

Applied Data Science Capstone Project
on
**“Exploring venues in Aurangabad, Maharashtra, India
Using Foursquare and Zomato API”**

For the Certification of
IBM Data Science Professional Certificate
(Offered by Courseera)

By
SURESH LAXMAN USHALWAR



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Maharashtra state, India

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1. Introduction

1.1 Background

Whenever a person searches for a venue in a new city, they're highly interested in the best places that the city has to offer. The person might want to know how good a given restaurant is or the price range it falls under. This extra information would help decide which venue to choose amongst the many venues in the city. Combining the location of the venues in the city with their price and rating information would surely help visitors in a city make better informed decisions about the places they should visit.

Aurangabad is a city in Maharashtra state, in India. It's known for the 17th-century marble Bibi ka Mukbara shrine, styled on the Taj Mahal. The nearby Shivaji Maharaj Museum, dedicated to the Maratha king Shivaji, displays war weapons and a coin collection. North of the city, the Aurangabad Caves comprise ancient, rock-cut Buddhist shrines. West of the city, battlements surround the medieval Daulatabad Fort. There are many venues (especially restaurants, hotels and cafes) which can be explored. This project explores various venues in Aurangabad and attributes the data based on user ratings and average price. To explore this information, this project involves the juxtaposition of both the Foursquare API and the Zomato API to fetch complete information of various venues (including name, address, category, rating, and price). Further, a map of the venues with specific color attributes will be plotted to highlight their position, and information about these venues. Such plots imbibe bountiful information in the form of their colored representations and location on the map. This enables any visitor to take a quick glance and decide what place to visit.

1.2 Interested audience

The target audience for such a project is twofold. Firstly, any person who is visiting Aurangabad, India can use the plots and maps from this project to quickly select places that suit their budget and rating preferences. Secondly, a company can use this information to create a website or a mobile application, which is updated on a regular basis, to allow individuals to the city or even expand same functionality to other places.

2. Data

2.1 Data Sources

To get location and other information about various venues in Aurangabad, I used two APIs and decided to combine the data from both of them together.

Using the Four square's exploring API (which gives venues recommendations), I fetched venues up to a range of 10 kilometers from the center of Aurangabad and collected their names, categories and locations (latitude and longitude).

Using the name, latitude and longitude values, I used the Zomato search API to fetch venues from its database. This API allows to find venues based on search criteria (usually the name), latitude and longitude values and more. Given that the data from the two APIs did not align completely, I had to use data cleaning to combine the two datasets properly.

From Foursquare API (<https://developers.zomato.com/api>), I retrieved the following for each venue:

- **Name:** The name of the venue.
- **Category:** The category type as defined by the API.
- **Latitude:** The latitude value of the venue.
- **Longitude:** The longitude value of the venue.

From Zomato API(<https://developers.zomato.com/api>), I retrieved the following for each venue:

- **Name:** The name of the venue.
- **Address:** The complete address of the venue.
- **Rating:** The ratings as provided by many users.
- **Price range:** The price range the venue belongs to as defined by Zomato.
- **Price for two:** The average cost for two people dining at the place. I later convert the same to average price per person by dividing by 2.
- **Latitude:** The latitude value of the venue.
- **Longitude:** The longitude value of the venue.

