Report

Restaurant Data Analysis in Delhi NCR

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(as part of IBM Data Science Capstone Project)

Acknowledgements

I would like to thank to all the teacher of Coursera IBM Data science course series of 9 courses. I would also like to thank all faculty, peers of this wonderful series. I would also like to especially thank to all those who reviewed my Assignments. I would also like to apologizes for any unknown mistakes committed during this series

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1. Introduction

Delhi is the capital city of India. It has huge population of around 19 million and area 1484 sqkm making it's population density to be 12803 people per square kilometers which makes Delhi to be among the list of densely populated cities of world.

Delhi has been cultural center from ancient times which lives upto its description till today. It was destroyed and rebuilt 7 times in history and each time the maker of city add his/her own cultural influence making the rich heritage even more diversified.

Food has been a major part of this cultural legacy. Diversity in food of Delhi is just mind numbing from Muglai to continental, north Indian to south Indian, food from each and every corner of world has graced the gastronomy of the city.

People of Delhi love food. Many restaurants pop up every month and more are shut down. The competition in restaurant industry is very intense. The place where restaurant is located plays huge role in its footfall. Theirs are certain preference of cuisines which people like. Also since population of city has grown so much many sub cities have grown around Delhi, collectively called as Delhi NCR. These sub cities further add to the competition in restaurant industry.

When we consider these challenges, we can create visualization to get information where the most of restaurants are located, which types of cusines are preferred , what is cost for 2 people etc. and give a broader picture to anyone who wish to open restaurant in city. Here I have assumed that input costing (raw material, rent, salary, etc.) of every restaurant is same and has not taken it into consideration.

2 Data

To consider problem we can list data as follows:

Data was collected from a file kaggle. https://www.kaggle.com/rabhar/zomato-restaurants-in-india

It contained data of all cities of India. The data intitially contained 211944 rows 26 columns. I cleaned the data and data of only Delhi NCR was created which included New Delhi, Gurgaon, Noida, Greater Noida, Faridabad. Various features of restaurants like Delivery, Takeaway , Seating etc. were explored. Taking Delhi NCR data 5964 rows 26 columns were obtained.

Columns dropped initially were : url, address, locality_verbose ,zipcode ,currency, country_id, city_id. The columns of url, address, locality_verbose ,zipcode didn't add much relevant information to dataset. Also since we were dealing with same country and same city so currency, country_id, city_id were dropped.

This data was further cleaned to remove missing and duplicate values. Various visualizations were created to draw certain conclusions.

Various columns were renamed for easy understanding. Also feature column had variety of different attributes, some of the important attributes like parking, card payment, pure veg, wheelchair accessibility etc. were added in the form of columns having '0' as No and '1' as Yes.

Column rating text had rating in different languages each of these rating were replaced by their suitable equivalent from Excellent, Very Good, Good, Average, Poor, Not Rated.

- Excelente, Harika, Ottimo, Terbaik, Wybitnie, Skvělá volba were replaced as Excellent
- Muy Bueno, Bardzo dobrze, Muito Bom, Sangat Baik were replaced as Very Good
- Scarso was replaced as Poor
- Çok iyi, Bom were replaced as Good

Further redundant columns of Opentable, Delivery, Takeaway, Pure_Veg were dropped

Six other dataframes were created for each of the 6 cities of Delhi NCR region namely New Delhi, Gurgaon, Noida, Faridabad , Ghaziabad, Greater Noida.

3 Data Analysis

Total number of Resturants in cities of Delhi NCR region were:

- New Delhi   3918
- Gurgaon   1290
- Noida   467
- Ghaziabad   132
- Faridabad   124
- Greater Noida   33

Each of these cities along with total data of Delhi NCR region is analyzed over various different characteristics to obtain meaningful result

3.1 Average Cost for 2 people
Costing plays an important role in functioning of restaurant. Every customer is generally looking for value for money. Too high costing stops customer from entering too low costing compromises on quality of product and effort of chef. Hence the costing must justify right balance between customer's need and service provider's needs.
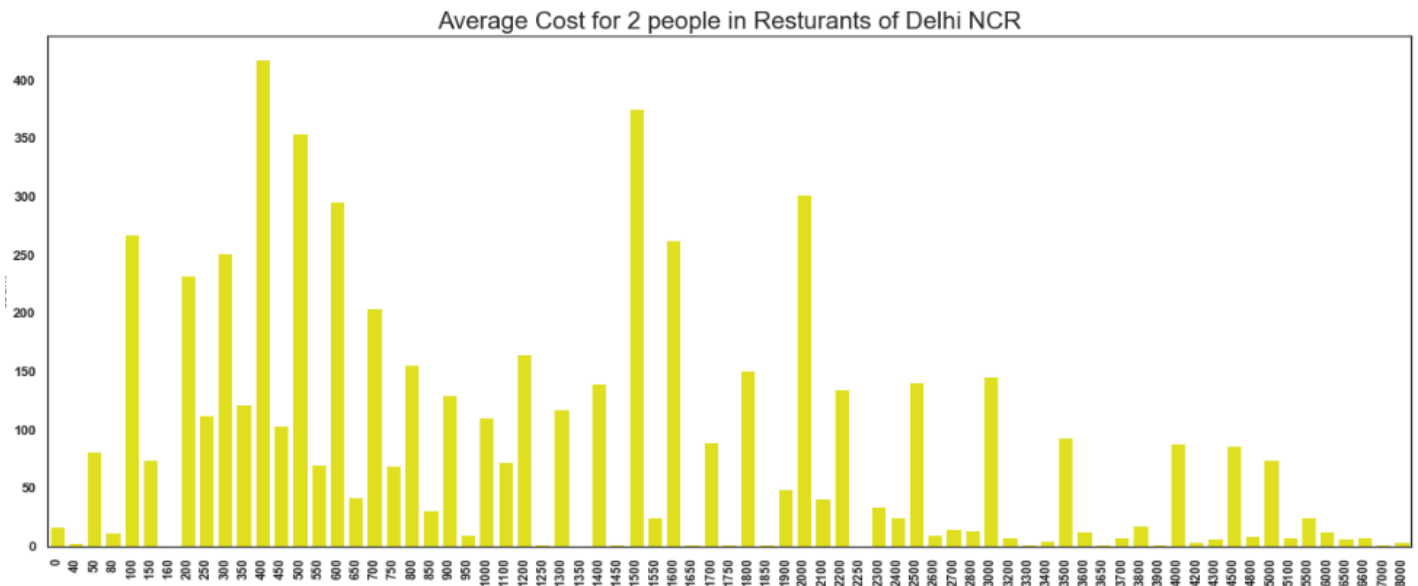Count plots were created to get better idea about data.

Fig.1 Count plot of Average Cost for 2 People

- The data of Delhi NCR region shows Average Cost for 2 people lie in the range of ₹0 to ₹8000 with most frequent cost being ₹400 followed by ₹ 1500 and ₹500.
- For Delhi Average Cost for 2 people lie in the range of ₹0 to ₹8000 with most frequent cost being₹ 1500
- followed by ₹400 and ₹100
- For Gurgaon Average Cost for 2 people lie in the range of ₹0 to ₹6000 with most frequent cost being ₹ 1500 followed by ₹1600 and ₹400
- For Noida Average Cost for 2 people lie in the range of ₹80 to ₹4000 with most frequent cost being ₹ 400 followed by ₹500 and ₹300
- For Faridabad Average Cost for 2 people lie in the range of ₹50 to ₹3600 with most frequent cost being ₹ 400 followed by ₹100 and ₹300
- For Ghaziabad Average Cost for 2 people lie in the range of ₹100 to ₹3000 with most frequent cost being ₹ 600 followed by ₹400 and ₹250
- For Greater Noida Average Cost for 2 people lie in the range of ₹50 to ₹1600 with most frequent cost being ₹ 560 followed by ₹300 and ₹500.
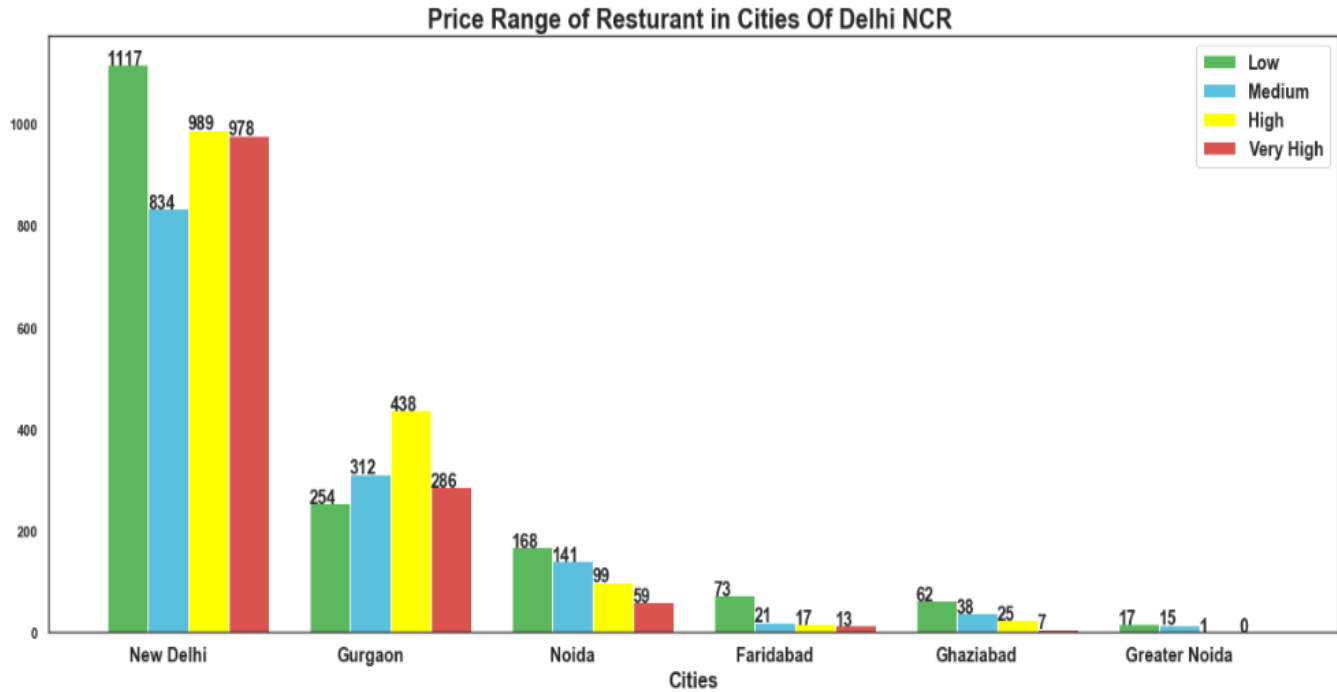
3.2 Price Range

