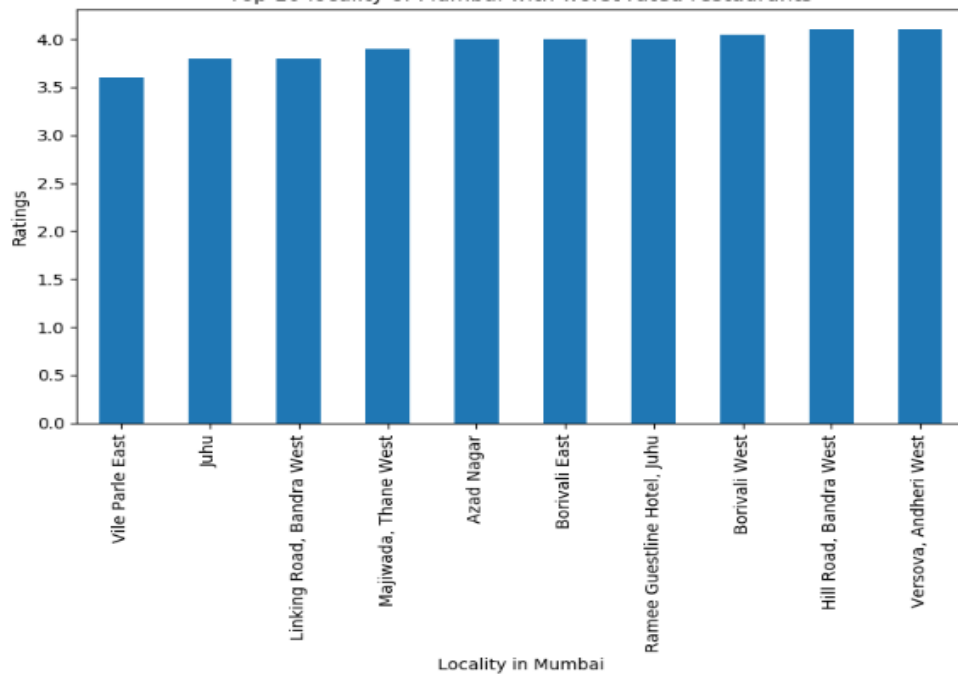
#### 3.1.1 Top 10 locality of Mumbai having highest rated restaurants



"Powai" and "Malad West" are the localities with most high-rated restaurants.

This was obtained by filtering restaurants based on the available ratings by users of Zomato API.

### 3.1.2 Top 10 locality of Mumbai with worst rated restaurants

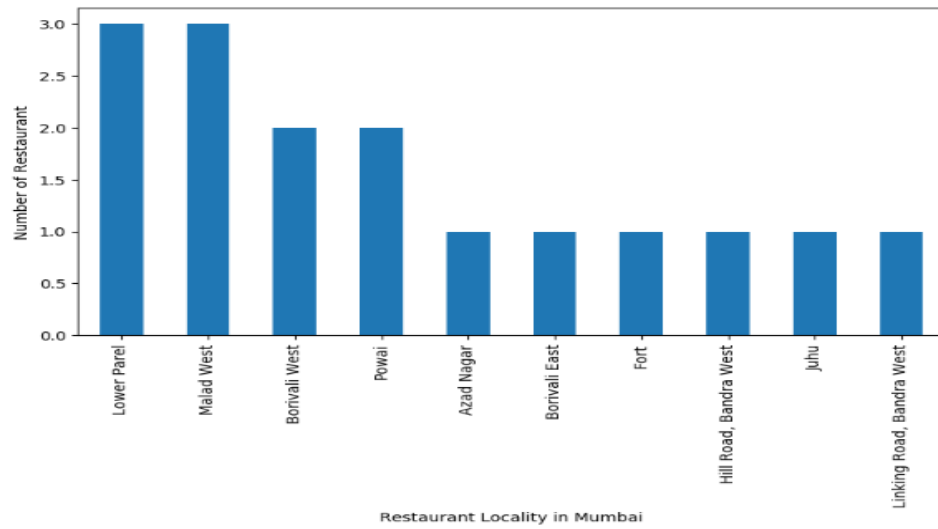


Worst-rated restaurants are located in "Vile Parle".