2.2 Data Cleaning

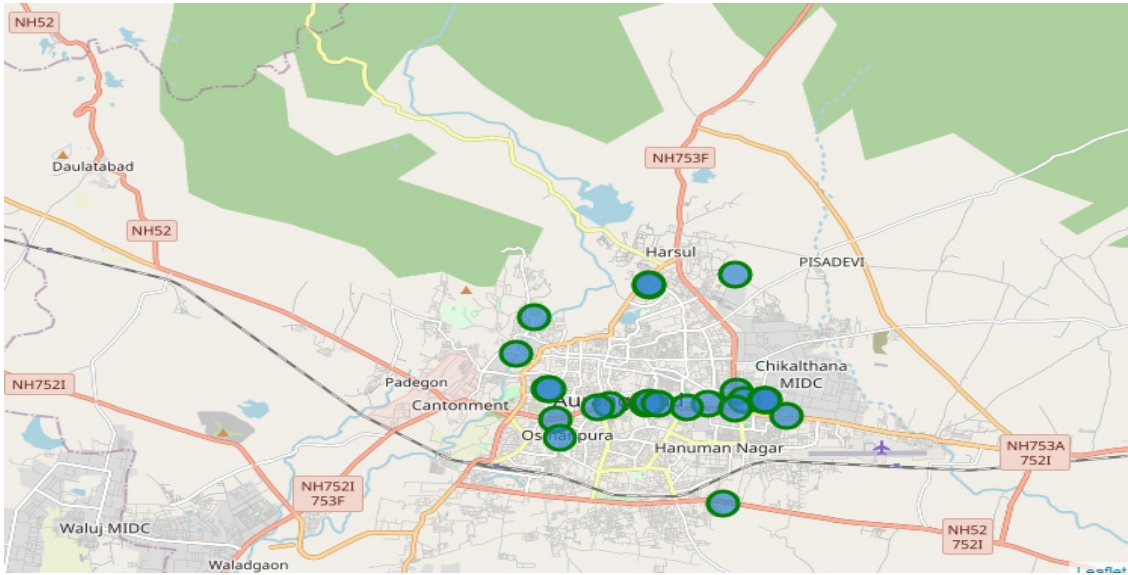


Figure 1: Venues retrieved from Foursquare API

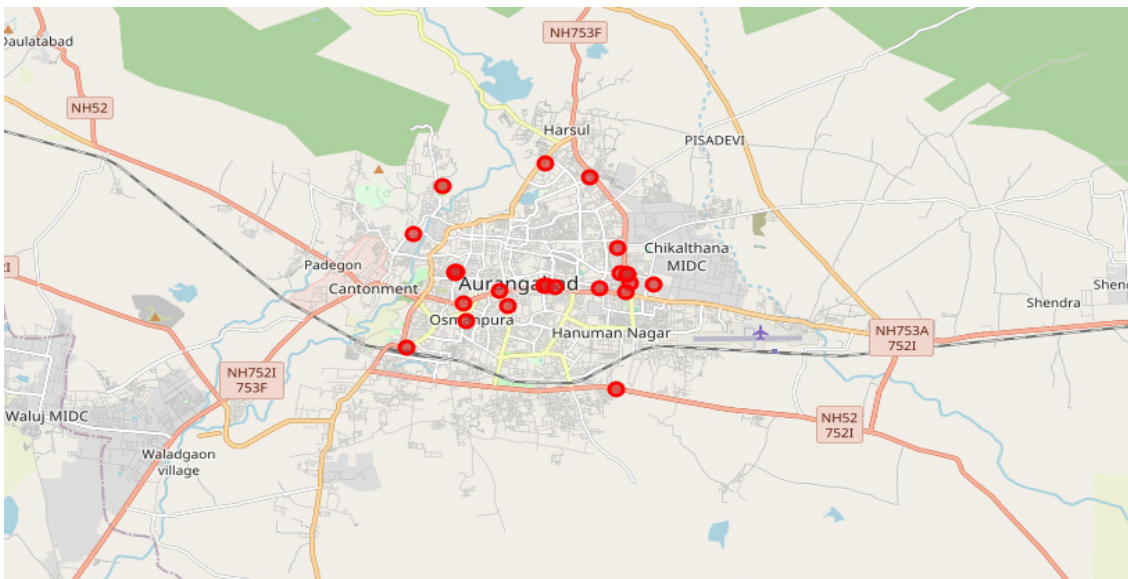


Figure 2: Venues retrieved from Zomato API

From figure 1 and figure 2, we can clearly see that some venues from the two APIs do not align with each other. Thus, I decided to combine them using their latitude and longitude values.

To combine the two datasets, I had to check that the latitude and longitude values of each corresponding venue match. After careful analysis, I rounded both the latitude and longitude values up to 4 decimal places. Once this was done, I observed that there were still some venues which were not correctly aligned.

After careful inspection and removal, the final dataset had a total of 21 venues with which we can work.