Fig.2 City wise Count plot of Price Range

Simplifying above data Price range were created. According to which

- New Delhi had maximum number of restaurants in every price range. Similarly Greater Noida had minimum number of restaurants in every price range.
- Noida, Faridabad, Ghaziabad, Greater Noida show decreasing trend in number of restaurants with maximum restaurants in Low price range and minimum restaurants in Very High price range.
- Gurgaon seems to be most costly city with maximum restaurants in High price range followed by Medium, Very High and Low.
- New Delhi seems to be least costly city with maximum restaurants in Low price range followed by High, Very High and Medium

3.3 Features(broadly)

Features reveal a lot about the Restaurant. More features may attract or repel customers. Many essential features are sometimes ignored by restaurants. Features makes the customer experience more convenient.
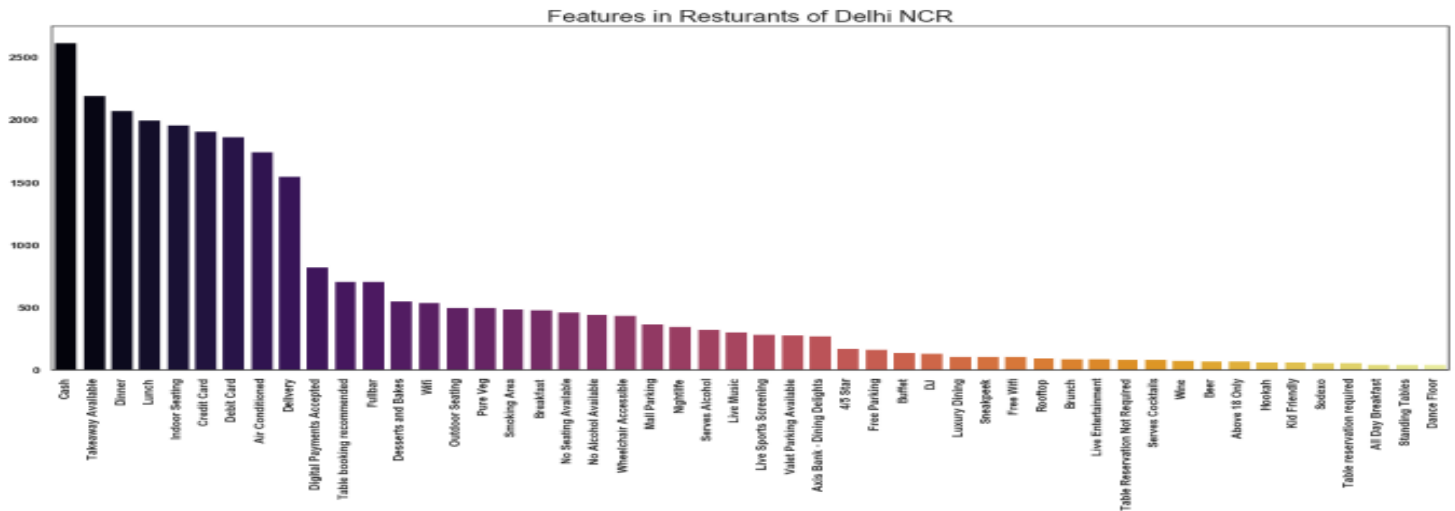

Fig.3 Count bar plot of features of Resturants

- For maximum restaurants in all cities of Delhi NCR Cash is most frequent feature.
- The data of Delhi NCR region shows second most frequent feature was Takeaway Available followed by Dinner.
- For Delhi, Gurgaon, Ghaziabad second most frequent feature was Dinner whereas for Noida and Faridabad it was Takeaway available. For Greater Noida it was Delivery.
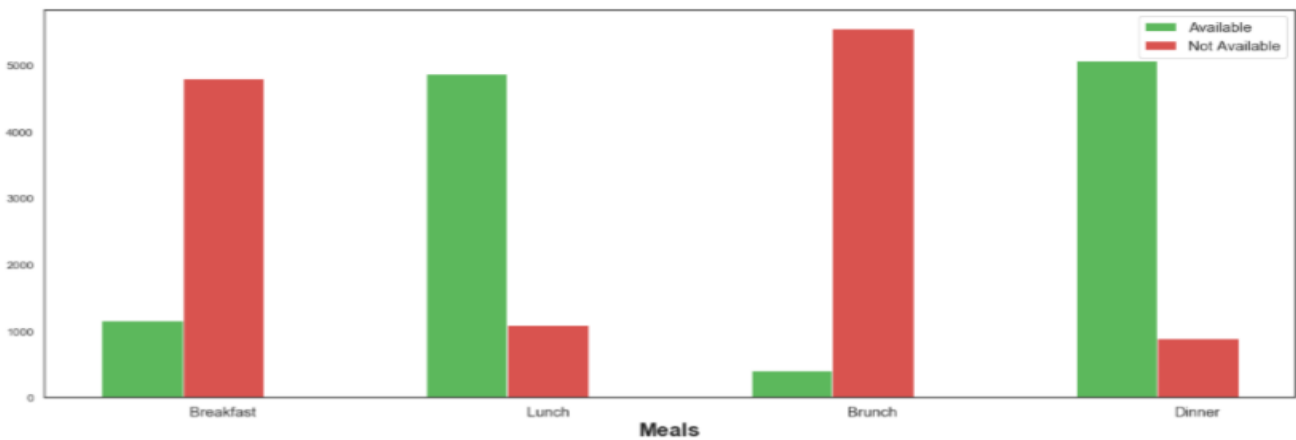
3.4 Features(in details)

3.4.1 Meals

Fig.4 Meals served in Restaurants in Delhi NCR Region

Maximum resturants serve Dinner and Lunch. But a few serve Breakfast and even few Brunch.
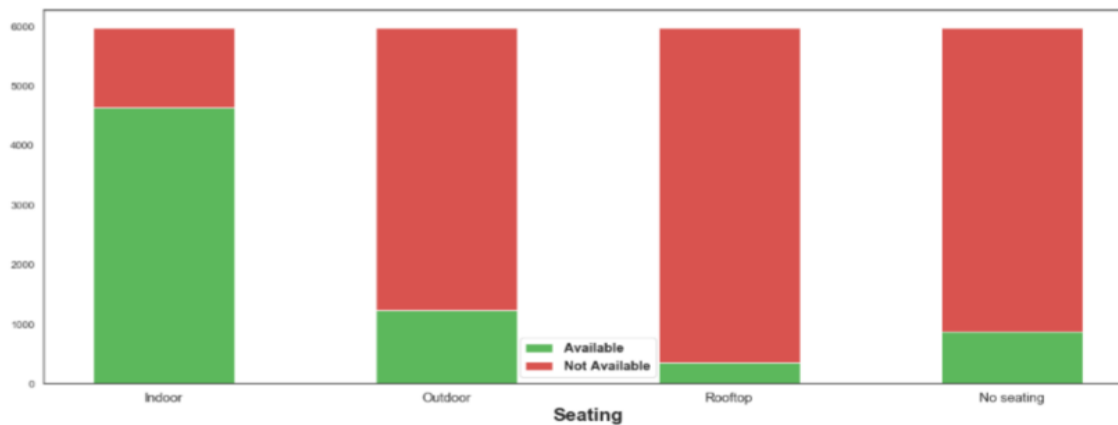
3.4.2 Seating

Fig.5 Type of Seating in Restaurants of Delhi NCR

Maximum number of Restaurants have Indoor seating followed by Outdoor and Rooftop. Some Restaurants even have combination of 2 types or even all 3 types of seating. Very few restaurants have No seating.

3.4.3 Payment Modes

Payment mode eases the customer experience. Restaurants are very passionate about this feature and rightly so as this feature highly influences their profit. Almost all restaurants have traditional payment mode of Cash followed by Card Payment (Debit/Credit). New payment mode of Digital payment is also catching up.
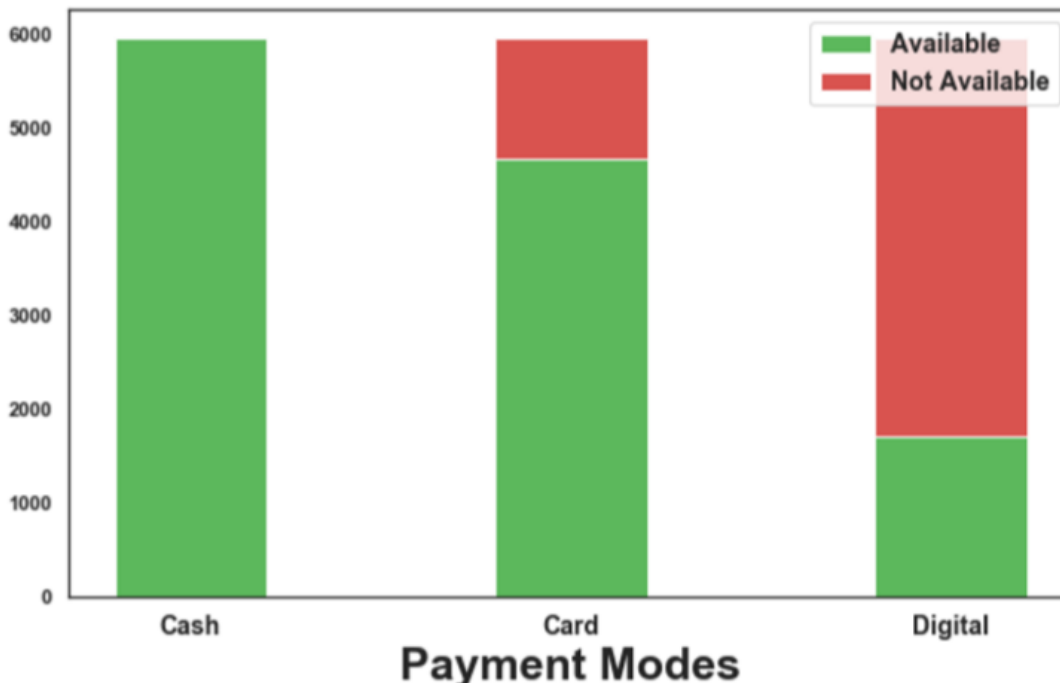