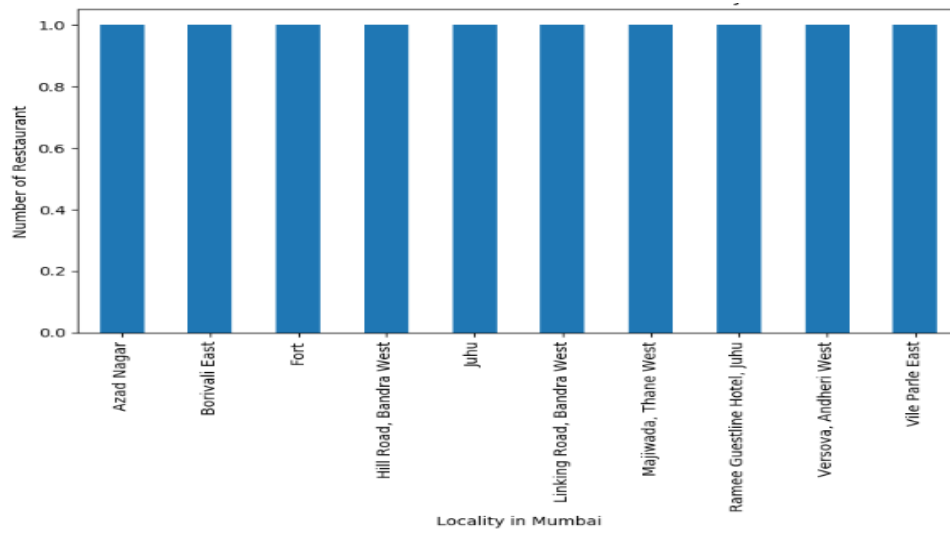
This was obtained by filtering restaurants based on the available ratings by users of Zomato API.

### 3.1.3 Highest number of Restaurant available in Locality of Mumbai

"Lower Parel" and "Malad West" are the topmost regions having highest number of restaurants.



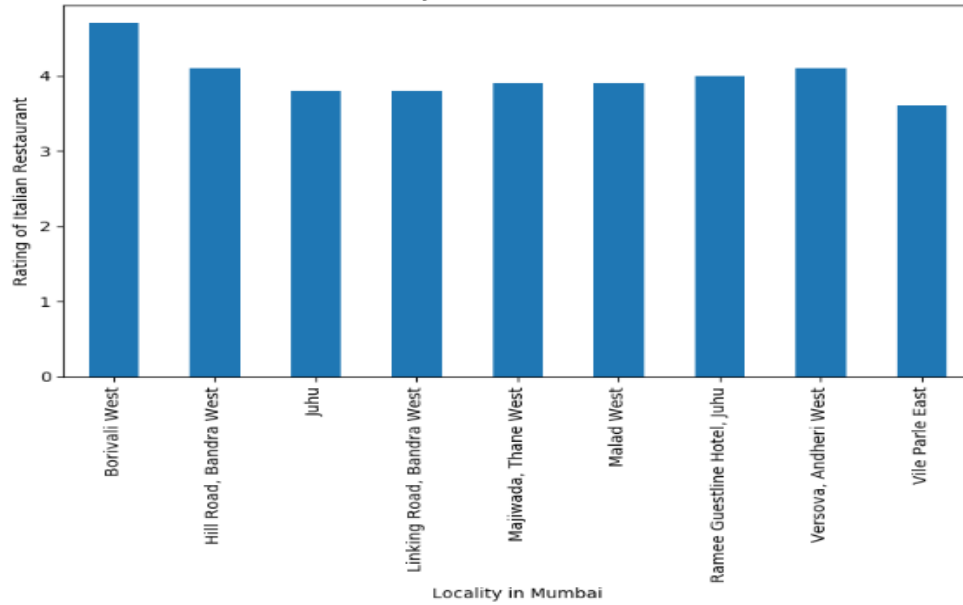
### 3.1.4 Lowest number of Restaurant available in Locality of Mumbai



”Azad Nagar” has the least number of restaurants

### 3.1.5 Locality for Italian restaurant in Mumbai

The Cuisine that is most prevalent in a lot of areas in Mumbai is "Italian". Finding best places for getting Italian cuisines with grouping based on locality.



