

1 Discussion of Background and Problem

1.1 Background

Bangalore, officially Bengaluru, is the capital of the Indian state of Karnataka. It has a population of over ten million, making it a megacity and the third-most populous city and fifth-most populous urban agglomeration in India. It is located in southern India, on the Deccan Plateau at an elevation of over 900 m (3,000 ft) above sea level. Its multi-ethnic, multi-religious,[promotional language] and cosmopolitan character[promotional language] is reflected by its more than 1000 Hindu temples, 400 mosques, 100 churches, 40 Jain Basadis, three Sikh gurdwaras, two Buddhist viharas and one Parsi fire temple located in an area of 741 km² of the metropolis.[citation needed] The religious places are further represented by the proposed Chabad of the Jewish community. The numerous Bahá'ís have a society called the Bahá'í Centre.

Bengaluru is sometimes referred to as the "Silicon Valley of India" (or "IT capital of India") because of its role as the nation's leading information technology (IT) exporter. Indian technological organisations ISRO, Infosys, Wipro and HAL are headquartered in the city. Bangalore is the second fastest-growing major metropolis in India. Recent estimates of the metro economy of its urban area have ranked Bangalore either the fourth or fifth-most productive metro area of India. It is home to many educational and research institutions. Mysore Sandal Soap is produced in this city. The city also houses the Kannada film industry also called Sandalwood.

Delhi, city and national capital territory, north-central India. The city of Delhi actually consists of two components: Old Delhi, in the north, the historic city; and New Delhi, in the south, since 1947 the capital

of India, built in the first part of the 20th century as the capital of British India.

One of the country's largest urban agglomerations, Delhi sits astride (but primarily on the west bank of) the Yamuna River, a tributary of the Ganges (Ganga) River, about 100 miles (160 km) south of the Himalayas. The national capital territory embraces Old and New Delhi and the surrounding metropolitan region, as well as adjacent rural areas. To the east the territory is bounded by the state of Uttar Pradesh, and to the north, west, and south it is bounded by the state of Haryana.

The pattern of land use in Delhi was influenced considerably by the implementation (albeit partial) of the Delhi Development Authority's 20-year (1962–81) master plan. Broadly, public and semipublic land use was concentrated in the Central Secretariat area of New Delhi and in the Old Secretariat area in the Civil Lines, with subsidiary centres developing in the Indraprastha Estate (an office complex) in the east and in Ramakrishnapuram (an office-cum-residence complex) in the south. A large number of small manufacturing establishments have entrenched themselves in almost every part of Old Delhi, but the main industrial areas have gravitated toward Najafgarh Road in the west and the large planned Okhla Industrial Estate in the south. Land for commercial use is found mainly in the Chandni Chowk and Khari Baoli areas, both in the north; in the Sadar Bazar of Old Delhi; in the Ajmal Khan Road area of Karol Bagh in western Delhi; around Connaught Place in New Delhi; and in the areas of Lajpat Nagar and Srojni Nagar in the south. A number of district and local shopping centres have developed in other localities

1.2 Problem

This project aims to compare city of Delhi and Bangalore in India. It compares venues and location data of Delhi and Bangalore. With this we try to find how similar or dissimilar neighbourhoods of these cities are. We consider factors like types of venues like food, venues to visit. This project analyzes the neighborhoods in each of these two cities and tries to understand what is popular in them and what they have to offer to someone who is contemplating to make a choice on seeking a life in either of the metro cities.

1.3 Interest

People who would be interested in this study are those who would like to create a projection of potential life and activities in these metro city neighborhoods if the subject moves to live in one of them. Also people who would like to travel for tourism in these cities might also be interested in this project.

2) Data Acquisition and Cleaning

2.1 Data Sources

For this study, we needed data about neighborhoods in each of these metro cities. We use data published by the government on postal codes for all India. We download the CSV from following site:

<https://data.gov.in/resources/all-india-pincode-directory-contact-details-along-latitude-and-longitude>.

Here, we download the CSV, filter the csv and convert it into two parts to get csv data of Bangalore and Delhi. After this it is read it into a pandas dataframe.