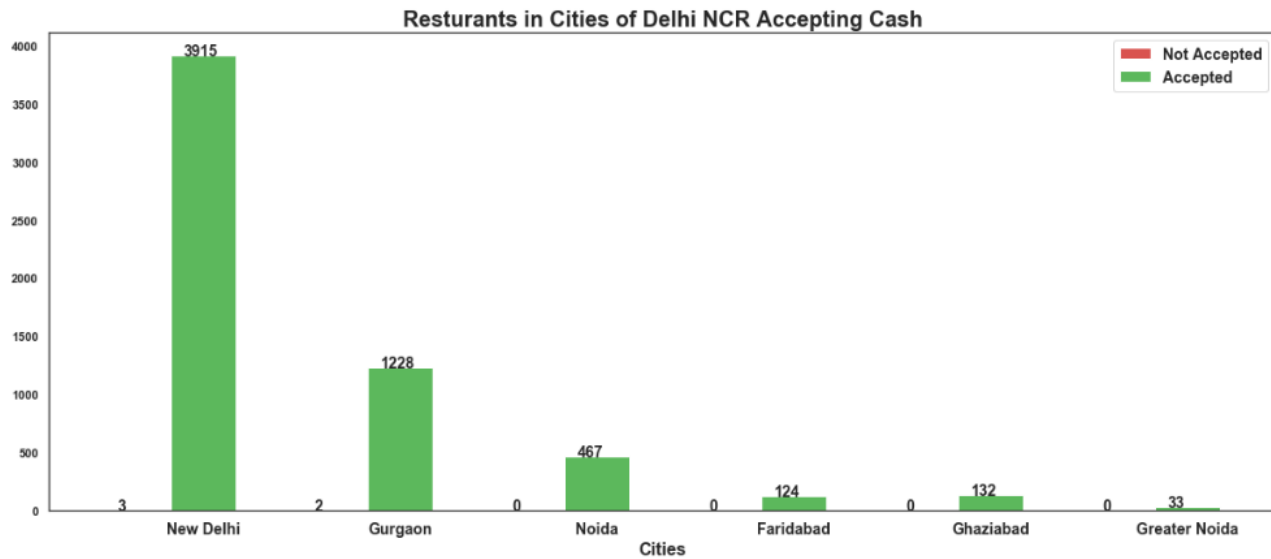Fig.6 Bar plots of Payment Modes in Restaurants in Delhi NCR

Fig.7 Bar plots of Restaurants accepting Cash in Cities of Delhi NCR

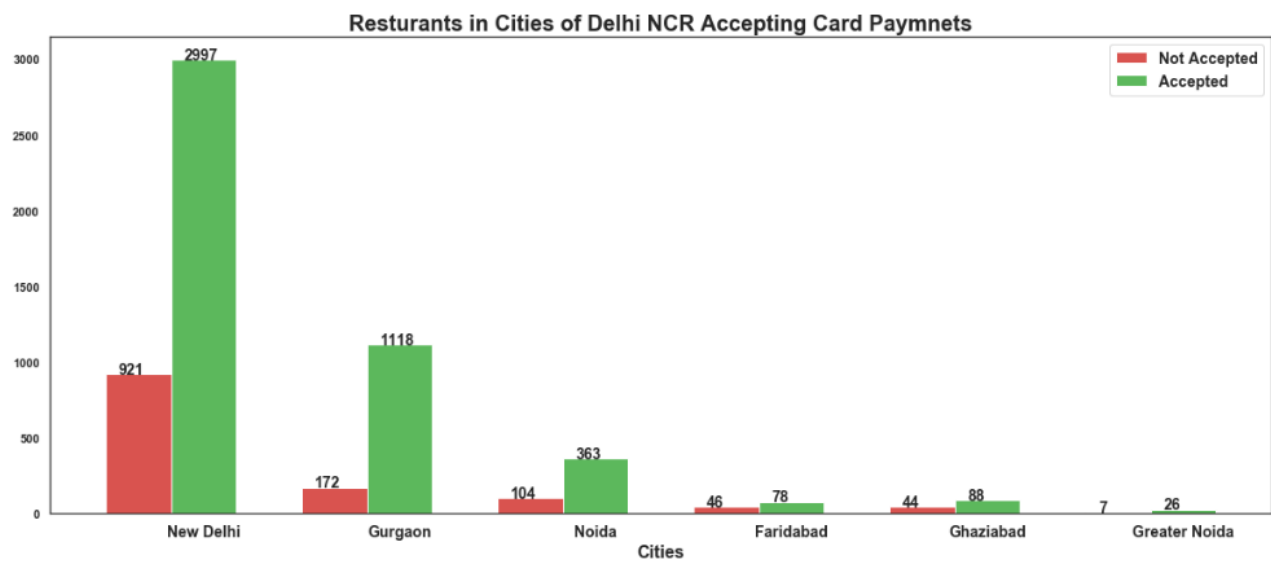Only 3 restaurants in New Delhi and 2 restaurants in Gurgaon do not accept the Cash.

Fig.8 Bar plots of Restaurants accepting Card Payments in Cities of Delhi NCR

More than half Restaurants in Faridabad and Ghaziabad do not accept Card. Rest Cities have even more than one third of Restaurants of not accepting Card payment.
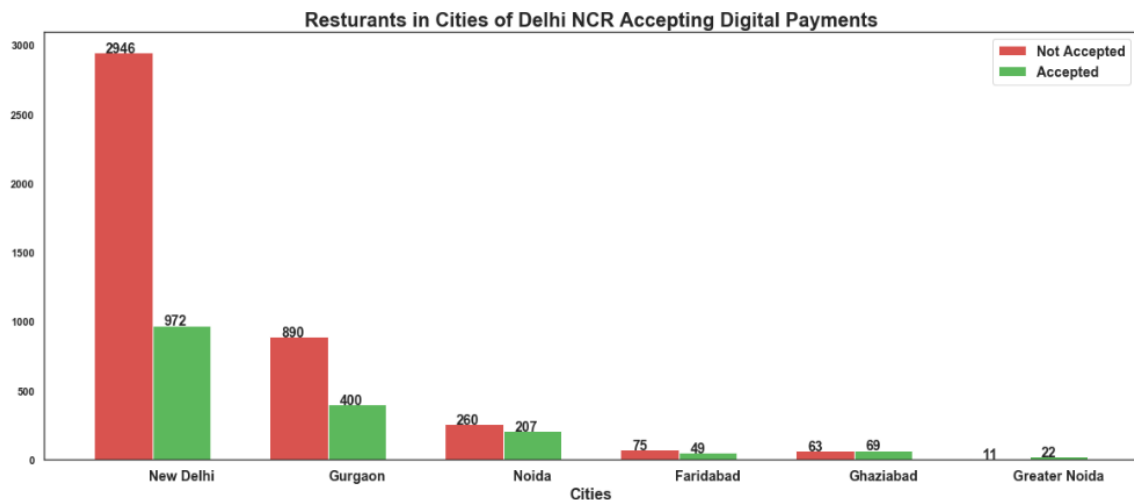
Fig.9 Bar plots of Restaurants accepting Digital Payments in Cities of Delhi NCR

Delhi, Gurgaon, Noida, Faridabad have more number of restaurants not accepting digital payment whereas Ghaziabad and Greater Noida have more number of restaurants accepting digital payment. This shows that when number of restaurants in city are less restaurants need to have all modes of payment to not miss any potential client.
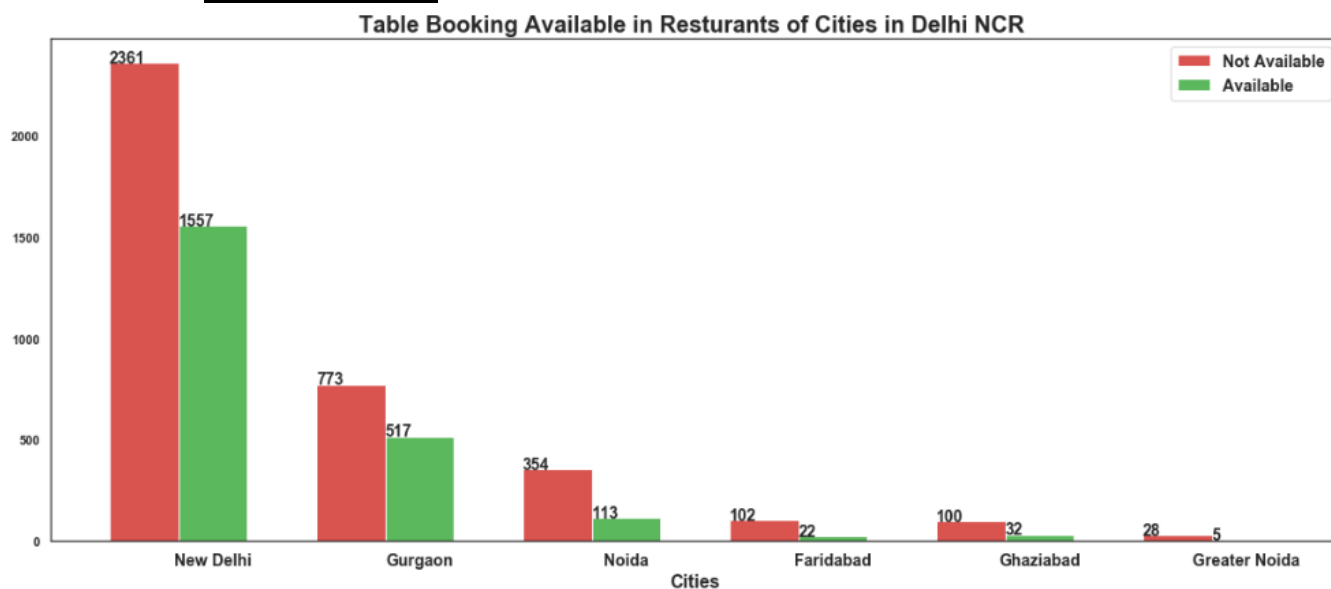
3.4.4 Table Booking

Fig.10 Bar plot of Table Booking in Restaurants in Cities of Delhi NCR

Table booking assures the seat of forthcoming customer in restaurant with heavy footfall. It decreases waiting time of customer and makes eating experience of customer more pleasant.