	Restaurant Name	Locality	Longitude	Latitude	Cuisines	Aggregate rating	Rating text	Votes	Cluster
3	The Fusion Kitchen	Borivali West	72.848923	19.254567	North Indian, Italian, Chinese, Mexican	4.7	Excellent	2083	1
5	Tea Villa Cafe	Hill Road, Bandra West	72.833984	19.055831	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	4.1	Very Good	2040	2
6	Grandmama's Cafe	Juhu	72.827808	19.091458	Continental, Italian	3.8	Good	617	2
7	Mumbai Vibe	Linking Road, Bandra West	72.832858	19.085838	Cafe, Continental, North Indian, Italian, Chin...	3.8	Good	146	2
11	Tea Villa Cafe	Majiwada, Thane West	72.872281	19.207222	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	3.9	Good	317	3
14	The English Department Bar & Diner	Malad West	72.836721	19.178269	Italian, Continental, Mexican, Japanese, Ameri...	3.9	Good	885	1
17	R' ADDA	Ramee Guestline Hotel, Juhu	72.825451	19.109300	Street Food, Burger, Desserts, Italian, Pizza,...	4.0	Very Good	536	2
18	Tea Villa Cafe	Versova, Andheri West	72.813074	19.131141	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	4.1	Very Good	1286	2
19	Tea Villa Cafe	Vile Parle East	72.848749	19.103249	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	3.6	Good	1515	2



”Borivali West” has the best rated Italian restaurant in Mumbai named ”The Fusion Kitchen”

### 3.2 Data Transformation

Grouping was performed, the values were cleaned and only the attributes that are necessary for performing operation was obtained. This can be viewed as a grouped list of location areas as shown below appended by their latitude and longitude configuration to obtain specific location. The next step involved

	Locality	Lat	Lng	No_of_Restaurant	Cusines	Agg_Rating	Comments	No_of_Votes
0	Azad Nagar	19.126630	72.829976	1	Pizza	4.000000	Very Good	5145
1	Borivali East	19.221315	72.862381	1	Asian	4.000000	Very Good	156
2	Borivali West	19.239203	72.846135	2	Healthy Food, American, Burger, Salad, North I...	4.060000	Average, Excellent	2253
3	Fort	18.927584	72.832585	1	Fast Food, Beverages, Desserts	4.200000	Very Good	1806
4	Hill Road, Bandra West	19.055831	72.833984	1	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	4.100000	Very Good	2040
5	Juhu	19.091458	72.827808	1	Continental, Italian	3.800000	Good	617
6	Linking Road, Bandra West	19.065838	72.832658	1	Cafe, Continental, North Indian, Italian, Chin...	3.800000	Good	146
7	Lower Parel	18.997268	72.826135	3	Bakery, Desserts, Cafe, Modern Indian, North I...	4.133333	Good, Very Good	6686
8	Majiwada, Thane West	19.207222	72.972281	1	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	3.900000	Good	317
9	Malad West	19.178630	72.835876	3	Pizza, American, Burger, Fast Food, Italian, C...	4.333333	Excellent, Good	3960
10	Powai	19.121041	72.907939	2	North Indian, South Indian, Mughlai, North Ind...	4.360000	Excellent, Good	3425
11	Ramee Guestline Hotel, Juhu	19.109300	72.825451	1	Street Food, Burger, Desserts, Italian, Pizza,...	4.000000	Very Good	536
12	Versova, Andheri West	19.131141	72.813074	1	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	4.100000	Very Good	1295
13	Vile Parle East	19.103249	72.846749	1	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	3.800000	Good	1515

obtaining a list of all possible location regions in Mumbai. These were obtained as:

1. Azad Nagar
2. Borivali East
3. Borivali West
4. Fort
5. Hill Road, Bandra West
6. Juhu

7. Linking Road, Bandra West
8. Lower Parel
9. Majiwada, Thane West
10. Malad West
11. Powai
12. Ramee Guestline Hotel, Juhu
13. Versova, Andheri West
14. Vile Parle East

The areas were analyzed using Foursquare API to obtain the categories of venues available in each region. In this process we obtained 113 unique categories.