2.2 Data Cleaning

We shall then clean up the unnecessary columns in the CSV, which is not relevant or useful for our current study. Post office names (**office name**) will be used as the neighborhood names. The imported dataset for delhi is shown as follows:

| | Circle Name | Region Name | Division Name | Office Name | Pincode | Office Type | Delivery | District | StateName |
|---|--------------|-------------|---------------------|------------------------------|---------|-------------|--------------|------------------|-----------|
| 0 | Delhi Circle | NaN | Delhi East Division | Anand Vihar SO | 110092 | SO | Non Delivery | EAST DELHI | Delhi |
| 1 | Delhi Circle | NaN | Delhi East Division | Azad Nagar SO East Delhi | 110051 | SO | Non Delivery | SHAHDARA | Delhi |
| 2 | Delhi Circle | NaN | Delhi East Division | Babarpur SO North East Delhi | 110032 | SO | Non Delivery | SHAHDARA | Delhi |
| 3 | Delhi Circle | NaN | Delhi East Division | Badarpur Khadar BO | 110090 | BO | Non Delivery | NORTH EAST DELHI | Delhi |
| 4 | Delhi Circle | NaN | Delhi East Division | Balbir Nagar SO | 110032 | SO | Non Delivery | SHAHDARA | Delhi |

We now see that there are the same *Pincode* values for different neighborhoods. Neighborhood names with the same **Pincode** will be combined as a single row by pandas groupby() function.

The first few records of the dataset we now have after this cleanup and curation appear as below.

Out[100]:

| | Pincode | Neighborhood | District |
|---|---------|---|---------------|
| 0 | 110001 | Baroda House SO,Bengali Market SO,Bhagat Singh... | CENTRAL DELHI |
| 1 | 110002 | AGCR EXTENSION COUNTER,AGCR SO,Ajmeri Gate Ext... | CENTRAL DELHI |
| 2 | 110003 | Delhi High Court Extension Counter SO,Delhi Hi... | CENTRAL DELHI |
| 3 | 110004 | Rashtrapati Bhawan SO | CENTRAL DELHI |
| 4 | 110005 | Anand Parbat Indl Area SO,Anand Parbat SO,Bank... | CENTRAL DELHI |

The next step is to add the the required information to dataset. We need the longitude and latitude values for the neighborhoods. We use the *Nominatim* library from *geocoders.geopy* package to find the longitude and latitude for each of the neighborhoods and then we add these to the original dataset.

Out[109]:

| | Pincode | Neighborhood | District | Latitude | Longitude |
|---|---------|---|---------------|-----------|-----------|
| 0 | 110001 | Baroda House SO,Bengali Market SO,Bhagat Singh... | CENTRAL DELHI | 28.698548 | 77.219391 |
| 1 | 110002 | AGCR EXTENSION COUNTER,AGCR SO,Ajmeri Gate Ext... | CENTRAL DELHI | 28.698548 | 77.219391 |
| 2 | 110003 | Delhi High Court Extension Counter SO,Delhi Hi... | CENTRAL DELHI | 28.698548 | 77.219391 |
| 3 | 110004 | Rashtrapati Bhawan SO | CENTRAL DELHI | 28.698548 | 77.219391 |
| 4 | 110005 | Anand Parbat Indl Area SO,Anand Parbat SO,Bank... | CENTRAL DELHI | 28.698548 | 77.219391 |

Similarly we import and clean the data for bangalore.

| | Pincode | Neighborhood | District | Latitude | Longitude |
|---|---------|---|-----------|----------|-----------|
| 0 | 560001 | Bengaluru G.P.O.,CMM Court Complex S.O,Dr. Amb... | BENGALURU | 12.97912 | 77.5913 |
| 1 | 560002 | Bengaluru Corporation Building S.O,Bengaluru C... | BENGALURU | 12.97912 | 77.5913 |
| 2 | 560003 | Malleswaram S.O,Palace Guttahalli S.O,Swimming... | BENGALURU | 12.97912 | 77.5913 |
| 3 | 560004 | Basavanagudi H.O,Gaviopuram Extension S.O,Mava... | BENGALURU | 12.97912 | 77.5913 |
| 4 | 560005 | Fraser Town S.O | BENGALURU | 12.97912 | 77.5913 |

Thus at end we have two datasets ,i.e., for Bangalore and delhi. Thus now we have the required dataset to analyse neighborhoods and now we can start to analyse our data with Foursquare API.

3 Methodology

3.1 Using Foursquare API

We use the **Foursquare API** to get the venues of each Neighborhood in Delhi and Bangalore. The Foursquare API allows application developers to interact with the Foursquare

platform. The API itself is a RESTful set of addresses to which you can send requests, so there's really nothing to download onto your server. Foursquare API returns the following response as the popular venues close to 500m radius of this neighbourhood. These venues form the basis on our comparison.

We will also use the Foursquare API to find the Top Picks venues in Delhi and Mumbai. This will help us in understanding the nature of life Delhi neighborhoods have to offer.

3.2 Using One Hot Encoding

We want to cluster our dataset so we use one hot encoding to convert the categories column of venues to dummy variables so that we can analyse and cluster our data by kmeans clustering algorithm.