Generally all cities have more number of restaurants where table booking is not available than those where it is available. This contrast is more visible in Noida, Faridabad, Ghaziabad and Greater Noida suggesting either the footfall is less in these cities as compared to other or there is ample seating which decreases waiting time.
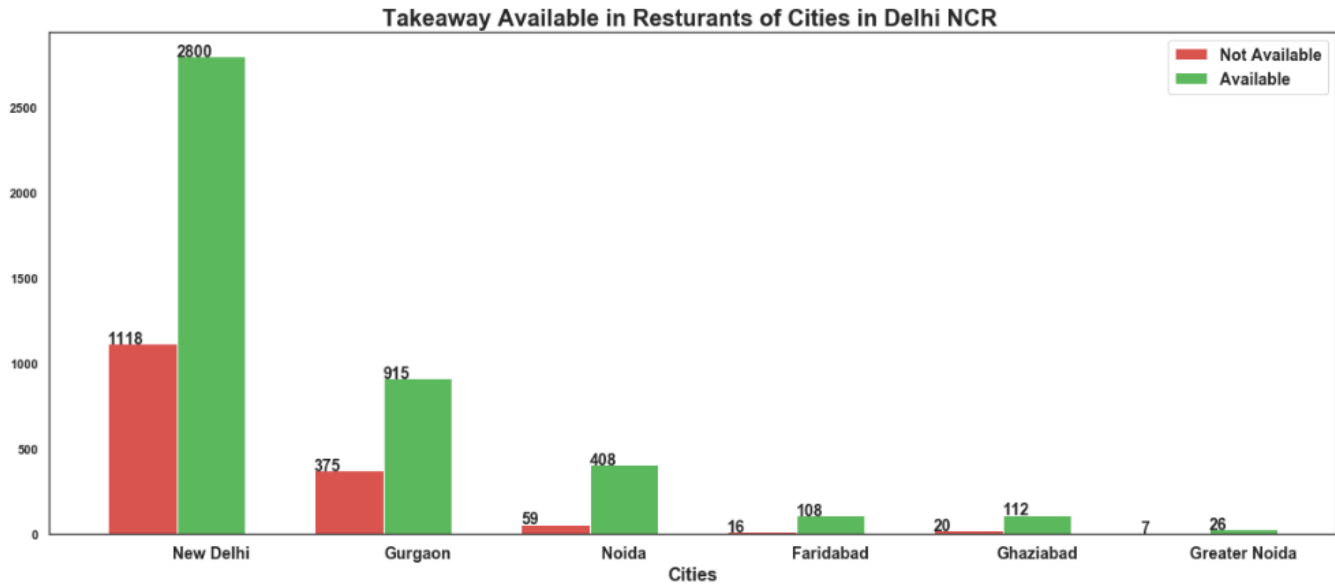
3.4.5 **Takeaway**

Fig.11 Bar plot of Takeaway in Restaurants in Cities of Delhi NCR

Takeaway option helps customer to take food with him/her. He/She may parcel the complete food or the leftovers. This options help in wastage of food as leftovers are generally dumped in bins by restaurants.

Generally all cities have more than twice number of restaurants where takeaway is available than where it is not.
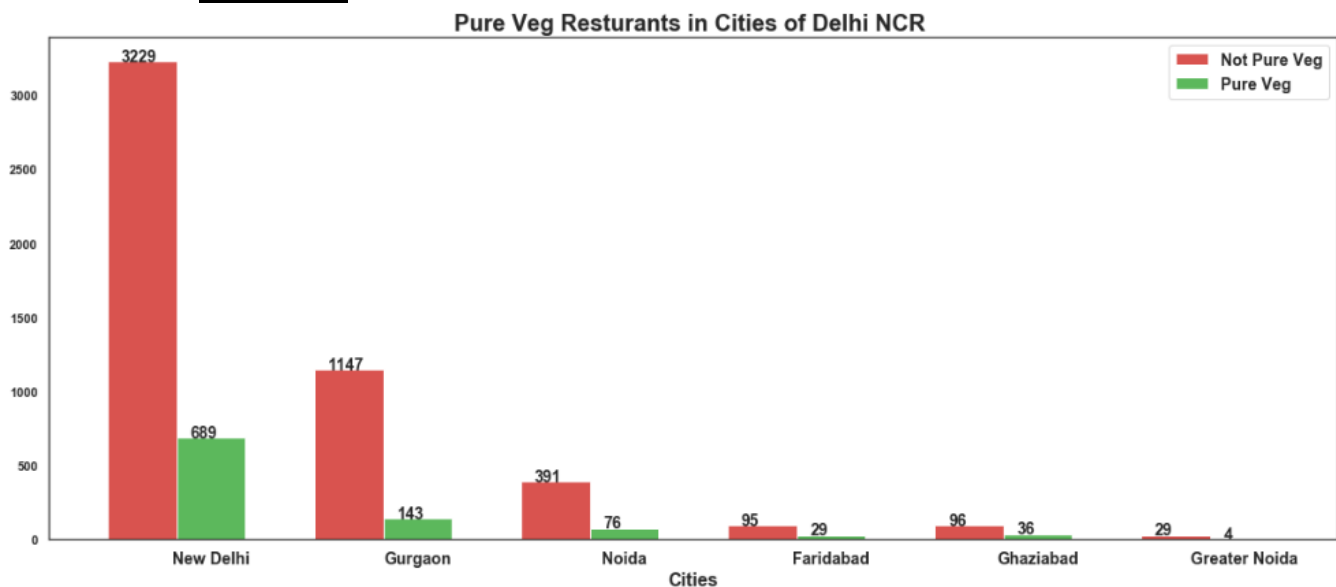
3.4.6 **Pure Veg**

Fig.12 Bar plot of Pure Veg in Restaurants in Cities of Delhi NCR

Various communities in India practice vegetarianism as part of daily lifestyle. Pure veg generally includes food from plants dairy products like milk, butter, cheese etc. it excludes meat, seafood, egg.

It is very important for the restaurant to mention whether it is pure veg or not.

Generally all cities more than thrice number of restaurants which are not Pure Veg than which Pure Veg.
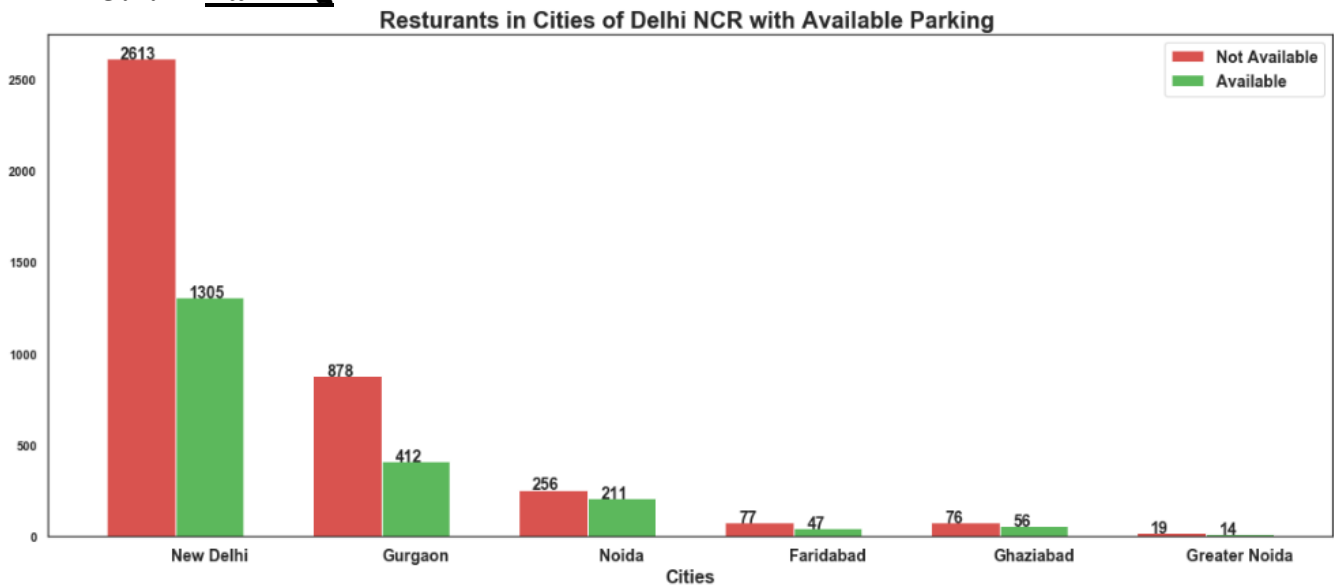
3.4.7 **Parking**

Fig.13 Bar plot of Parking in Restaurants in Cities of Delhi NCR

People generally come to restaurant via their vehicle, hence parking of their vehicle becomes very important for them. Be it valet parking or mall parking or any other type of parking this feature enhances the customer experience assuring the safety of his/her vehicle.

Generally all cities have more restaurant where parking is not available than where it is. This contrast is more pronounced in Delhi.

