

# **Exploring Venues in Bengaluru, India**

## **using Foursquare and Zomato API**

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May 30, 2020

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## 1. Introduction

### Background

Whenever a person explores a new city, they would be highly interested in the best the city has to offer. The first thing they might search for in a new city is a good place for food. They might want to know how good a restaurant is, the price range it falls under and where it is located. This information will help them choose a restaurant of their liking among many other places in the city. Combining the location, rating and price information would help anyone in the city make better decision about the place they choose.

Bengaluru (also called Bangalore) is the capital of India's southern Karnataka state. The center of India's high-tech industry, the city is also known for its parks and nightlife. There are a lot of places to can be explored. In this project we try to explore different venues in Bengaluru and attributes the data based on average price and user ratings. Foursquare API and Zomato API are used to fetch complete information which include name, address, category, ratings and price, of various venues. A map of the venues is also provided with different color attributes plotted to highlight their position and information about them.

### Stakeholders

Mainly, any person visting the city would be interested to have the details and plots of the local landscape and choose a place that suits them. It would also help the people in the city to have the details of this analysis and a company could use this information to create a website or mobile application, which is updated regularly, and let its users explore different options available for them.

## 2. Data acquisition and processing

Using Foursquare explore API (<https://developer.foursquare.com/>) which gives venue recommendations, we fetch venues in a 4km range from the center of Bengaluru and get their names, which category they fall under and their locations (latitude and longitude).

Using the name and location, we use Zomato API (<https://developers.zomato.com/api>) to fetch details like 'Name', 'Address', 'Ratings', 'Price Range', 'Latitude', 'Longitude' for the respective venues.