3.3 Using KMeans Clustering

We seek to compare cities of Delhi and Bangalore on basis of their lifestyle and checking on venues of these two cities can tell us about how the lifestyle will be in these cities.

We then use the extracted dataset of venues for each neighborhood to **cluster** neighborhoods based on venues types. We use KMeans clustering. KMeans Clustering is a partitioning clustering that divides data into k non overlapping subsets or clusters without any clustered internal structure or labels.

3.4 Using Folium to display maps

We use folium library to display the clusters on map of Delhi and Bangalore. Through this we can analyse how our clusters are divided based on boroughs or division of the city like South Delhi, North Delhi.

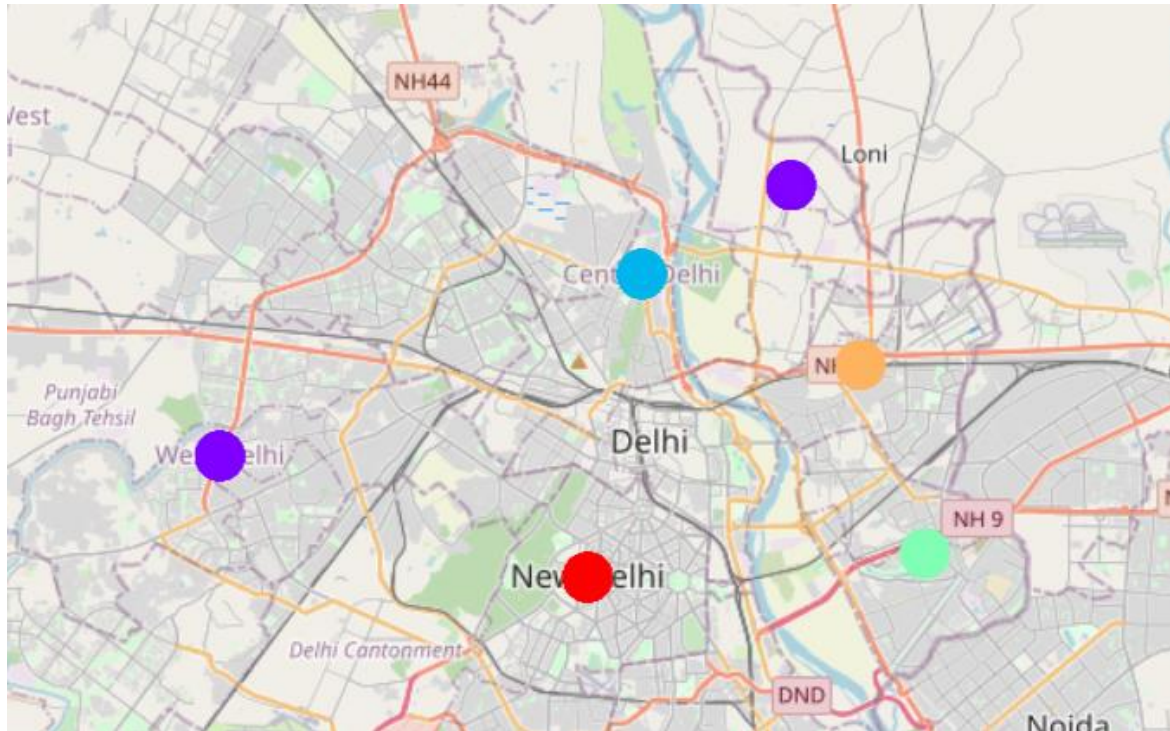
4) Results

4.1) Analysis of Venues of Delhi

We use Foursquare API to get the venues and then we extract the required data and then convert the categories to dummy variables by process of one hot encoding. Then we use this dataset to cluster our dataset on basis of top 5 most common venues.

| | Pincode | Neighborhood | District | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|---|---------|---|---------------|-----------|-----------|----------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|
| 0 | 110001 | Baroda House SO,Bengali Market SO,Bhagat Singh... | CENTRAL DELHI | 28.698548 | 77.219391 | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 1 | 110002 | AGCR EXTENSION COUNTER,AGCR SO,Ajmeri Gate Ext... | CENTRAL DELHI | 28.698548 | 77.219391 | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 2 | 110003 | Delhi High Court Extension Counter SO,Delhi Hi... | CENTRAL DELHI | 28.698548 | 77.219391 | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 3 | 110004 | Rashtrapati Bhawan SO | CENTRAL DELHI | 28.698548 | 77.219391 | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 4 | 110005 | Anand Parbat Indl Area SO,Anand Parbat SO,Bank... | CENTRAL DELHI | 28.698548 | 77.219391 | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |

After this we plot the dataset on map of Delhi which is shown as follows:



Cluster 1: red colour, Cluster 2: purple colour, Cluster 3: blue colour, Cluster 4: Green colour, Cluster 5: Orange Colour

Then we explore our clusters.