As a final dataset, we're left with 21 venues with 8 columns as described in figure 3.

| | categories | venue | latitude | longitude | price_range | rating | address | average_price |
|---|----------------|----------------------------|----------|-----------|-------------|--------|---|---------------|
| 0 | Ice Cream Shop | Natural Ice Cream | 19.8765 | 75.3453 | 1.0 | 4.6 | Ahinsa Bhavan, Near Rajendra Tyre Services, Ja... | 75.0 |
| 1 | Multiplex | Hotel Sai Sarang | 19.8862 | 75.3636 | 1.0 | 2.9 | House 35, Satyam Nagar, N5, CIDCO, Aurangabad | 100.0 |
| 2 | Restaurant | Kream N Krunch | 19.8766 | 75.3461 | 3.0 | 4.3 | 2, Near Akashwani Circle, Mahesh Nagar, Jalna ... | 500.0 |
| 3 | Hotel | Vivanta by Taj | 19.9079 | 75.3457 | 4.0 | 4.3 | Vivanta by Taj, Rauza Baugh, CIDCO, Aurangabad | 1100.0 |
| 4 | Restaurant | Madhuban Garden Restaurant | 19.8500 | 75.3630 | 3.0 | 3.8 | Beed Bypass, Madhuban, Gadia Vihar, Aurangabad | 400.0 |

Figure 3: Final data aggregated from both APIs

3. Methodology and Exploratory Data Analysis

As a first step, I retrieve the venues in Aurangabad from Foursquare and Zomato APIs. I extract the location data from the Foursquare API for all venues up to a distance of 10 kilometers from the center of Aurangabad. Using this, I fetch the venue information including price and rating data from Zomato API.

Using data cleaning, the dataset from the two APIs will be combined based on the venue names, latitude, and longitude values. One to one matching and careful data inspection would be used to remove any remaining outliers such as multiple venues at the same location from the two datasets. The final data will include the venue name, category, address, latitude, longitude, rating, price range, and average cost per person.

Using this dataset, I begin by analyzing the top venue types that exist in Aurangabad. I will then explore the venues on maps. This will allow us to better understand the location of various venues and the places where many venues co-exist and create place worth visiting. I'll also explore the venues based on the ratings and price range of various venues. The venues will be plot using proper color coding such that a simple glance at the map would reveal the location of the venues as well as give information about them. I aim to identify places which can be recommended to visitors based on their price and rating preferences. I'll also cluster the venues and see if we can draw meaningful information out of what kind of venues exist in Aurangabad.

As a final step, I will analyze these plots and try to draw conclusions on what places can be recommended to visitors. I'll discuss my findings and any inferences I can draw.

3.1 Categories

I begin my analysis by taking a look at the various categories of venues that exist in Aurangabad. As there are many restaurants, I believe that the majority venues shall include restaurants.