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Azad Nagar	Women's Store	Bakery	Indian Restaurant	Liquor Store	Clothing Store	Pizza Place	Residential Building (Apartment / Condo)	Gym / Fitness Center	BBQ Joint	Food Truck
1	Borivali East	Indian Restaurant	Bike Rental / Bike Share	Café	Department Store	Shopping Mall	Auto Dealership	Bus Station	Garden Center	Fast Food Restaurant	Electronics Store
2	Borivali West	Café	Restaurant	Park	Lounge	Dessert Shop	Italian Restaurant	Snack Place	Donut Shop	Electronics Store	Dumpling Restaurant
3	Fort	Café	Bar	Indian Restaurant	Breakfast Spot	Nightclub	Pub	Pizza Place	Chinese Restaurant	New American Restaurant	Coffee Shop
4	Hill Road, Bandra West	Indian Restaurant	Café	Chinese Restaurant	Snack Place	Coffee Shop	Gourmet Shop	Women's Store	Seafood Restaurant	Pizza Place	Pub
5	Juhu	Hotel	Indian Restaurant	Italian Restaurant	Clothing Store	Bistro	Gym	Diner	Dessert Shop	Cosmetics Shop	Nightclub
6	Linking Road, Bandra West	Indian Restaurant	Bar	Dessert Shop	Seafood Restaurant	Arcade	Asian Restaurant	Lounge	Ice Cream Shop	Cupcake Shop	Deli / Bodega
7	Lower Parel	Indian Restaurant	Clothing Store	Café	Shopping Mall	Restaurant	Mediterranean Restaurant	Pizza Place	Asian Restaurant	Italian Restaurant	Chinese Restaurant
8	Majiwada, Thane West	Indian Restaurant	Clothing Store	Italian Restaurant	Fast Food Restaurant	Ice Cream Shop	Pub	Pizza Place	Brewery	Bus Station	Cheese Shop
9	Malad West	Coffee Shop	Fast Food Restaurant	Café	Lounge	Italian Restaurant	Pizza Place	Restaurant	Dumpling Restaurant	Juice Bar	Outdoors & Recreation
10	Powai	Indian Restaurant	Café	Bar	Chinese Restaurant	Italian Restaurant	Fast Food Restaurant	Mobile Phone Shop	Pizza Place	Park	North Indian Restaurant
11	Ramee Guestline Hotel, Juhu	Chinese Restaurant	Indian Restaurant	Café	Hotel	Bar	Coffee Shop	Cocktail Bar	Asian Restaurant	Lounge	Donut Shop
12	Versova, Andheri West	Café	Ice Cream Shop	Beach	Coffee Shop	Diner	Pizza Place	Recreation Center	Film Studio	Seafood Restaurant	Frozen Yogurt Shop
13	Vile Parle East	Tea Room	Coffee Shop	Chinese Restaurant	Maharashtrian Restaurant	Fast Food Restaurant	Juice Bar	Snack Place	Diner	Martial Arts Dojo	Market

### 3.3 Algorithm Deployed: CLUSTERING

Clustering is the task of dividing the population or data points into a number of groups such that data points in the same groups are more similar to other data points in the same group and dissimilar to the data points in other groups.

#### 3.3.1 Clustering based on Latitude and Longitude

In many situations we want to split the data set into groups and do something with those groups.

Formally, by “group by” we are referring to a process involving one or more of the following steps:

- Splitting the data into groups based on some criteria.
- Applying a function to each group independently.
- Combining the results into a data structure, usually into DataFrame, or column which is Series.

Out of these, the split step is the most straightforward, usually we split by the different values of some feature. In the apply step, we might wish to one of the following:

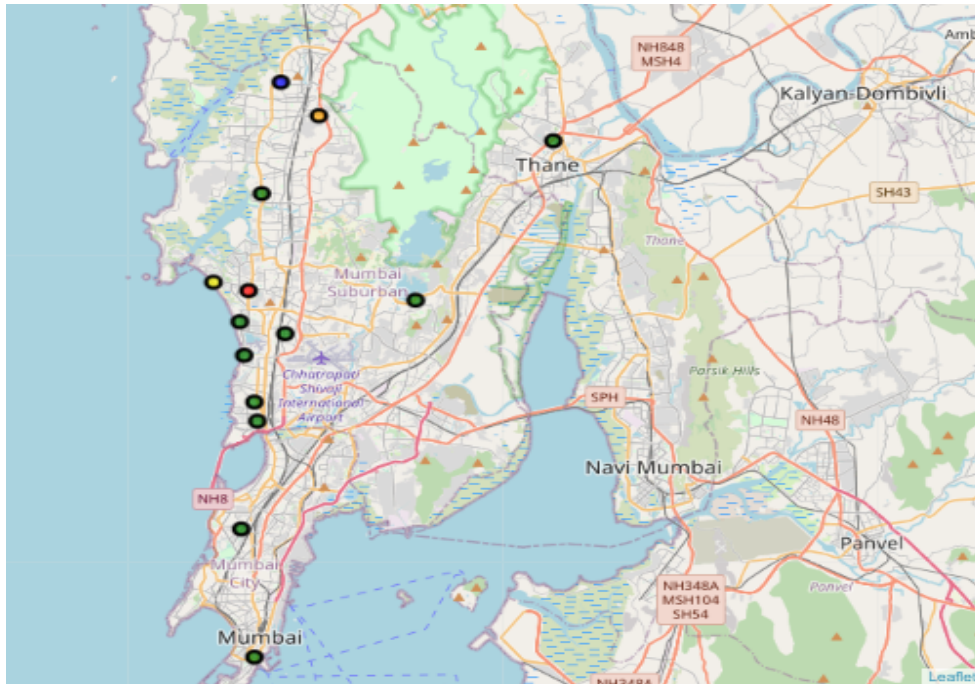
- Aggregation functions like sum or count, statistical functions like mean or std and custom functions.
- Transformation: perform some group-specific computations and return a “list” of values — like-indexed object. For example to Filling Nan’s within specific value to each group.
- Filtration discard some groups. For example, discard groups with only a few members. Filter outliers based on the group sum or mean.