Cluster 1

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|------------------------------|---|----------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|
| 5 | Delhi GPO,Baratooti SO,Chandni Chowk SO,Chawri... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 6 | Delhi University SO,Gulabi Bagh SO,Jawahar Nag... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| output; double click to hide | gar SO,G T B Nagar extension SO,G... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 13 | R K Puram Sect1 SO,R K Puram Sect12 SO,R K Pur... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 14 | Kidwai Nagar East SO,Kidwai Nagar West SO,Laxm... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 19 | Adrash Nagar SO,Bhalaswa BO,Jahangir Puri A Bl... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 20 | Anandvas Shakurpur SO,Maurya Enclave SO,Rani B... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 21 | C4 Keshav Puram SO North West Delhi,Ganeshpura... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 22 | Alipur SO,Bakhtawar Pur BO,Bakoli BO,Hiranki B... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 23 | Gurgaon Road SO,IGI Airport SO,Mahipalpur BO,N... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 24 | A F Rajokari SO,Rajokari BO | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 25 | Auchandi BO,Barwala BO,Bawana SO,Ghoga BO,Hare... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 26 | Bankner BO,Bhorgarh BO,Kanya Gurukul BO,Lampur... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 28 | Badli SO North West Delhi,Delhi Engg College S... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 31 | Ashok Vihar HO,Nimri SO,Satyawati Nagar SO,Sha... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 33 | Aruna Nagar SO,Civil Lines SO North Delhi,Dist... | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |
| 35 | Shakur Basti Depot SO | 0.0 | Museum | Garden | Vegetarian / Vegan Restaurant | Platform | Park |

From map we see that this cluster (red colour) lies in New Delhi area. This cluster has museums, gardens, parks and restaurants as most common venues. This area is good place for someone who loves history, arts and nature.

Cluster 2

1 *

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|---|----------------|-----------------------|-------------------------------|-------------------------------|-----------------------|-----------------------|
| 11 | ESI S.O,Karam Pura S.O,L. M. Nagar Indl. Area ... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 12 | Ashok Nagar S.O (West Delhi),Chand Nagar S.O,C... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 15 | Ashoka Park Extn. S.O,Punjabi Bagh S.O,Punjabi... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 16 | Janta Market S.O,Rajouri Garden J 6 S.O,Rajour... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 27 | Bakkarwala B.O,Hirankudna B.O,Kunwar Singh Nag... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 29 | Arjun Park PO,Baprola B.O,Daulatpur B.O,Dichau... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 37 | D.E.S.U. Colony S.O,Jail Road S.O (West Delhi)... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 38 | D. K. Mohan Garden S.O,Hastal Village B.O,Jeev... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 40 | Jawala Heri B.O,Madipur Slum Quarter S.O,Madip... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 41 | Hari Nagar BE Block S.O,Hari Nagar Dadb Block ... | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 47 | Burari SO,Jagatpur BO,Jharoda Majraa BO,Nathup... | 1.0 | ATM | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 50 | Jwala Puri S.O,Peeragarhi B.O,Sunder Vihar S.O | 1.0 | Bakery | ATM | Vegetarian / Vegan Restaurant | Platform | Park |
| 53 | Badarpur Khadar BO,Karawal Nagar SO,Khajoori K... | 1.0 | ATM | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 56 | Harsh Vihar SO,Housing Complex Loni Road SO,Ma... | 1.0 | ATM | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 57 | Dayalpur BO,Gokal Puri SO,Johripur BO | 1.0 | ATM | Vegetarian / Vegan Restaurant | Platform | Park | Museum |

We see this cluster has many bakery, ATM, Restaurant, Platforms and Parks. This area lies in north east Delhi on seeing the map (purple colour) .