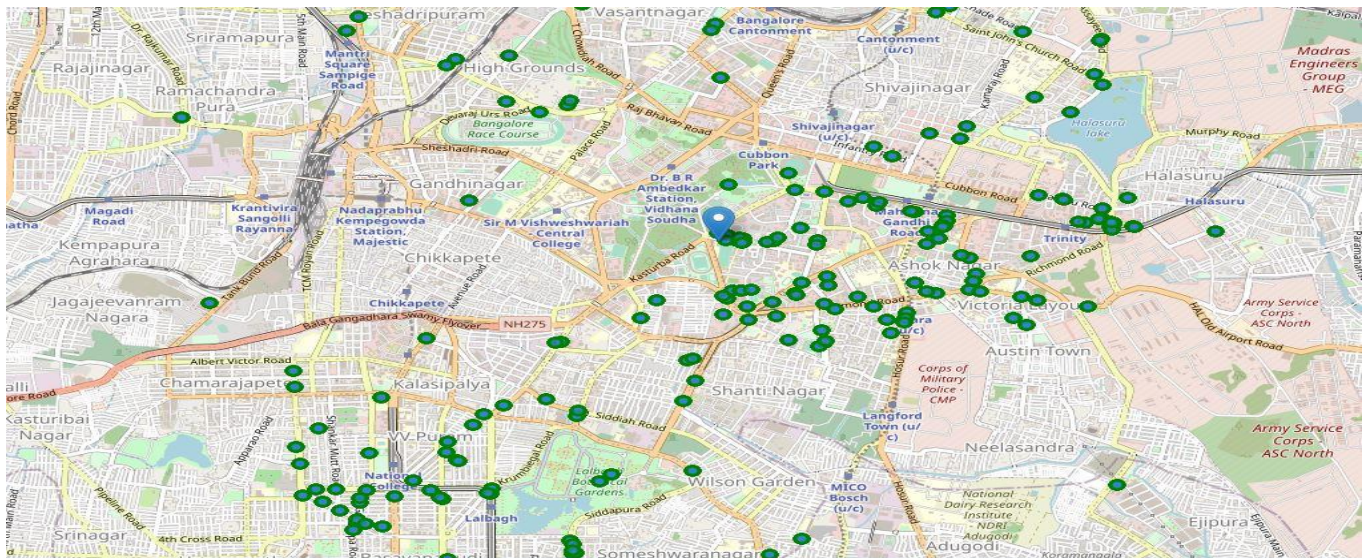


Fig 1: Map showing different venues in Bengaluru generated by Foursquare API

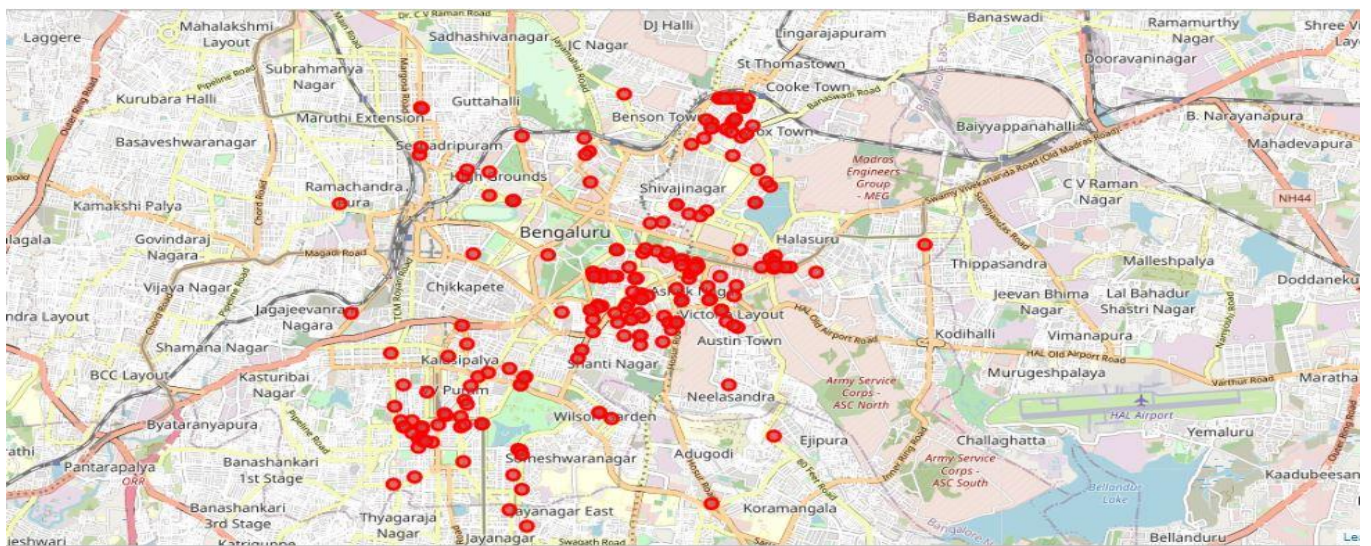


Fig 2: Map showing venues in Bengaluru generated by Zomato API

Using both Foursquare and Zomato API's, the data of venues is obtained. The dataset from two API's will be combined based on venue names, category and latitude and longitude values. To combine the two datasets, we check if the corresponding latitude and longitude values match. We drop the all the corresponding venues that have latitude and longitude differences more than 0.0004 from both the API's. After dropping the venues with 0 rating we are left with 139 venues in a 4km range from the center of the Bengaluru city. The final data frame will include the venue name, category, complete address, rating, price range and average price per person, latitude and longitude values. The first five rows of the resultant data are shown below:

(Note: Venue represents name of the venue, category represents the type of venue and average price represents the average cost for 1 person)

	categories	venue	latitude	longitude	price_range	rating	address	average_price
0	Hotel	Merak-JW Marriott Hotel	12.9724	77.5951	3.0	3.8	JW Marriott, 24/1, Vittal Mallya Road, Lavelle...	600.0
1	Shopping Mall	Shiro	12.9718	77.5959	4.0	4.4	2nd Floor, UB City Mall, Vittal Mallya Road, L...	1500.0
2	Italian Restaurant	Toscana	12.9719	77.5964	4.0	4.4	2nd Floor, UB City, Vittal Mallya Road, Lavelle...	1200.0
3	Deli / Bodega	Smoke House Deli	12.9717	77.5983	3.0	4.5	52/ 53, Ground Floor, Lavelle Road, Bangalore	800.0
4	Japanese Restaurant	Shiro	12.9718	77.5959	4.0	4.4	2nd Floor, UB City Mall, Vittal Mallya Road, L...	1500.0

*Fig 3: First 5 elements of final aggregated data from both API's*

### 3. Methodology and Exploratory Data Analysis

In this section we will perform data analysis on the resultant data frame and analyze the types of restaurants in Bengaluru and plot them on a map. This will help us understand features, like ratings, price range and average price of various venues in a location. The plots will be color coded, so a simple glance at them would reveal the location of the venues and give us the information we need about different attributes of a venue. We aim to identify places which can be recommended to visitors based on their price and rating preferences. We will also cluster the venues based on categories.

We start by looking at the various categories of venues and how many venues belong to each category.