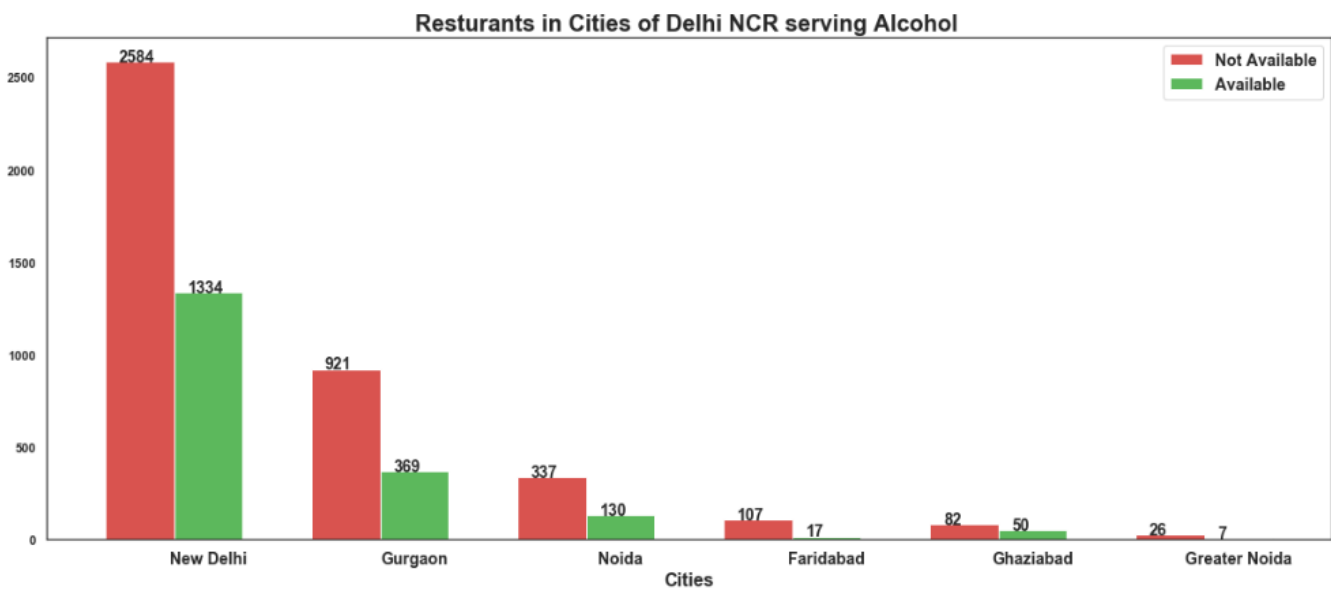### 3.4.8 **Alcohol Serving**

Fig.14 Bar plot of Restaurants in Cities of Delhi NCR serving Alcohol

Alcohol is generally considered as sin good by various communities in India. Also being costly item everyone cannot afford it. People maintain distance from places serving alcohol. Generally all cities have more restaurant where alcohol is not erved than where it is. This contrast is more pronounced in Faridabad.
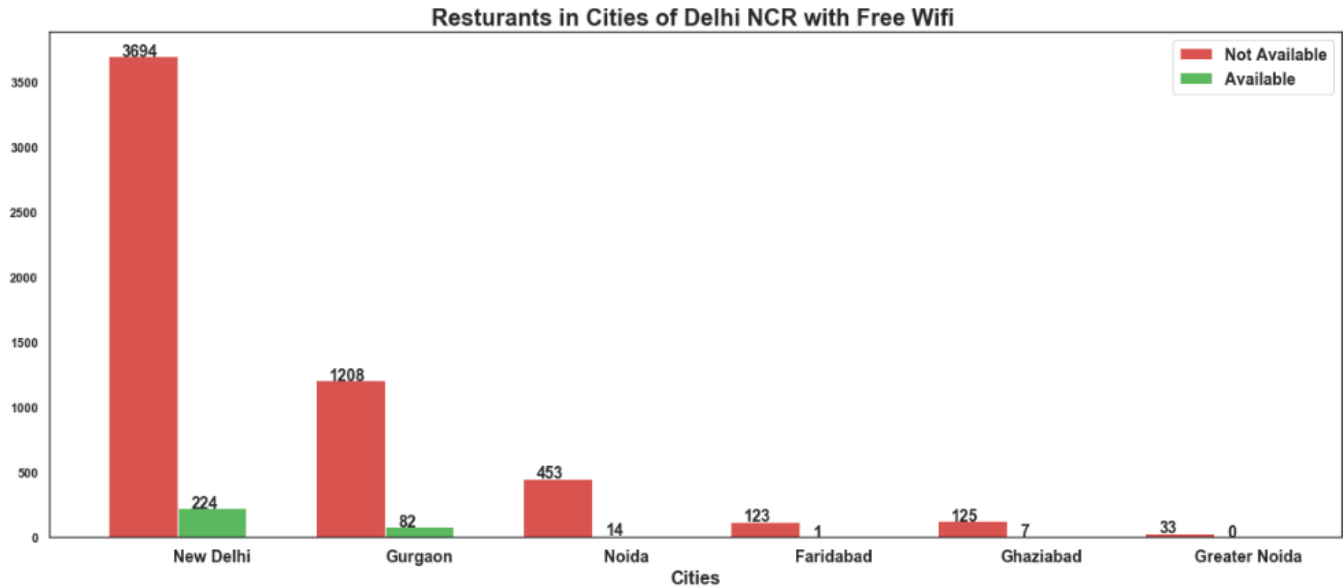
3.4.9 Free Wifi

Fig.15 Bar plot of Restaurants in Cities of Delhi NCR providing Free Wifi

Free Wifi is just an added feature which does not play any significance today in restaurants across Delhi NCR but have potential in future.

Generally very few restaurants provide Free Wifi across all cities, in Faridabad there is only one restaurant having this feature and Greater Noida has none.

A plausible explanation to this may be generally people these day carry data packs in their smartphones and people without smartphones have no use of Wifi.

3.4.10 Air Conditioning

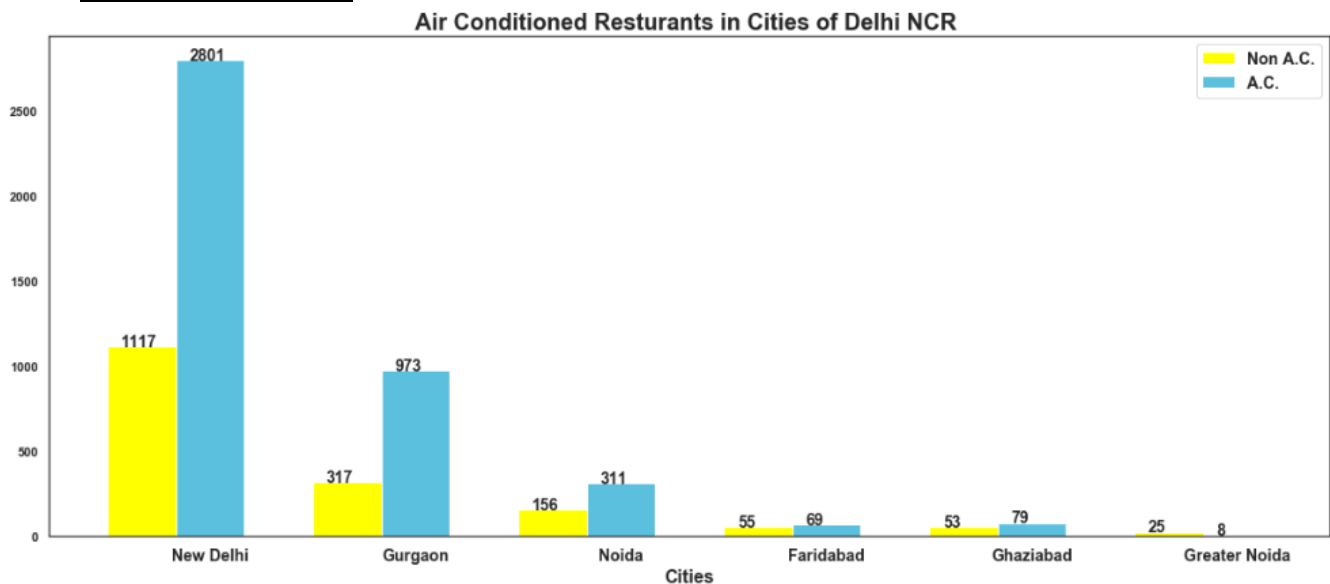Fig.16 Bar plot of Restaurants in Cities of Delhi NCR providing Air Conditioning

Delhi NCR generally has hot climate almost 8 months in a year. Air conditioning becomes important for the restaurants to have in order to counter the climatic heat.

Generally all cities have more number of restaurants with air conditioning than those without.

Greater Noida is exception having more restaurants without air conditioning than those with.

3.4.11 Wheelchair Accessibility
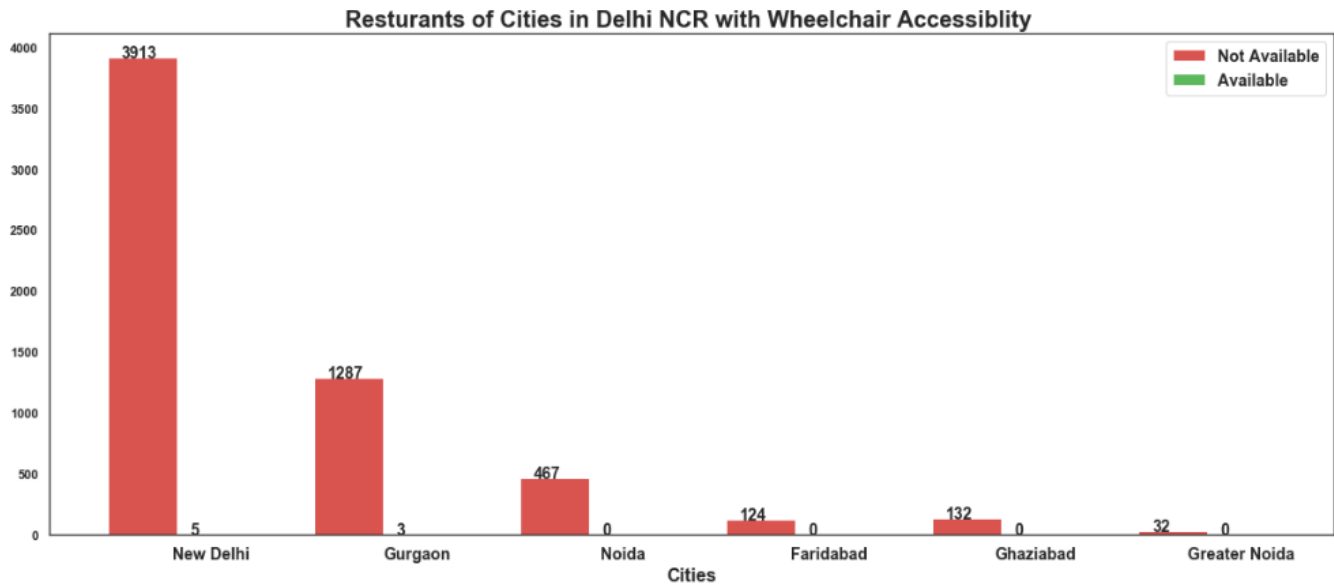
Fig.17 Bar plot of Restaurants in Cities of Delhi NCR providing Wheelchair Accessibility

Despite many notifications and guidelines issued by government authorities this feature is generally ignored all across cities in Delhi NCR region.

New Delhi has 5 and Gurgaon has 3 only restaurants having wheelchair accessibility, moreover Noida, Faridabad, Ghaziabad and Greater Noida.

I recommend that more restaurants should include this feature to make it inclusive.

3.5 Popular Localities of Restaurants

Locality plays crucial role in footfall a restaurant receives. Popular localities have more option of restaurant, more option of price ranges, connectivity to public transport, better features etc. These localities attract people in number as individual would like to visit the place with his friends and families.