Cluster 3

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|--|----------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|
| 0 | Baroda House SO,Bengali Market SO,Bhagat Singh... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 1 | AGCR EXTENSION COUNTER,AGCR SO,Ajmeri Gate Ext... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 2 | Delhi High Court Extension Counter SO,Delhi Hi... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 3 | Rashtrapati Bhawan SO | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 4 | Anand Parbat Indl Area SO,Anand Parbat SO,Bank... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 7 | Dada Ghosh Bhawan SO,Patel Nagar East SO,Patel... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 9 | Nirman Bhawan SO,Udyog Bhawan SO | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 10 | IARI SO,Inderpuri SO,National Physical Laborat... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 34 | AKMarket SO,Multani Dhandra SO,Pahar Ganj SO,SR... | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 39 | Rajender Nagar SO | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |
| 43 | Union Public Service Commission SO | 2.0 | Park | Cosmetics Shop | Vegetarian / Vegan Restaurant | Platform | Museum |

We see this clusters has many parks, cosmetics shop, restaurants, museum and railway platform. On seeing the map (Blue colour) we find this cluster lies in north Delhi which is known for large number of colleges.

Cluster 4

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|--|----------------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------------|
| 17 | Gandhi Nagar Bazar SO,Gandhi Nagar SO East Del... | 3.0 | Gym | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 54 | Chilla BO,Himmatpuri SO,Kalyanpuri SO,Kalyanva... | 3.0 | Gym | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 55 | Anand Vihar SO,IP Extension SO,Laxmi Nagar Ext... | 3.0 | Gym | Vegetarian / Vegan Restaurant | Platform | Park | Museum |
| 59 | Ghazipur BO,Mayur Vihar Philli SO,Vasundhra Enc... | 3.0 | Gym | Vegetarian / Vegan Restaurant | Platform | Park | Museum |

This area has many gyms, parks, restaurant, museum and railway platform. Seeing from map(Green colour) this cluster lies in mayor vihar area of Delhi.

Cluster 5

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|---|----------------|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 18 | Babarpur SO North East Delhi,Balbir Nagar SO,B... | 4.0 | Vegetarian / Vegan Restaurant | Platform | Light Rail Station | Gift Shop | Park |
| 30 | Azad Nagar SO East Delhi,Govind Pura SO,Krishn... | 4.0 | Vegetarian / Vegan Restaurant | Platform | Light Rail Station | Gift Shop | Park |
| 32 | Bhajan Pura SO,Brahampuri SO,Garhi Mandu BO,Ja... | 4.0 | Vegetarian / Vegan Restaurant | Platform | Light Rail Station | Gift Shop | Park |
| 58 | Dilshad Garden SO,GTB Hospital SO,Jhilmil HO,J... | 4.0 | Vegetarian / Vegan Restaurant | Platform | Light Rail Station | Gift Shop | Park |

This area has restaurants, shops parks and railway stations as most common venues. From map we see that this lies in east delhi area.

4.2) Analysis of top fun venues in Delhi

We find the top venues in Delhi and then we analyse it to find the top fun venues in Delhi. Starting dataset of top fun places is shown below which is found by using Foursquare API.