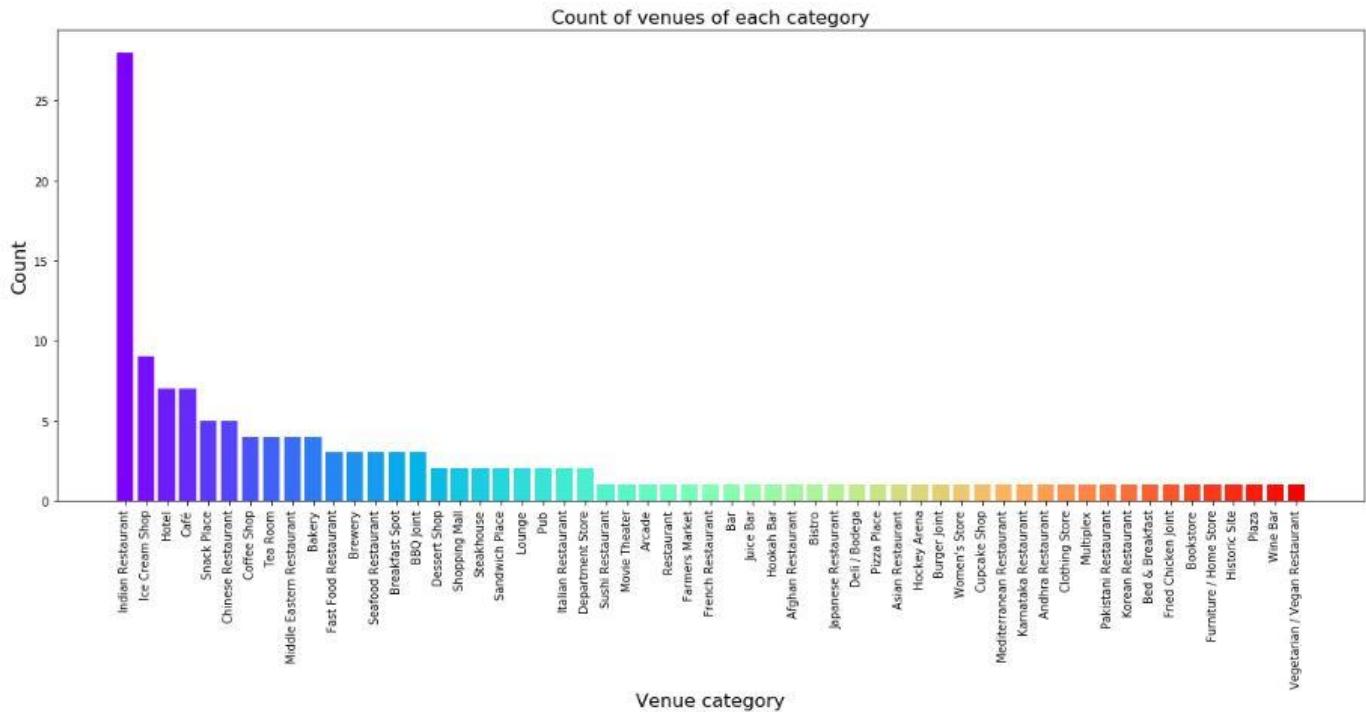


Fig 4: Plot showing different types of venues and number of venues in Bengaluru city within a 4km radius from the center.

The top 5 categories and their respective counts are

- Indian Restaurant      28
- Ice Cream Shop        9
- Café                      7
- Hotel                     7
- Snack Place            5

Next we plot a bar chart to explore the ratings of the venues. This is done by plotting ratings range from 0 to 5 against the number of venues falling into that range.

Then we plot this information of venues and their ratings on the map of Bengaluru. The venues were marked red, orange, green and dark green for ratings range of 1-2, 2-3, 3-4 and 4-5 respectively.

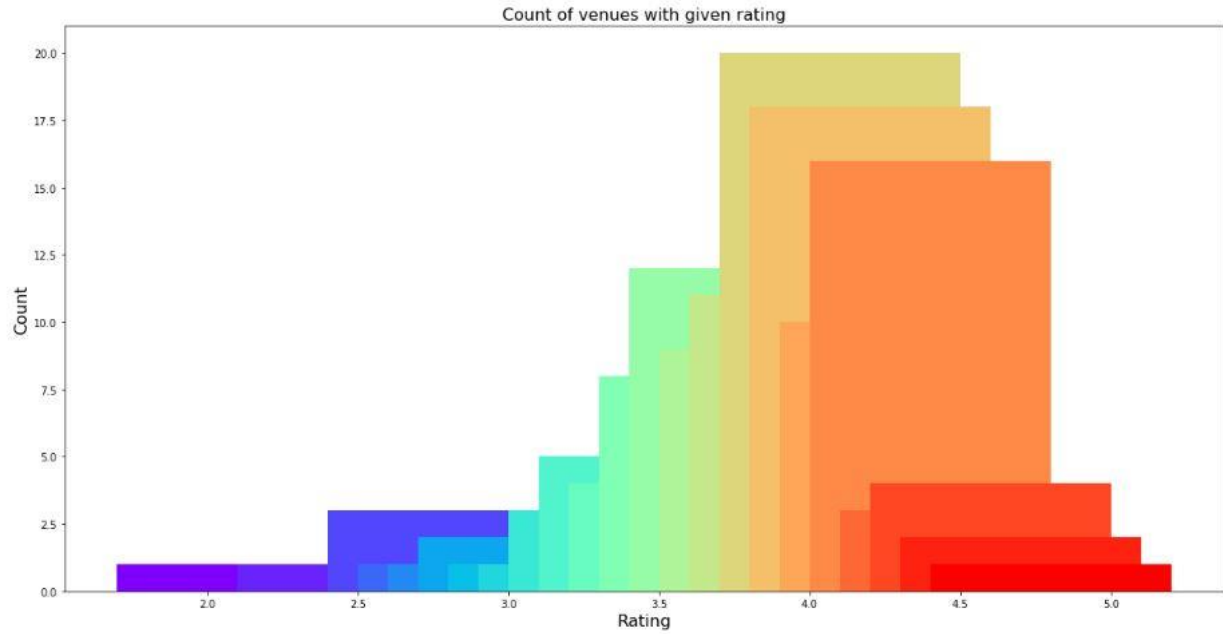


Fig 5: Plot showing rating and number of venues with that rating.