Count plots were created to get better idea about data. Also maps were created to mark localities in Delhi NCR also in each city of Delhi NCR
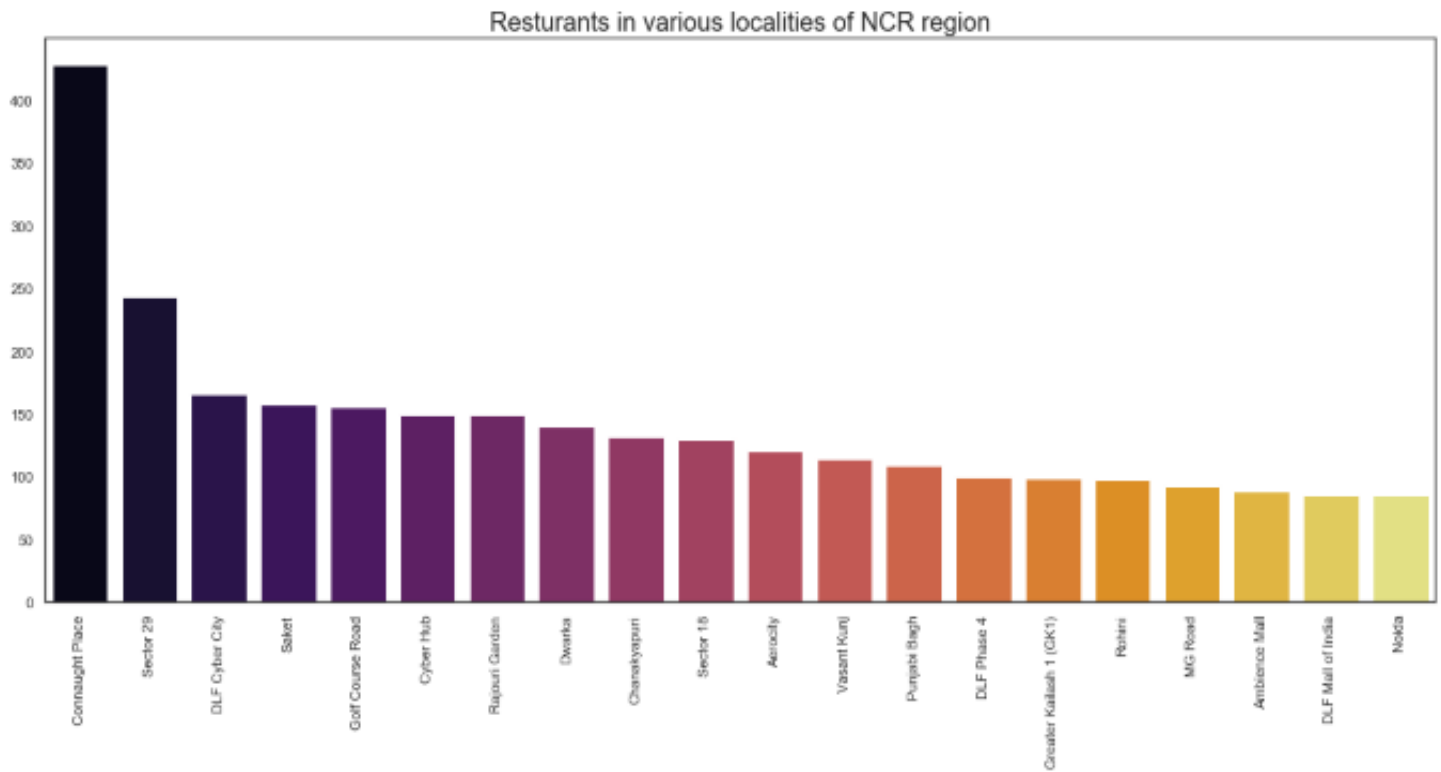

Fig.18 Bar plot of popular localities in Delhi NCR where restaurants are located

- The data shows most popular locality in Delhi NCR region is Connaught Place followed by Sector 29 and DLF Cyber City.
- Most popular locality in New Delhi is Connaught Place followed by Saket and Rajouri Garden.
- Most popular locality in Gurgaon is Sector 29 followed by DLF Cyber City and Golf Course Road.
- Most popular locality in Noida is Sector 18 followed by DLF Mall of India and Noida.
- Most popular locality in Faridabad is NIT followed by Sector 16 and Vivanta by Taj.
- Most popular locality in Ghaziabad is Indirapuram followed by Indirapuram Habitat Center and Raj Nagar.
- Most popular locality in Greater Noida is Delta1 followed by Gaur City1 and Knowledge Park.
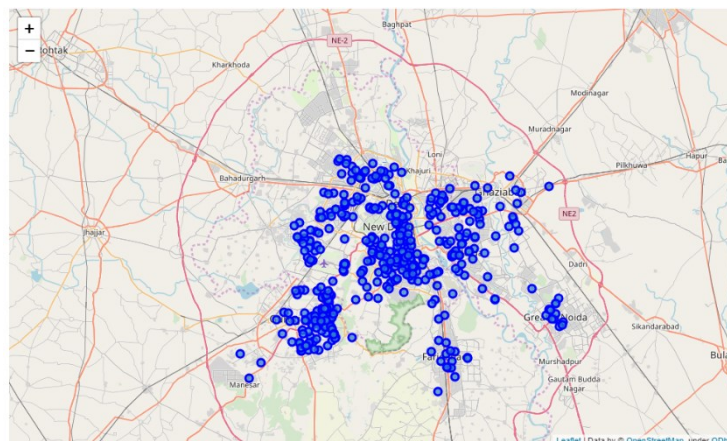

Fig.19 Delhi map showing popular localities

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3.6 Ratings of Restaurants

Restaurant's rating is done by customer based on their experience. Restaurant ratings influence potential customer visiting restaurant.

Fig.20 Count plot of Restaurant Ratings of Delhi NCR

- The data shows max frequency of Restaurant Ratings in Delhi NCR region is 4.0 followed by 4.1 and 3.9.
- Max Frequency of Restaurant Ratings in New Delhi is 4.1 followed by 4.0 and 4.2.
- Max Frequency of Restaurant Ratings in Gurgaon is 4.1 followed by 4.2 and 4.3.
- Max Frequency of Restaurant Ratings in Noida is 4.1 followed by 4.3 and 4.0.
- Max Frequency of Restaurant Ratings in Faridabad is 4.0 followed by 3.9 and 3.8.
- Max Frequency of Restaurant Ratings in Ghaziabad is 4.0 followed by 3.8 and 3.9.
- Max Frequency of Restaurant Ratings in Greater Noida is 3.8 followed by 2.2 and 2.4.
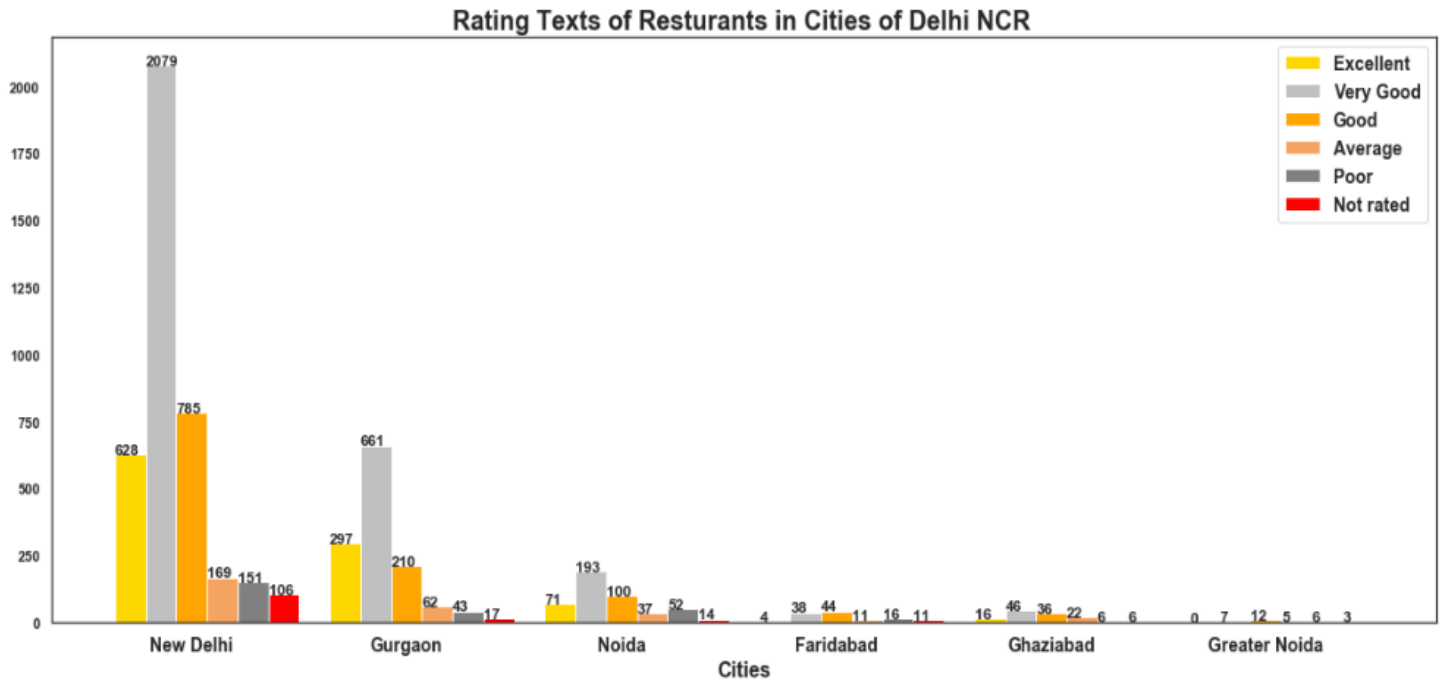
3.7 Ratings Texts of Restaurants

Fig.21 Bar plot of Rating texts of Restaurants of various cities of Delhi NCR

Rating Texts are text categories given by customer play same role as ratings.

Column rating text had rating in different languages each of these rating were replaced by their suitable equivalent from Excellent, Very Good, Good, Average, Poor, Not Rated.