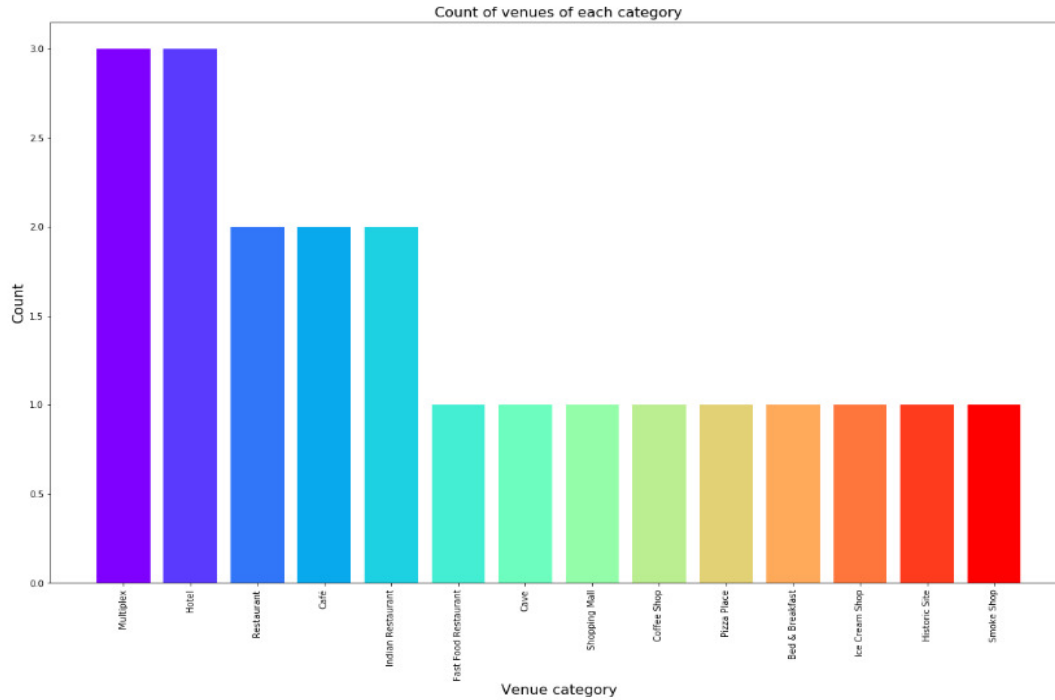


Figure 4: Count of various types of venues in Aurangabad

From figure 4, we see that the majority venues are actually Multiplex & Hotels. This is closely followed by Restaurants. For someone who is visiting Aurangabad and loves either Cafes or Restaurants & multiplex, they'd surely love their stay.

3.2 Rating

Next, I'll explore the ratings of various venues in Aurangabad. I decided to plot a bar chart with x-axis as the rating from 1 to 5 and the y-axis as the count of venues with that rating. I decided to plot the bar chart to see what average rating venues get in Aurangabad. This can be seen in figure 5.

While the whole range of rating of venues might stretch from 1 to 5, the average rating is spread across 3.5 to 4 with maximum number of venues scoring between 3 and 5.

I followed this information by plotting the venues on the map of Aurangabad. The venues that were rated below 3 were marked by red and orange while the venues that were rated more than or equal to 3 were plot as green and dark green. Taking a look at figure 6 reveals the same results as the bar plot. However, it is interesting to note that many high rated venues are located near Cidco, and Jalna road to Akashwani.