#### 3.3.2 K-Means Algorithm

Kmeans algorithm is an iterative algorithm that tries to partition the dataset into Kpre-defined distinct non-overlapping subgroups (clusters) where each data point belongs to only one group. It tries to make the intra-cluster data points as similar as possible while also keeping the clusters as different (far) as possible. It assigns data points to a cluster such that the sum of the squared distance between the data points and the cluster’s centroid (arithmetic mean of all the data points that belong to that cluster) is at the minimum. The less variation we have within clusters, the more homogeneous (similar) the data points are within the same cluster.

K-Means was applied to obtain locations in 5 clusters. This can be viewed as:

	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 Common Venue
0	Azad Nagar	19.128630	72.829876	1	Pizza	4.00	Very Good	5145	0	Women's Store	Bakery	Indian Restaurant	L
1	Borivali East	19.221315	72.862381	1	Asian	4.00	Very Good	156	4	Indian Restaurant	Bike Rental / Bike Share	Café	Depart
2	Borivali West	19.239203	72.845135	2	Healthy Food, American, Burger, Salad, North I...	4.05	Average, Excellent	2253	2	Café	Restaurant	Park	Lo
3	Fort	18.927584	72.832585	1	Fast Food, Beverages, Desserts	4.20	Very Good	1606	1	Café	Bar	Indian Restaurant	Brea
4	Hill Road, Bandra West	19.055831	72.833884	1	Cafe, Italian, Desserts, Fast Food, Chinese, Tea	4.10	Very Good	2040	1	Indian Restaurant	Café	Chinese Restaurant	S



## 4 Results

The performed clustering led to the creation of following 5 clusters based on similarity along with their associated latitude longitude value determining location. This can be seen in the above map

1. Cluster 1 marked in Blue, is best suited for Indian restaurants
2. Cluster 2 marked in Orange, is best suited for Tea rooms
3. Cluster 3 marked in Green, is best suited for Cafes
4. Cluster 4 marked in Red, is best suited for Cafes
5. Cluster 5 marked in Yellow, is best suited for Chinese restaurants

## 5 Discussions

Considering the times of harmful virus taking over the world, the Zomato ensures restaurant listing on its API is of the highest hygiene standard as issued by the WHO. This is being cheked upon on the following factors:

- Sanitized kitchen as per WHO advisory
- Daily Temperature checks
- Provide hand wash stations for riders
- Grading santitation levels as Poor, Good and Excellent

Keeping this in mind and viewing the feature of online delivery and availability, the data clearly shows what all restaurants are available in a given locality in Mumbai and what is the type of cuisine being served by them. this, thus allows a comprehensive check on food availability for all the people even during lockdown based on their respective cuisine filtration.

## 6 Conclusion

This project evaluates the restaurant availability in Mumbai. As can be seen, the culture of Cafes is pretty evident in most regions of the city. This analysis of cuisine availability based on location helps a viewer filter data and find desired cuisine food in their own locality. This will ensure the safety of users and provide delivery.

This project can be extended to include the large frontline warriors including the doctors, police officers,etc. to be provided food by home cooks and ensure no one sleeps hungry in this fast-paced city thus helping fight this virus standing united as one.