- Excelente, Harika, Ottimo, Terbaik, Wybitnie, Skvělá volba were replaced as Excellent
- Muy Bueno, Bardzo dobrze, Muito Bom, Sangat Baik were replaced as Very Good
- Scarso was replaced as Poor
- Çok iyi, Bom were replaced as Good

- The data shows max frequency of Restaurant Ratings text in Delhi NCR region is Very Good followed by Good and Excellent.
- Max Frequency of Restaurant Ratings text in New Delhi is Very Good followed by Good and Excellent.
- Max Frequency of Restaurant Ratings text in Gurgaon is Very Good followed by Excellent and Good.
- Max Frequency of Restaurant Ratings text in Noida is Very Good followed by Good and Excellent.
- Max Frequency of Restaurant Ratings text in Faridabad is Excellent followed by Very Good and Poor.
- Max Frequency of Restaurant Ratings text in Ghaziabad is Very Good followed by Good and Average.
- Max Frequency of Restaurant Ratings text in Greater Noida is Good followed by Very Good and Poor.
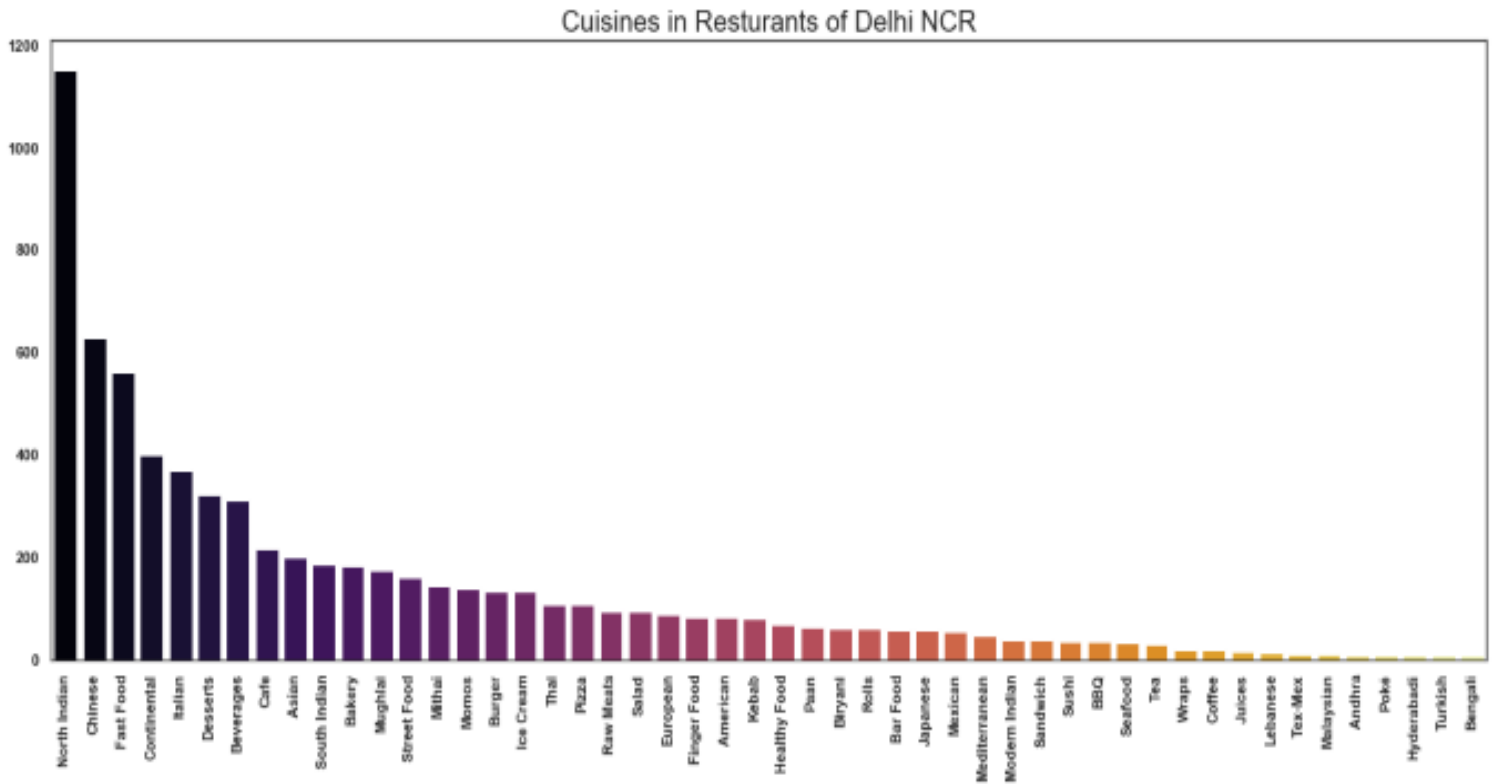
3.8 Cuisines of Restaurants

Fig.22 Count plot of various Cuisines in Restaurants in Delhi NCR

Cuisines are type of food category served by restaurants. It tells about food preferences and palette preferences of people of particular region. Since Delhi NCR is North of India so predominately North Indian Cuisines are prevalent

- The data shows most popular cuisine in Delhi NCR region is North Indian followed by Chinese and Fast Food.
- Most popular cuisine in New Delhi is North Indian followed by Chinese and Continental.
- Most popular cuisine in Gurgaon is North Indian followed by Continental and Chinese.
- Most popular cuisine in Noida is North Indian followed by Chinese and Fast Food.
- Most popular cuisine in Faridabad is North Indian followed by Fast Food and Chinese.
- Most popular cuisine in Ghaziabad is North Indian followed by Chinese and Fast Food.
- Most popular cuisine in Greater Noida is North Indian followed by Fast Food and Chinese.
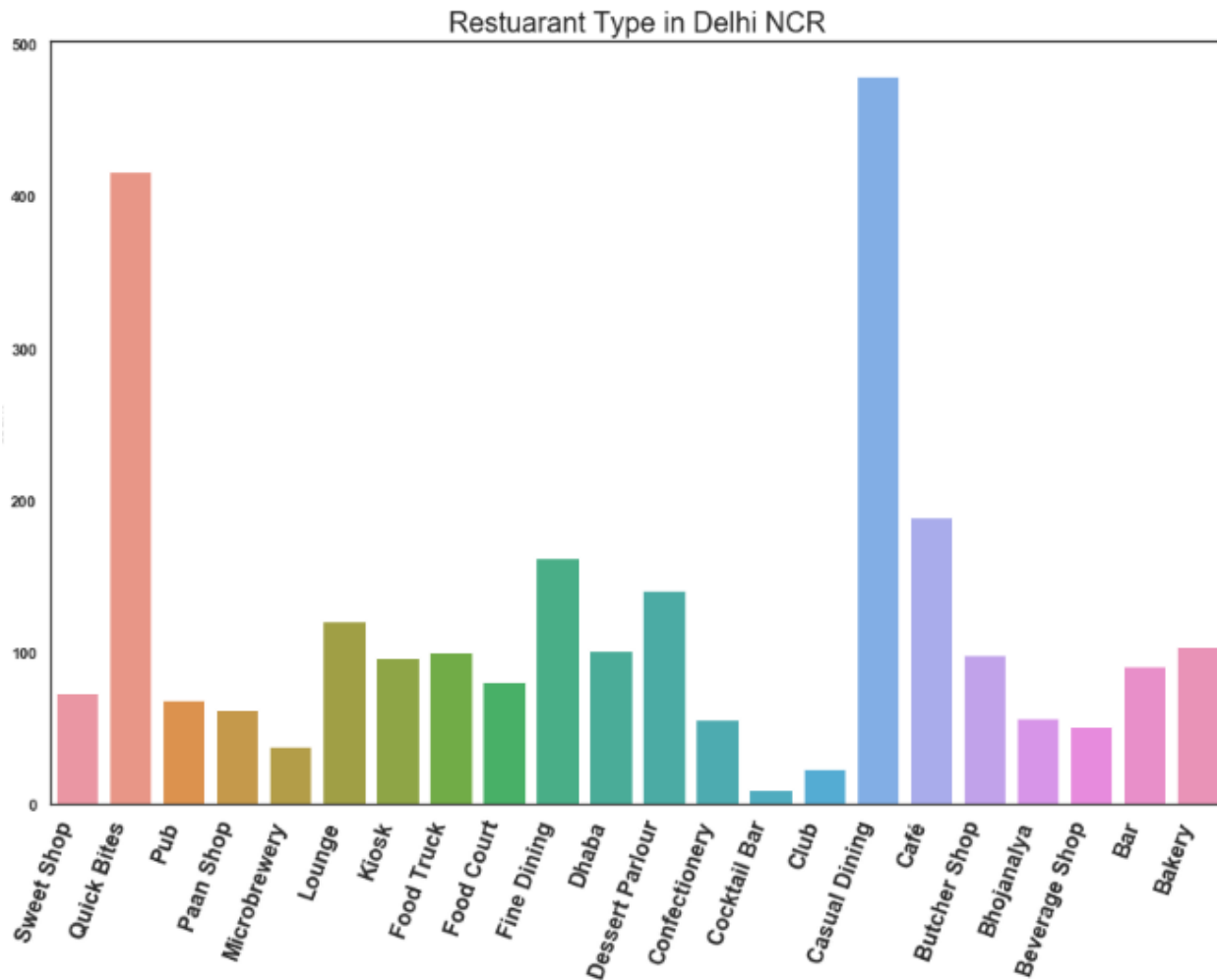
3.9 Restaurants Types

Fig.23 Count plot of Type of Restaurants in Delhi NCR

There are different types of restaurants in Delhi NCR region. Predominately Casual Dinning is most popular restaurant type across all cities of Delhi-NCR.

- The data shows most popular type of restaurant in Delhi NCR region is Casual Dinning followed by Quick Bites and Café .
- Most popular type of restaurant in New Delhi is Casual Dinning followed by Fine Dining and Quick Bites.
- Most popular type of restaurant in Gurgaon is Casual Dinning followed by Microbrewery and Pub.
- Most popular type of restaurant in Noida is Casual Dinning followed by Quick Bites and Food Truck.
- Most popular type of restaurant in Faridabad is Quick Bites followed by Fine Dining and Bhojanalya, Bakery .
- Most popular type of restaurant in Ghaziabad is Casual Dinning followed by Quick Bites and Cafe.
- Most popular type of restaurant in Greater Noida is Quick Bites followed by Kiosk, Food Truck, Café, Butcher Shop.
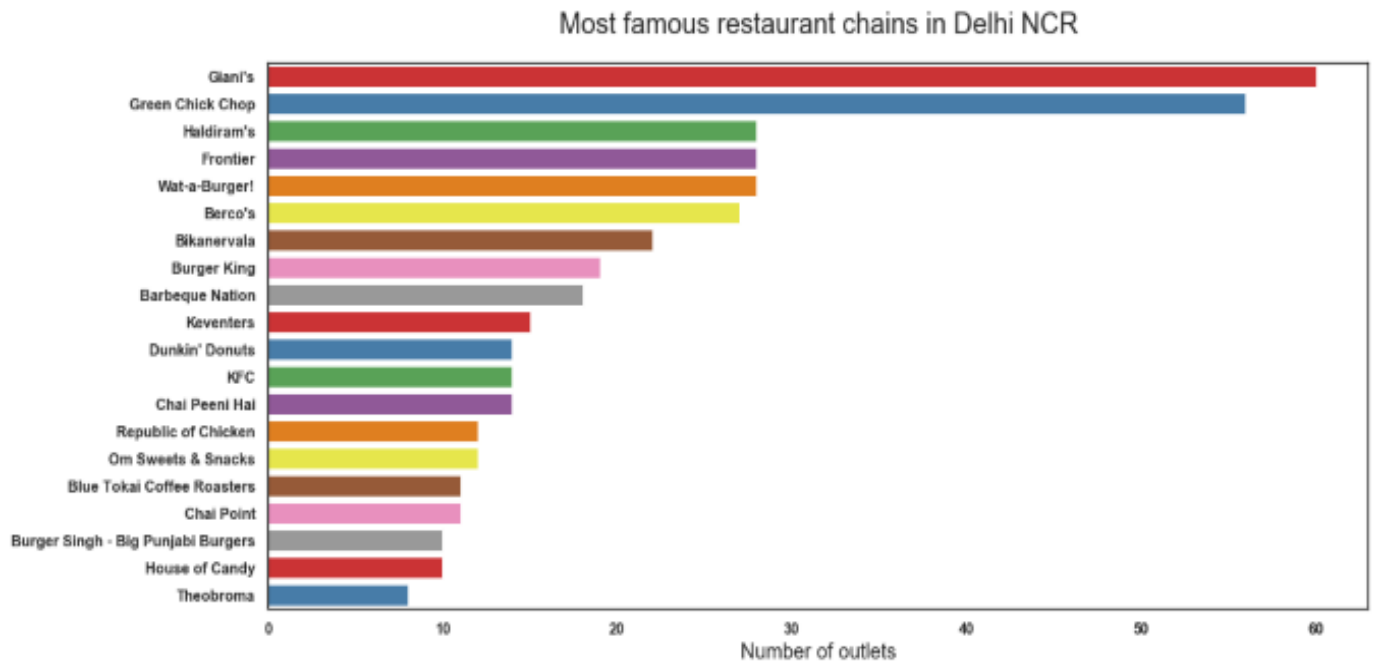
3.10   Famous Restaurant chain