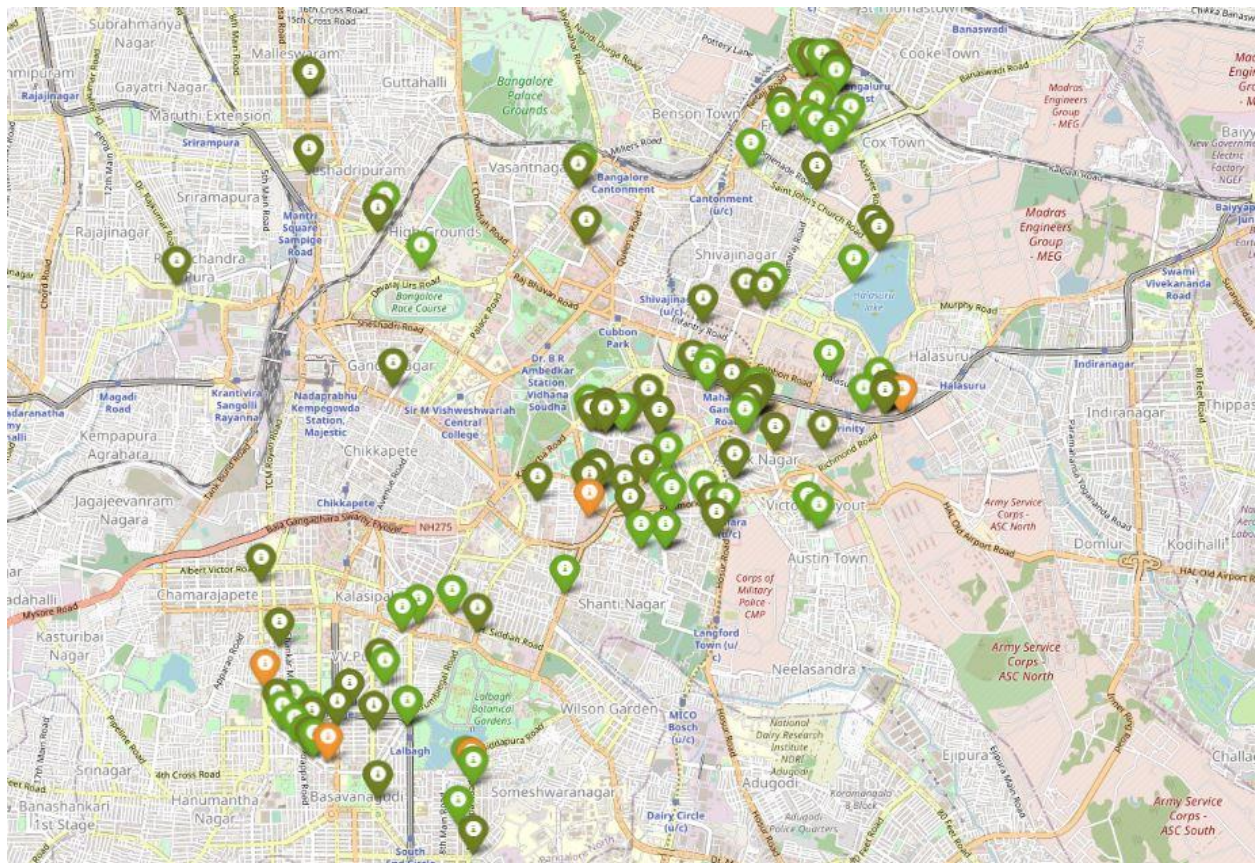


Fig 6: Map showing venues with different ratings within a 4km radius from center of Bengaluru.



Next we explore the average prices across all venues for one person using a scatter plot with number of venues plotted against the average price per person.