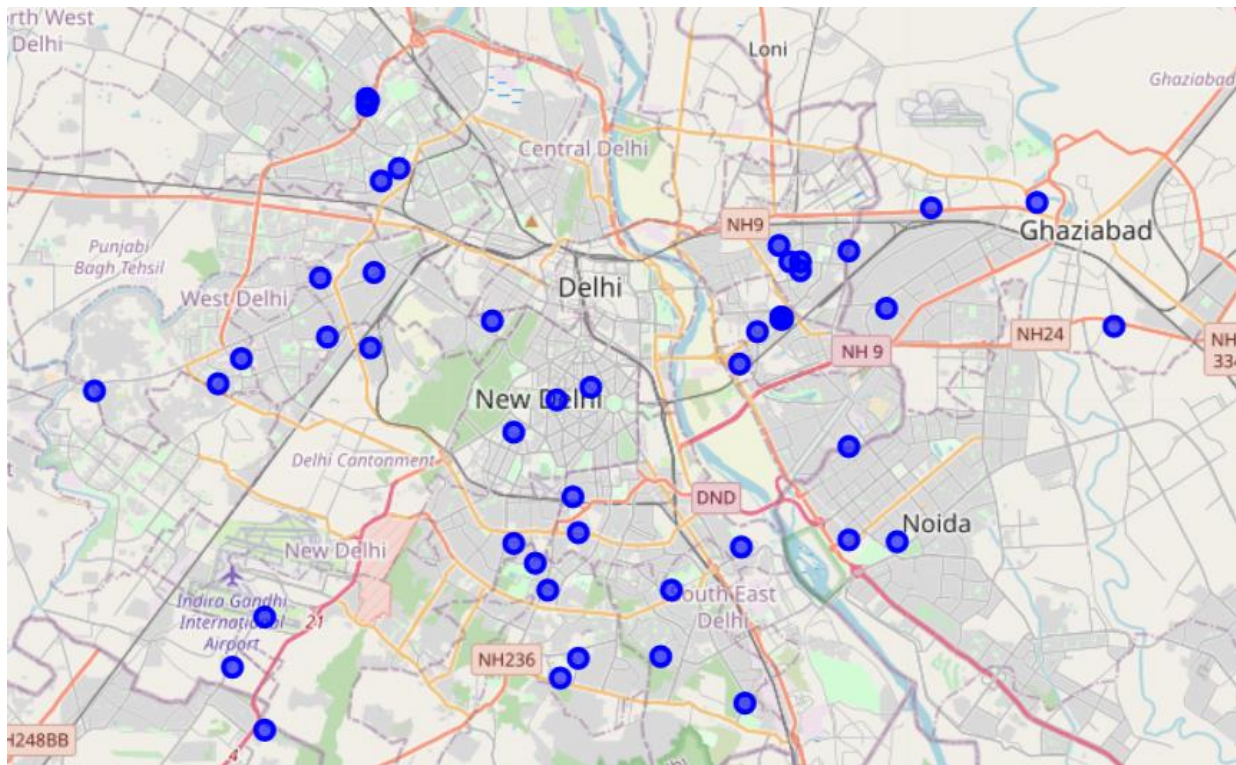
| | name | categories | address | cc | city | country | crossStreet | distance | formattedAddress | labeledLatLngs | lat | lng |
|---|--------------|-------------|----------------|----|-----------|---------|-------------------------------------|----------|---|---|-----------|-----------|
| 0 | Fun Cinema | Multiplex | moti nagar | IN | New Delhi | India | NaN | 8099 | [moti nagar, New Delhi, Delhi, India] | [{"label": "display", "lat": 28.65684246613703... | 28.656842 | 77.139228 |
| 1 | Fun Cinemas | Multiplex | Plot No. 9B 9C | IN | New Delhi | India | Central Business District, Shahdara | 7876 | [Plot No. 9B 9C (Central Business District, Sh... | [{"label": "display", "lat": 28.65754482513052... | 28.657545 | 77.302301 |
| 2 | Fun | Other Event | Dwarka | IN | Delhi | India | Dwarka | 6111 | [Dwarka (Dwarka), Delhi 110001, Delhi, India] | [{"label": "display", "lat": 28.60328692048269... | 28.603287 | 77.192484 |
| 3 | Fun republic | Ski Area | NaN | IN | NaN | India | NaN | 6250 | [India] | [{"label": "display", "lat": 28.62610042123082... | 28.626100 | 77.278865 |
| 4 | Fun Cinemas | Multiplex | V3S Mall | IN | New Delhi | India | Nirman Vihar | 6468 | [V3S Mall (Nirman Vihar), New Delhi 110092, De... | [{"label": "display", "lat": 28.63696070493917... | 28.636961 | 77.285980 |
| 5 | Fun Cinemas | Multiplex | Pitampura | IN | Delhi | India | Netaji Subhash Place | 8428 | [Pitampura (Netaji Subhash Place), Delhi 11003... | [{"label": "display", "lat": 28.69185181838334... | 28.691852 | 77.148766 |

Then we find counts of unique fun venues on basis of their categories.

```
Out[72]: categories
Multiplex          9
Office             4
Water Park         3
Indoor Play Area   3
Arcade             2
Clothing Store     2
Movie Theater      2
Shopping Mall      2
Wedding Hall       1
Medical Center     1
Name: categories, dtype: int64
```

We see that it has large number of multiplex. Delhi also has Venues like water parks, arcade, movie theatres and shopping malls.

We also plot the fun places on Delhi map.