Fig.24 Count plot of Restaurant chain in Delhi NCR

Restaurant Chains are restaurant by same owner or company serving similar food items

- The data shows most popular restaurant chains in Delhi NCR region is Giani's followed by Green Chick chop and Haldiram's .
- Most popular restaurant chains in New Delhi is Giani's followed by Green chick chop and Chilli's Grill & Bar.
- Most popular restaurant chains in Gurgaon is Vapour Bar Exchange followed by Om Sweets& Snacks and The Drunken Botanist.
- Most popular type of restaurant in Noida is Chilli's Grill & Bar followed by I Sacked Newton and SodaBottleOpenerWala.
- Most popular type of restaurant in Faridabad is Om Sweets & Snacks followed by Pizza Live and Paranda Vivanta by Taj.
- Most popular type of restaurant in Ghaziabad is The Flying Dutchman followed by The Mask Café & Lounge and Berco's.
- Most popular type of restaurant in Greater Noida is Faasos followed by Biryani Chaska and Delight Pizza.
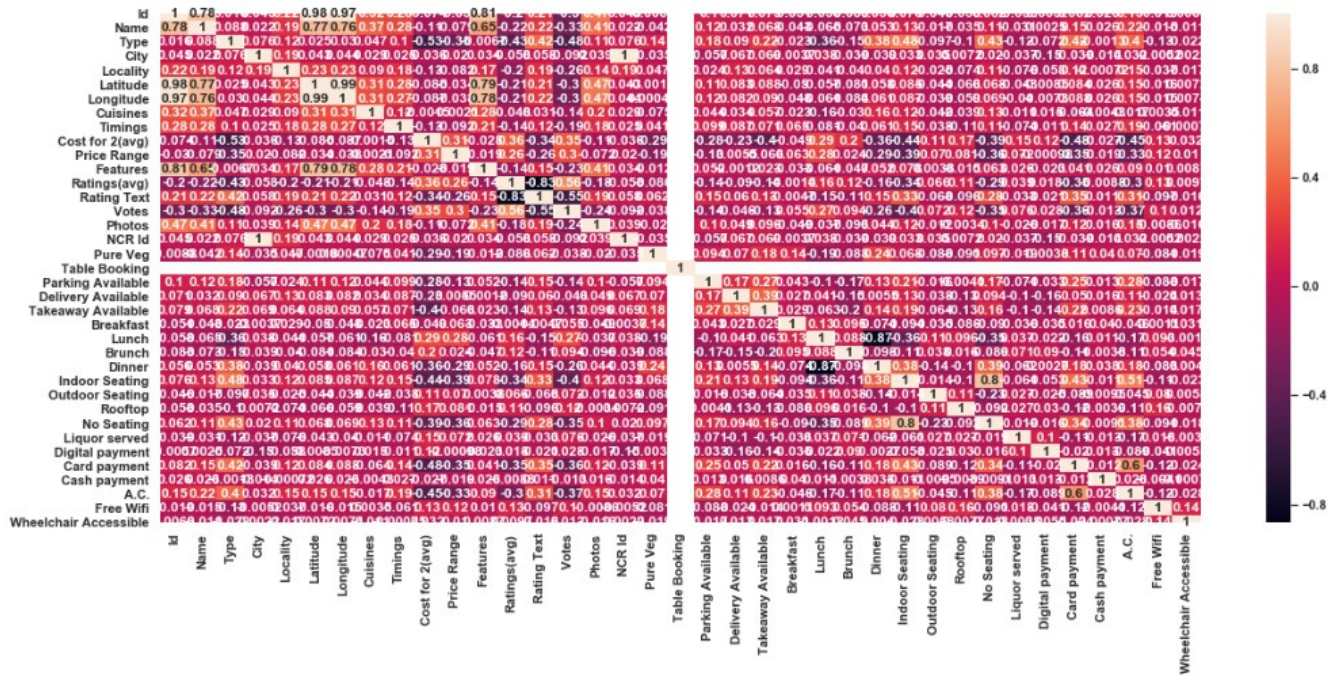
3.11 **Model Building**

Fig.25 Heat map of Kendall correlation

- Heat Map was built using Kendall correlation.
- Ratings(avg) was dependent variable which depended on various other independent variables which are:-

  Type, Locality, Latitude, 'Longitude, Cuisines, Timings, Cost for 2(avg), Price Range, Features,Rating Text, Votes, Photos, NCR Id, Pure Veg, Table Booking, Parking Available, Delivery Available, Takeaway Available, Breakfast, Lunch, Brunch, Dinner, Indoor Seating, Outdoor Seating, Rooftop, No Seating, Liquor served, Digital payment, Card payment, Cash payment,A.C., Free Wifi, Wheelchair Accessible.

- Regression Model was created to calculate R square values using Linear Regression technique and Decision Tree technique.
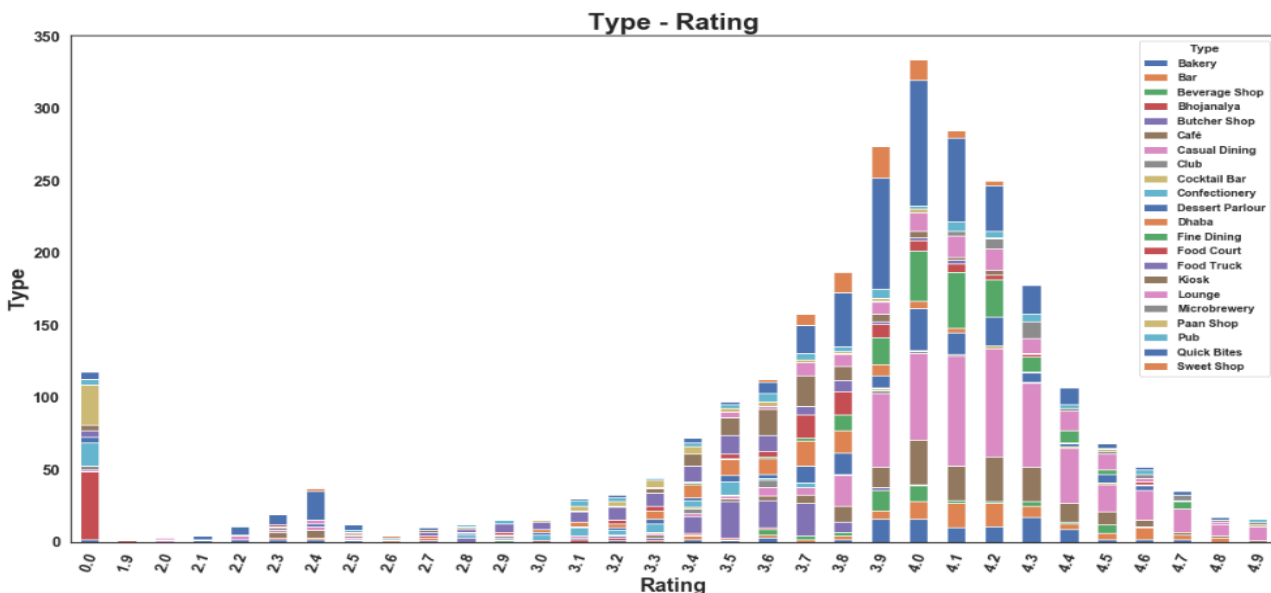- Linear Regression R-square score: 0.67
- Decision Tree R-square score: 0.98

Fig.26 Count Plot of Type and Rating created after model analysis

4 Conclusion

- Built useful models to predict Average Ratings of Restaurants.

- Created various visualizations of various parameters of Restaurants to find best possible criteria of every parameter

Parameter	Best Option/Value/City of Delhi NCR
Average cost for 2 people	₹ 400/New Delhi
Price Range	Low/New Delhi
Meal	Dinner/New Delhi
Seating	Indoor/New Delhi
Payment mode	Cash/New Delhi
Digital Payment mode	Not Available/New Delhi (Availability of Digital Payment is recommended)
Card Payment mode	Available/New Delhi
Cash Payment mode	Available/New Delhi
Table booking	Not Available/New Delhi
Delivery	Available/New Delhi
Takeaway	Available/New Delhi
Pure Veg	Not Available/New Delhi
Parking	Not Available/New Delhi (Availability of Parking is recommended)
Alcohol Serving	Not Available/New Delhi
Free Wifi	Not Available/New Delhi (Availability of Free Wifi is recommended)
Air Conditioning	Available/New Delhi
Wheelchair Accessibility	Not Available/New Delhi (Accessibility of Wheelchair is recommended)
Locality	Connaught Place/New Delhi
Rating	4.0/New Delhi
Rating Text	Very Good/New Delhi
Cuisines	North Indian/New Delhi
Type	Casual Dinning/New Delhi
Famous Restaurant Chain	Giani's/New Delhi

5 **Future Directions**

- Accuracy of the models has room for improvement.

- Capture more of Parameters of Restaurants.

- Ideas include:

    - Physical data (connectivity to various metro and bus stations, seating capacity, fire safety plan, etc.)

    - Financial data (Rent, salary of staff, raw material cost, etc.)

    - Other (Chef special menu, hospitality of staff, etc.)