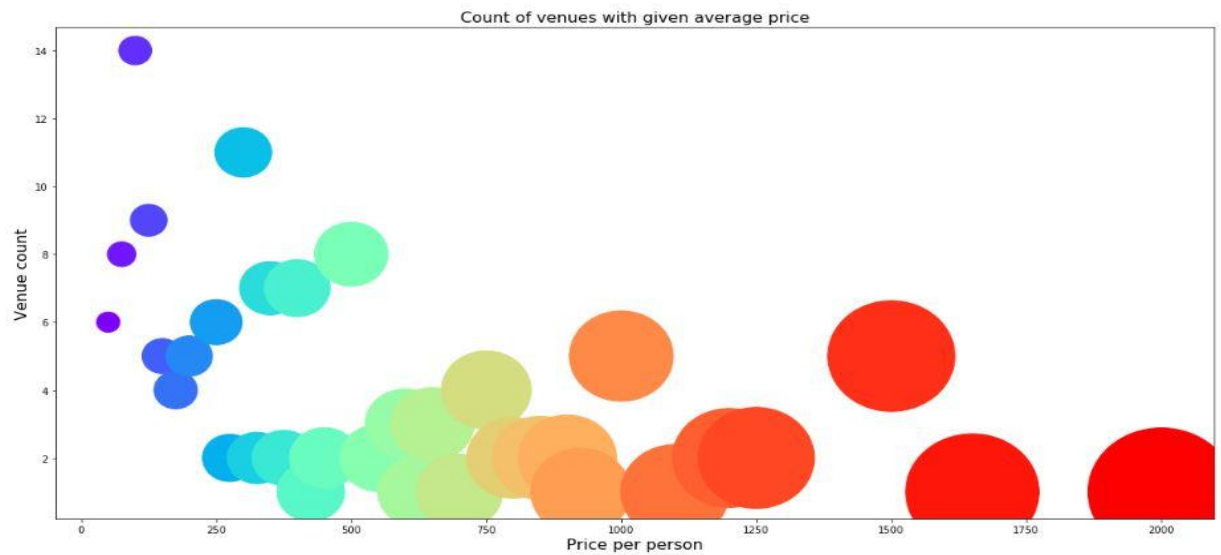


Fig 7: Plot showing average price per person and number of venues with that price.

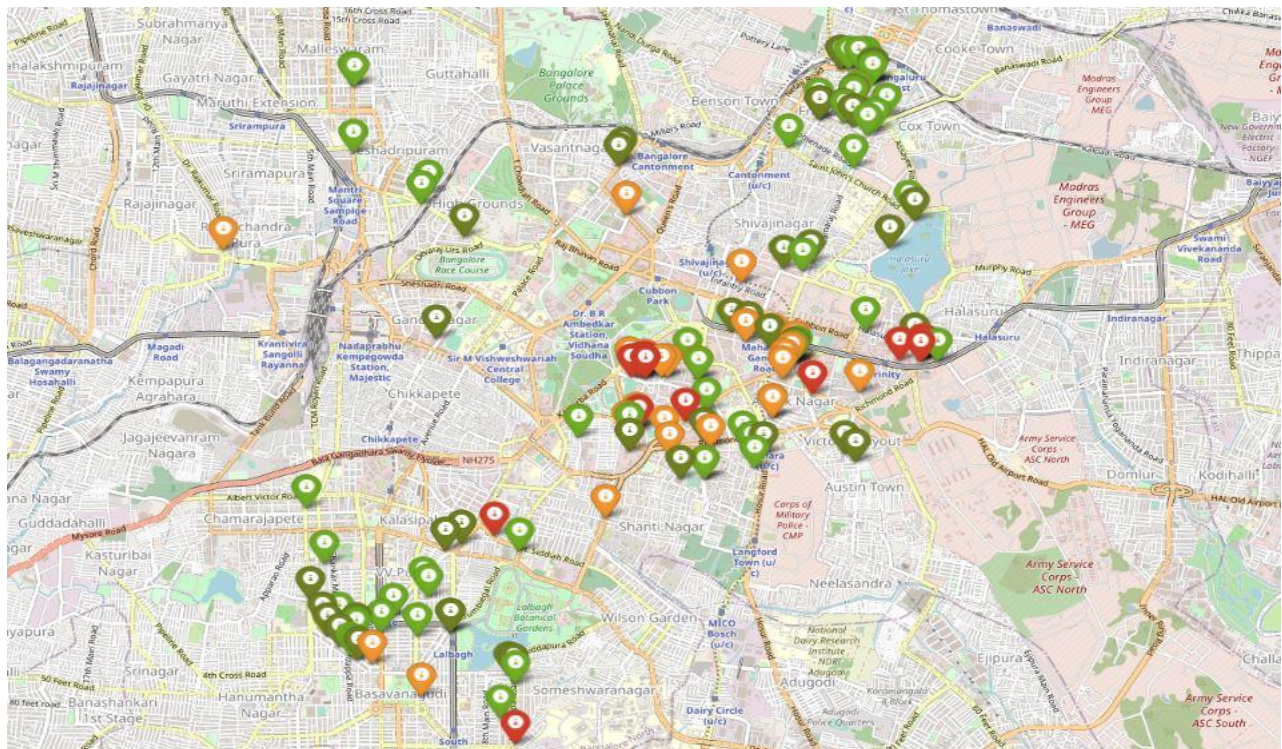


Fig 8: Map showing venues with average price per person color coded red being the highest and green being lowest, within 4km radius from center of Bengaluru.