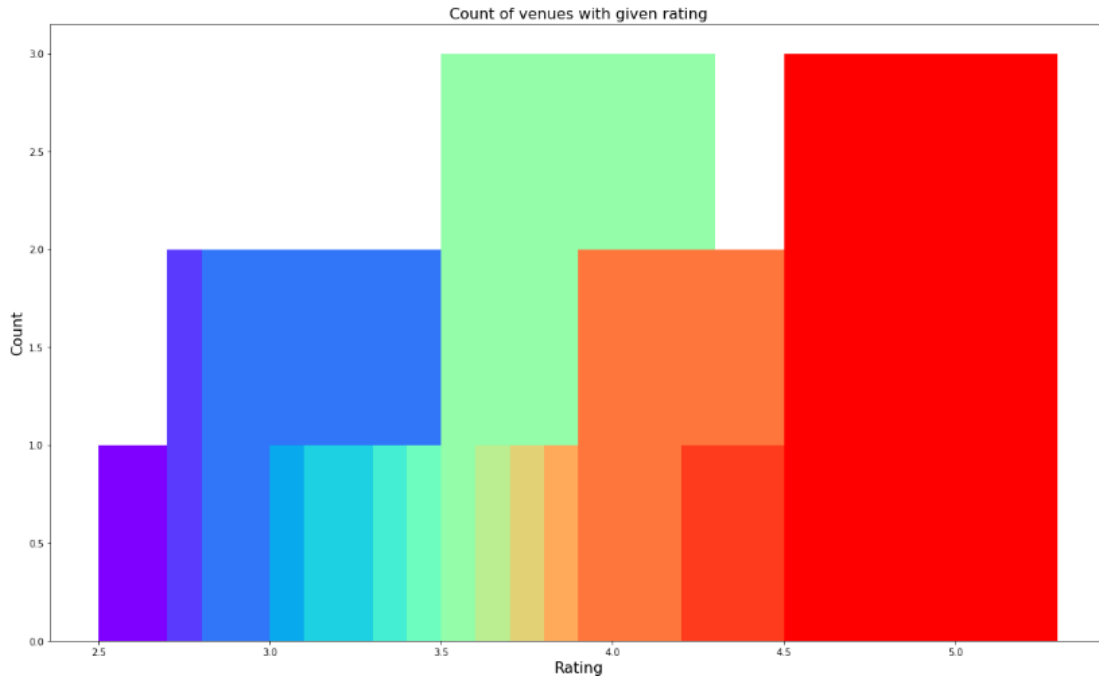


Figure 5: Rating and count of venues with that rating

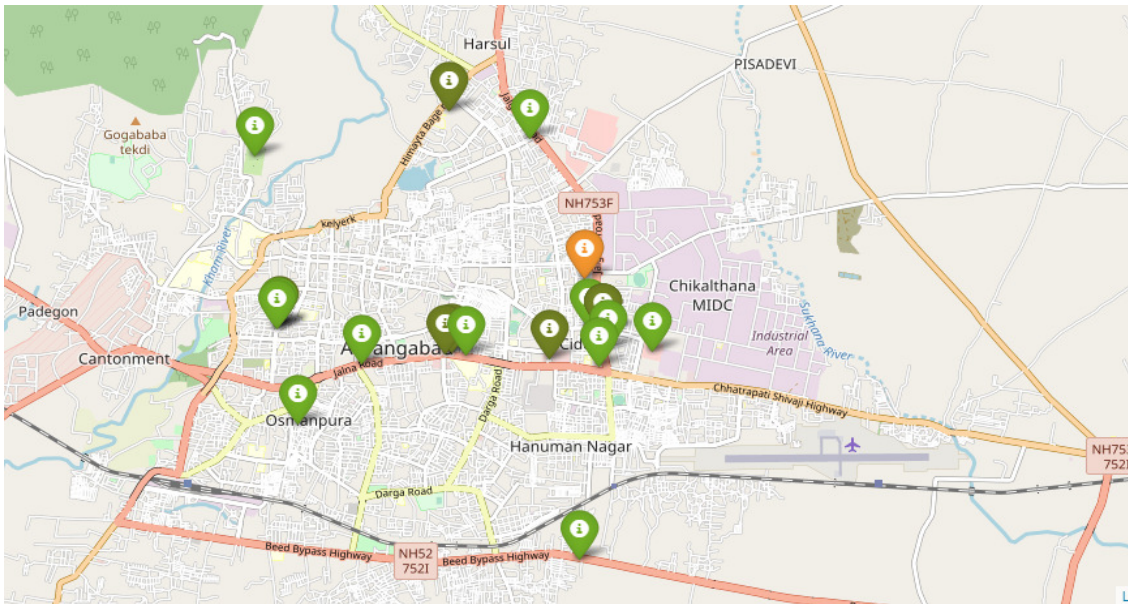


Figure 6: Plot of venues with different ratings

The venues in sectors that do not have many venues have rating more than 3. Overall, Aurangabad on an average has good rating for its venues.

3.3 Price

Next, I explore the average prices of all venues for one person using a scatter plot along with the count of venues with that average price per person. Taking a look at figure 7, reveals that

the majority venues have an average cost of Rs 200 to Rs 500 for one person. Even though the maximum venues lie in that range, the actual range of prices is very different. There are places with average price even as high as Rs 1000+ for one person.