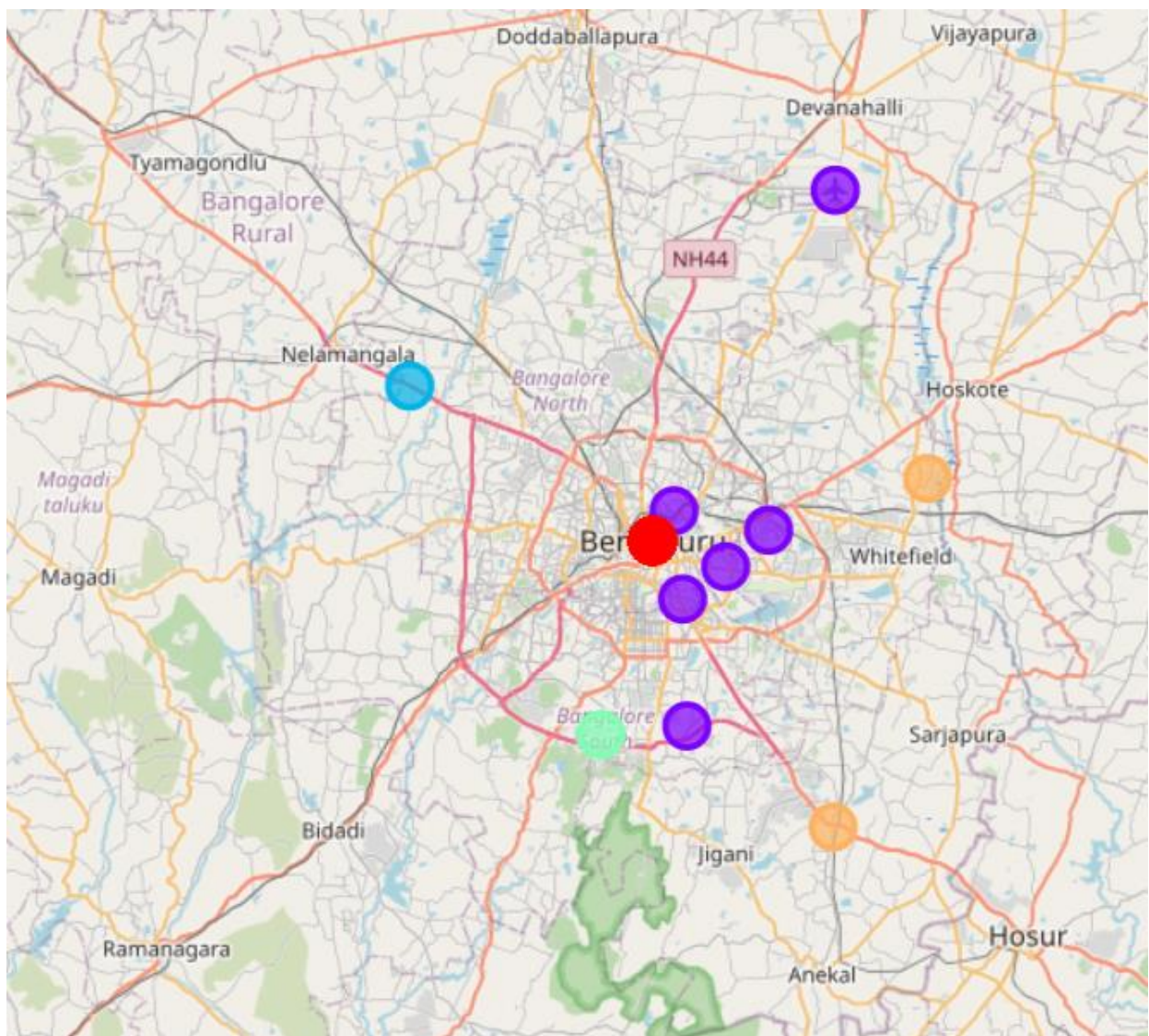


4.3) Analysis of Venues of Bangalore

We use Foursquare API to get the venues and then we extract the required data and then convert the categories to dummy variables by process of one hot encoding. Then we use this dataset to cluster our dataset on basis of top 5 most common venues.

| | Pincode | Neighborhood | District | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|---|---------|---|-----------|----------|-----------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 0 | 560001 | Bengaluru G.P.O.,CMM Court Complex S.O,Dr. Amb... | BENGALURU | 12.97912 | 77.5913 | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 1 | 560002 | Bengaluru Corporation Building S.O,Bengaluru C... | BENGALURU | 12.97912 | 77.5913 | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 2 | 560004 | Basavanagudi H.O,Gaviopuram Extension S.O,Mava... | BENGALURU | 12.97912 | 77.5913 | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 3 | 560005 | Fraser Town S.O | BENGALURU | 12.97912 | 77.5913 | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 4 | 560007 | Air Force Hospital S.O | BENGALURU | 12.97912 | 77.5913 | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |

After this we plot the dataset on map of bangalore which is shown as follows:



Key:

Red: Cluster 1 , Purple: Cluster 2, Light Blue: Cluster 3, Light Orange Cluster 4, Light Green: Cluster 5

Then we explore our clusters.