## 4. Predictive Modeling

In this section, we will perform predictive modeling of the data by using K-means clustering.

This clustering technique partitions the data into K distinct non-overlapping clusters such that intra cluster data samples will be as similar as possible while keeping the clusters as dissimilar as possible. It assigns data points to a cluster such that the sum of the squared distance between the data samples and the cluster's centroid (arithmetic mean of all the data samples that belong to that cluster) is at the minimum. The less variation we have within clusters, the more homogeneous (similar) the data samples are within the same cluster.

In our problem clustering helps in dividing venues into 3 different clusters so that the venues of a given cluster will have similarity in their price range, location and ratings as well as dissimilarity with respect to venues in different clusters. After clustering the data frame with cluster labels assigned to the will be as shown below:

cluster_labels		categories		venue	latitude	longitude	price_range	rating		address	average_price	rating_bin
0	2	Hotel		Merak-JW Marriott Hotel	12.9724	77.5951	3.0	3.8		JW Marriott, 24/1, Vittal Maliya Road, Lavelle...	600.0	Good
1	1	Shopping Mall		Shiro	12.9718	77.5959	4.0	4.4		2nd Floor, UB City Mall, Vittal Maliya Road, L...	1500.0	Very good
2	1	Italian Restaurant		Toscano	12.9719	77.5964	4.0	4.4		2nd Floor, UB City, Vittal Maliya Road, Lavelle...	1200.0	Very good
3	2	Deli / Bodega		Smoke House Deli	12.9717	77.5983	3.0	4.5		52/ 53, Ground Floor, Lavelle Road, Bangalore	800.0	Very good
4	1	Japanese Restaurant		Shiro	12.9718	77.5959	4.0	4.4		2nd Floor, UB City Mall, Vittal Maliya Road, L...	1500.0	Very good
5	2	French Restaurant		Cafe Noir	12.9721	77.5964	3.0	4.2		2nd Floor, UB City, Vittal Maliya Road, Lavelle...	750.0	Very good
6	1	Lounge		Skyye	12.9716	77.5964	4.0	4.2		Uber Level, 16th Floor, UB City, Vittal Maliya...	1250.0	Very good
7	1	Cupcake Shop		Skyye	12.9716	77.5964	4.0	4.2		Uber Level, 16th Floor, UB City, Vittal Maliya...	1250.0	Very good
8	2	Sushi Restaurant		Harima	12.9675	77.5999	4.0	4.3		131, 4th Floor, Devatha Plaza, Residency Road,...	1000.0	Very good
9	2	Burger Joint		Mainland China	12.9715	77.6009	3.0	4.4		15/16, Ground Floor, House of Lords, St. Marks...	850.0	Very good
10	0	Ice Cream Shop		Corner House Ice Cream	12.9732	77.6000	1.0	4.4		4, Madras Bank Road, Lavelle Road, Bangalore	175.0	Very good
11	2	Hotel		Fabelle Chocolate Boutique - ITC Gardenia	12.9671	77.5957	3.0	4.4		ITC Gardenia, 1, Ashok Nagar, Residency Road, ...	625.0	Very good

*Fig 9: First 12 rows of the data frame that contains venues, price range, rating and location after clustering with cluster labels.*



## 5. Result and Discussions

### 5.1 Results

Using the K means clustering with  $k=3$ , we partitioned the venues into 3 clusters as shown in the below figure. Each dot representing a venue and similar color dots represents a cluster.