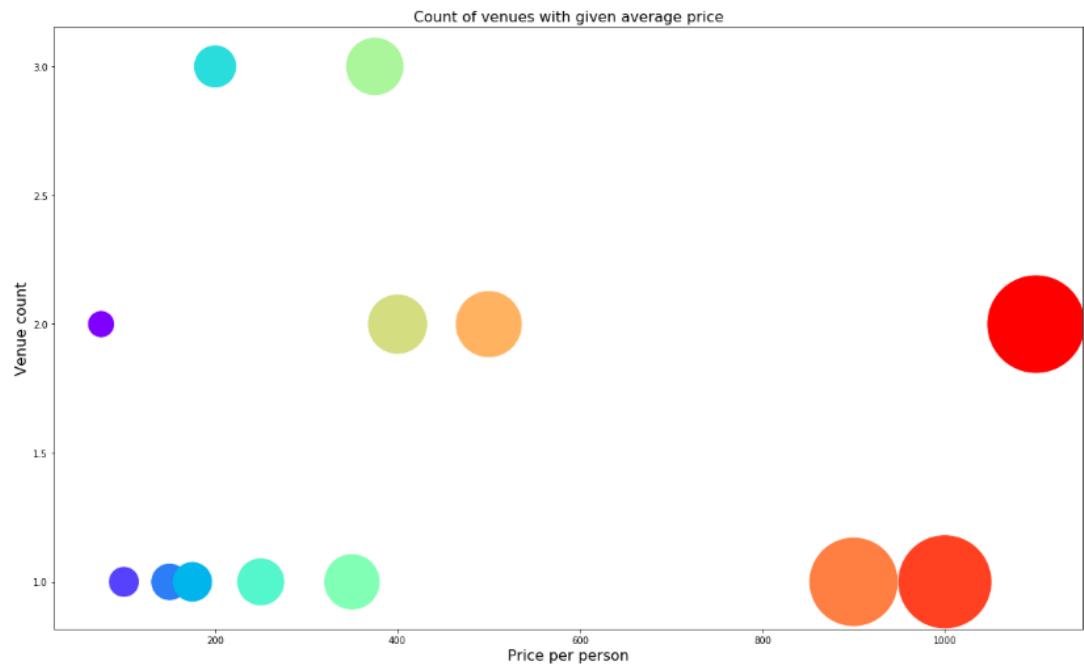


Figure 7: Price per person with count of venues with that price

I also plot the venues based on their price range.

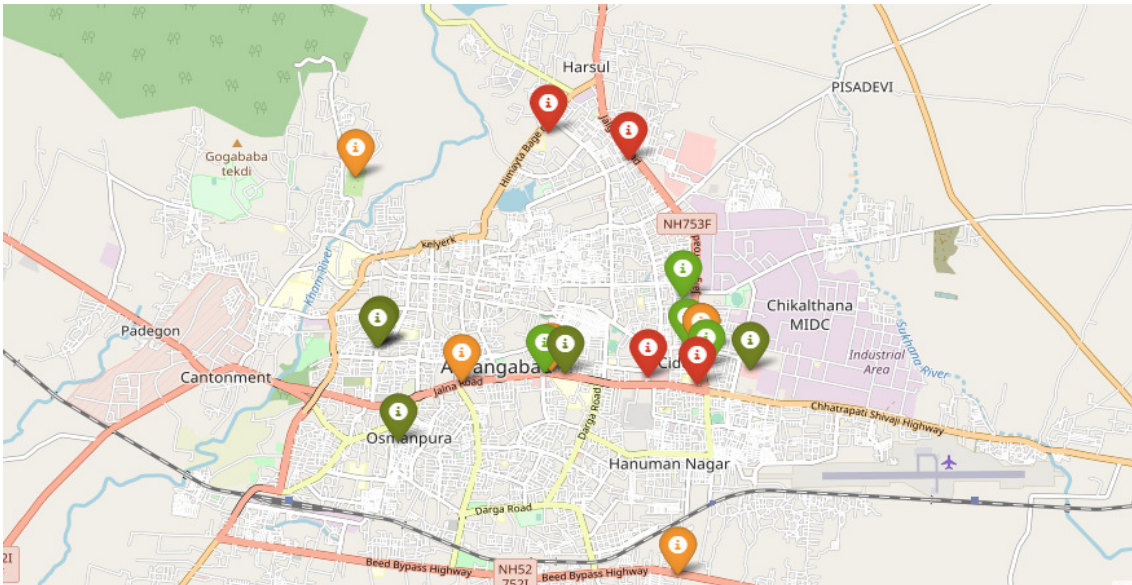


Figure 8: Plot of venues with different prices

Figure 8 includes all the venues where high priced venues are marked by orange and red while the lowpriced venues are marked with green and dark green. From the plot, we observe

that the venues near Cidco and Near Akashwani are primarily lower priced. A high price exists in Rama International, Lemmon Tree & Taj Hotel.

Clustering

Finally, I cluster all the venues based on their price range, location and more to identify similar venues and the relationship amongst them. I used KMeans clustering and decided to cluster the venues into two separate groups.