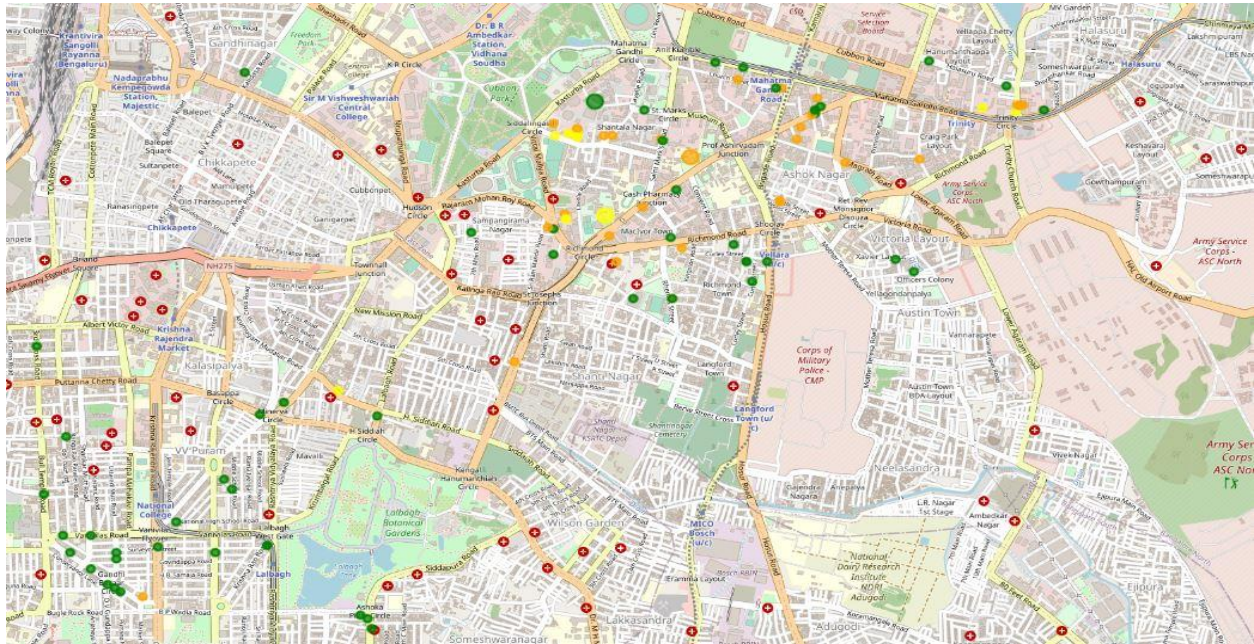


Fig 10: Map showing different Clusters of venues within 4km radius from center of Bengaluru.

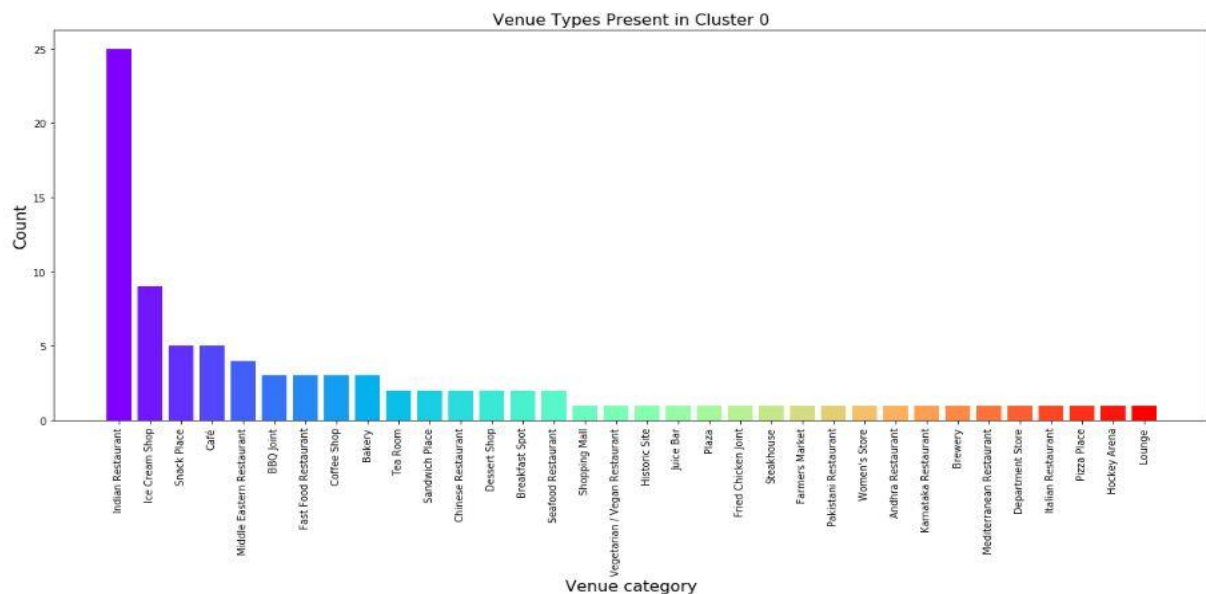


Fig 11: Plot showing venue category vs number of venues in Cluster 0.