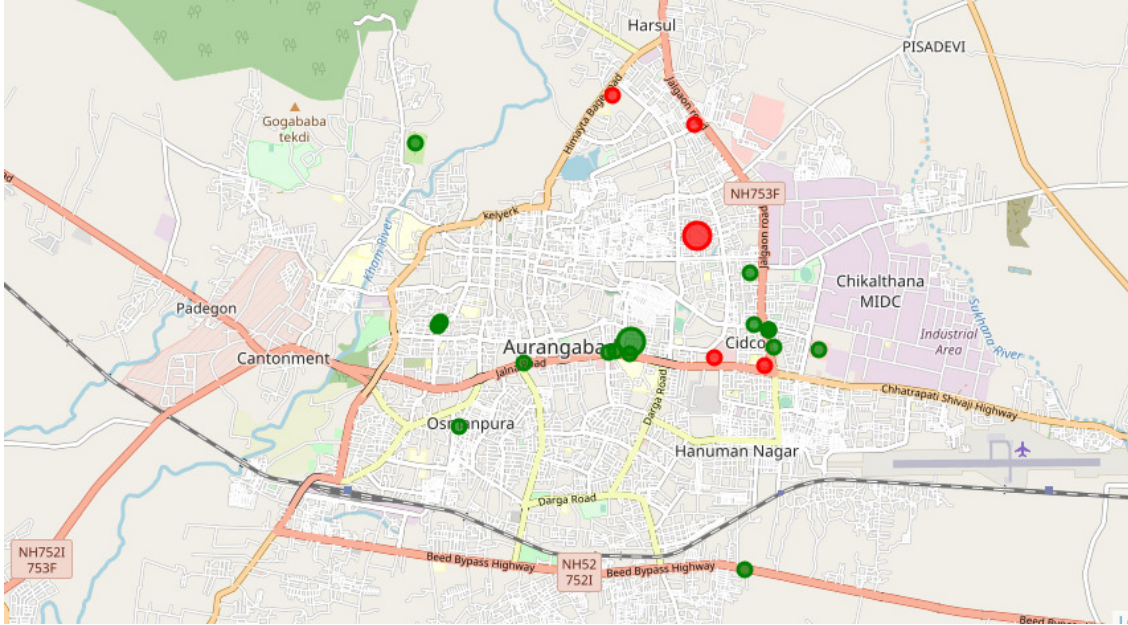


Figure 9: Clusters of venues

Infigure 9, we see the two clusters:

1. The first cluster (green) is spread across the whole city and includes the majority venues. These venues have mean price range of 2.18 and rating spread around 3.86.
2. The second cluster (red) is very sparsely spread and has very limited venues. These venues have mean price range of 4.00 and rating spread around 4.02.

4. Results and Discussion

After collecting data from the Foursquare and Zomato APIs, we got a list of 26 different venues. However, not all venues from the two APIs were identical. Hence, we had to inspect their latitude and longitude values as well as their names to combine them and remove all the outliers. This resulted in a total venue count of 21. Based on our analysis above, we can draw a number of conclusions that will be useful to aid any visitor visiting the city of Aurangabad, Maharashtra, India.

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We identified that from the total set of venues, majority of them were Multiplex, Hotels, Cafes and Restaurants. A visitor who loves Multiplex/Hotels/Cafes/Restaurants would surely benefit from coming to Aurangabad.

While the complete range of ratings ranges from 1 to 5, the majority venues have ratings between 3.5 to 4. This means that most restaurants provide good quality food which is liked by the people of the city, thus indicating the high rating. When we plot these venues on the map, we discover that there are clusters of venues around Cidco and Jalna Road to Akashwani. These clusters also have very high ratings (more than 3). When we take a look at the price values of each venue, we explore that many venues have prices which are in the range of Rs 200 to Rs 500 for one person. However, the variation in prices is very large, given the complete range starts from Rs 100 and goes up to Rs 1200. On plotting the venues based on their price range on the map, we discovered that venues located near Cidco and Akashwani are relatively priced lower than other venues in City. A high price exists in Rama International, Lemmon Tree & Taj Hotel.

Finally, through clusters we identified that there are many venues which are relatively lower priced but have an average rating of 3.86. On the other hand, there are few venues which are high priced and have average rating of 4.02.

1. If you're looking for cheap places with relatively high rating, you should check Cidco & Akashwani.
2. If you're looking for the best places, with the highest rating but might also carry a high price tag, you should visit Rama International, Lemmon Tree & Taj Hotel.
3. If you're looking to explore the city and have no specific criteria to decide upon the places you want to visit, you should try Bibi ka Mukbara M & Ellora Caves.

A company can use this information to build an online website/mobile application, to provide users with up to date information about various venues in the city based on the search criteria (name, rating and price).

5. Conclusion

The purpose of this project was to explore the places that a person visiting Aurangabad, Maharashtra, could visit. The venues have been identified using foursquare and Zomato API and have been plotted on the map. The map reveals that there are four major areas a person can visit: Cidco, Jalna Road to Akashwani & Ellora Caves and Bibi ka Mukbara. Based on the visitor's venue rating and price requirements, he/she can choose amongst the Four Categories places