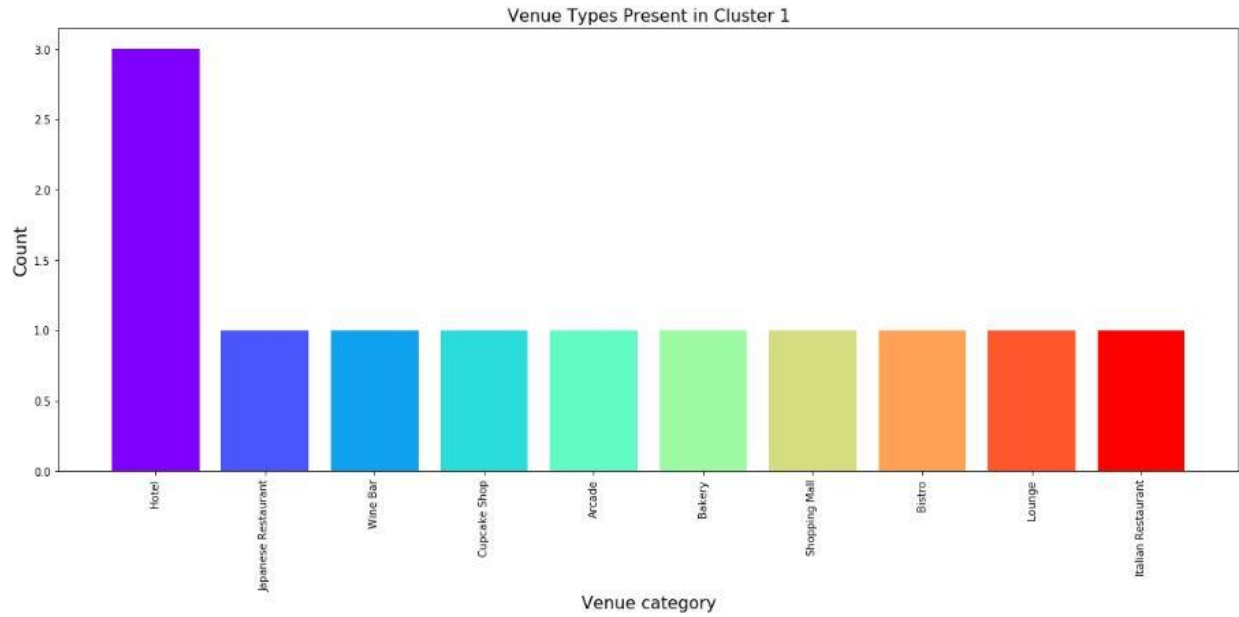


Fig 12: Plot showing venue category vs number of venues in Cluster 1.

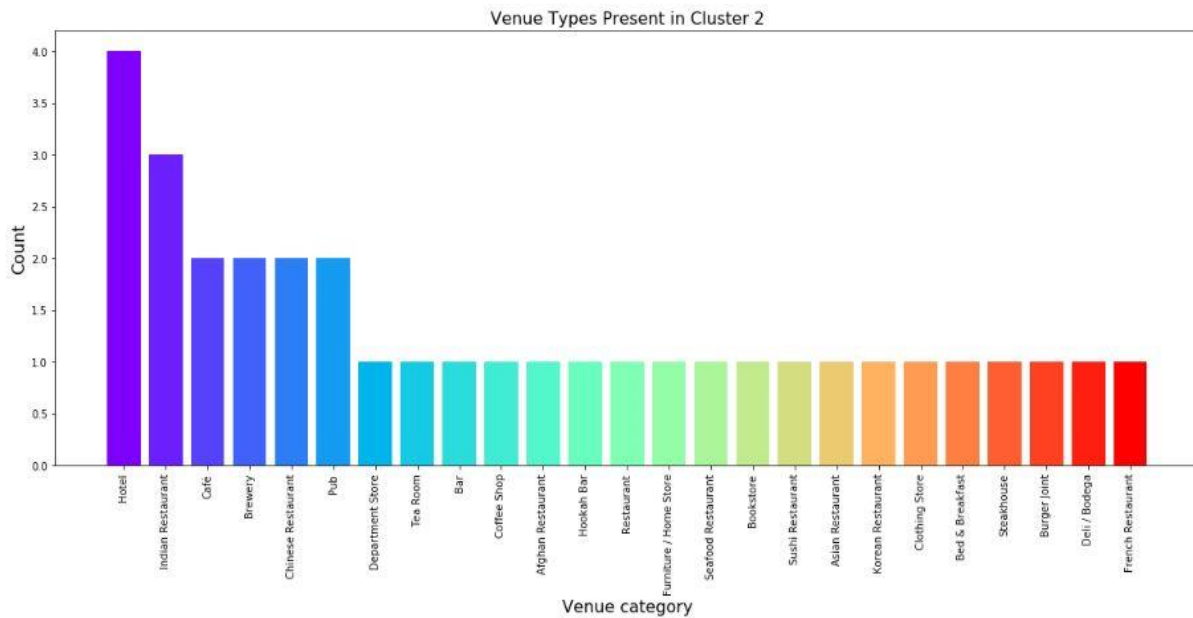


Fig 11: Plot showing venue category vs number of venues in Cluster 2.

The venues for cluster 0 have mean price range of 1.44 and rating spread around 3.84

The venues for cluster 1 have mean price range of 4.00 and rating spread around 4.19

The venues for cluster 2 have mean price range of 3.15 and rating spread around 4.11

## 6. Conclusion

In this project we explored different venues and predicted most dominant types of venues within 4km radius from the center of Bengaluru city. Using Foursquare API and Zomato API we obtained location data for different types of venues, their types, ratings and average price.

The venues have been partitioned into 3 different clusters based on their price range and ratings using K means clustering algorithm and have been on a map. This analysis can be helpful for any person trying to find a suitable place for them when visiting the city. Any organization can use this information and build a website or mobile application and provide its users with updated information about various venues in the city based on the search criteria (name, price, ratings) of its users.