Cluster 1

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|---|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 0 | Bengaluru G.P.O.,CMM Court Complex S.O,Dr. Amb... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 1 | Bengaluru Corporation Building S.O,Bengaluru C... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 2 | Basavanagudi H.O,Gaviopuram Extension S.O,Mava... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 3 | Fraser Town S.O | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 4 | Air Force Hospital S.O | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 5 | Bengaluru Dist Offices Bldg S.O,K. G. Road S.O | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 6 | Doorvaninagar S.O,Krishnarajapuram R S S.O,Ram... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 7 | Chamrajpet S.O (Bengaluru), Goripalya SO | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 8 | Anandanagar S.O,H A Farm S.O,Hebbal Kempapura S.O | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 9 | CMP Centre And School S.O,Museum Road S.O,Rich... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 10 | Deepanjalinagar S.O,Governmemnt Electric Facto... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 11 | Dharmaram College S.O,Tavarekere S.O | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |
| 13 | Agara B.O,Koramangala I Block S.O,Koramangala ... | 0.0 | Park | Hotel | Capitol Building | Metro Station | Dhaba |

We see that this cluster has parks, hotels, metro station and dhabas as most common venues. Also we find that in map this cluster(red color) is located in central Bangalore. Hence it is natural to have hotels, dhaba and metros as most common venues in this cluster. Also we see that there are many parks in this area.

Cluster 2

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|-------------------------------------|----------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 12 | Adugodi S.O | 1.0 | Ice Cream Shop | Playground | Athletics & Sports | Café | Bus Station |
| 20 | Benson Town S.O | 1.0 | Café | Asian Restaurant | Intersection | Bakery | Vietnamese Restaurant |
| 28 | Chamrajpet S.O | 1.0 | Indian Restaurant | Café | Vietnamese Restaurant | Restaurant | Chinese Restaurant |
| 44 | C V Raman Nagar S.O | 1.0 | Indian Restaurant | Pizza Place | Park | Café | Department Store |
| 49 | Begur | 1.0 | Fruit & Vegetable Store | Playground | Bus Station | Dhaba | Clothing Store |
| 52 | Bengaluru International Airport S.O | 1.0 | Airport Service | Coffee Shop | Café | Beer Bar | French Restaurant |

This cluster has many different types of common venues like Restaurants, Café Bar, Cloth shops, department store and playground. On seeing the map (purple colour) we find it located near central Bangalore. This cluster neighbourhoods represent a typical neighbourhood in Metro cities with large variety of venues.

Cluster 3

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|----------------|----------------|-------------------------|-------------------------|-----------------------|-----------------------|-----------------------|
| 60 | Dasanapura B.O | 2.0 | North Indian Restaurant | Fruit & Vegetable Store | Chinese Restaurant | Clothing Store | Coffee Shop |

This cluster has mostly restaurant, vegetable shops and cloth shop and no hotels and Café. In Map we see that this cluster lies in outskirts of the main city.

Cluster 4

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|----------------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 48 | Anjanapura S.O | 3.0 | Pool | Vietnamese Restaurant | Chettinad Restaurant | Clothing Store | Coffee S |

This Cluster has pool has most common venue along with different cuisine restaurants. This cluster lies far from centre of Bangalore and offers different types of venues which might have been different to set up in crowded main part of city.

Cluster 5

| | Neighborhood | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|----------------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 40 | Chandapura S.O | 4.0 | Asian Restaurant | Department Store | Vietnamese Restaurant | Doner Restaurant | Clothing Store |
| 47 | Bellandur S.O | 4.0 | Department Store | Kids Store | Flower Shop | Asian Restaurant | Vietnamese Restaurant |

This cluster has mostly departmental stores and multi cuisine restaurants. From map we see it lies litter far away from main Bangalore which might have had space to set up big departmental stores without compromising on distance from main Bangalore.

4.4) Analysis of top fun venues in Bangalore

We find the top venues in Bangalore and then we analyse it to find the top fun venues in Bangalore. Starting dataset of top fun places is shown below which is found by using Foursquare API.

| | name | categories | address | cc | city | country | crossStreet | distance |
|---|--------------------------------|-------------------|--------------------|----|-----------|---------|-----------------|----------|
| 0 | Fun Cinemas | Multiplex | Sigma Mall | IN | Bangalore | India | Cunningham Rd. | 1091 |
| 1 | Fun Travel Deals | Travel Lounge | Tank Bund Road | IN | Bangalore | India | NaN | 79 |
| 2 | Fun cinemas | Movie Theater | NaN | IN | NaN | India | NaN | 1031 |
| 3 | Vangal - Worldwide HQ of FUN | Tech Startup | NaN | IN | NaN | India | NaN | 1195 |
| 4 | Fun Zone at Phoenix MarketCity | Gaming Cafe | Phoenix MarketCity | IN | Bangalore | India | Whitefield Road | 11575 |
| 5 | Fun World, Near TV Tower | Recreation Center | Near TV Tower | IN | Bangalore | India | NaN | 3239 |

Then we find counts of unique fun venues on basis of their categories.

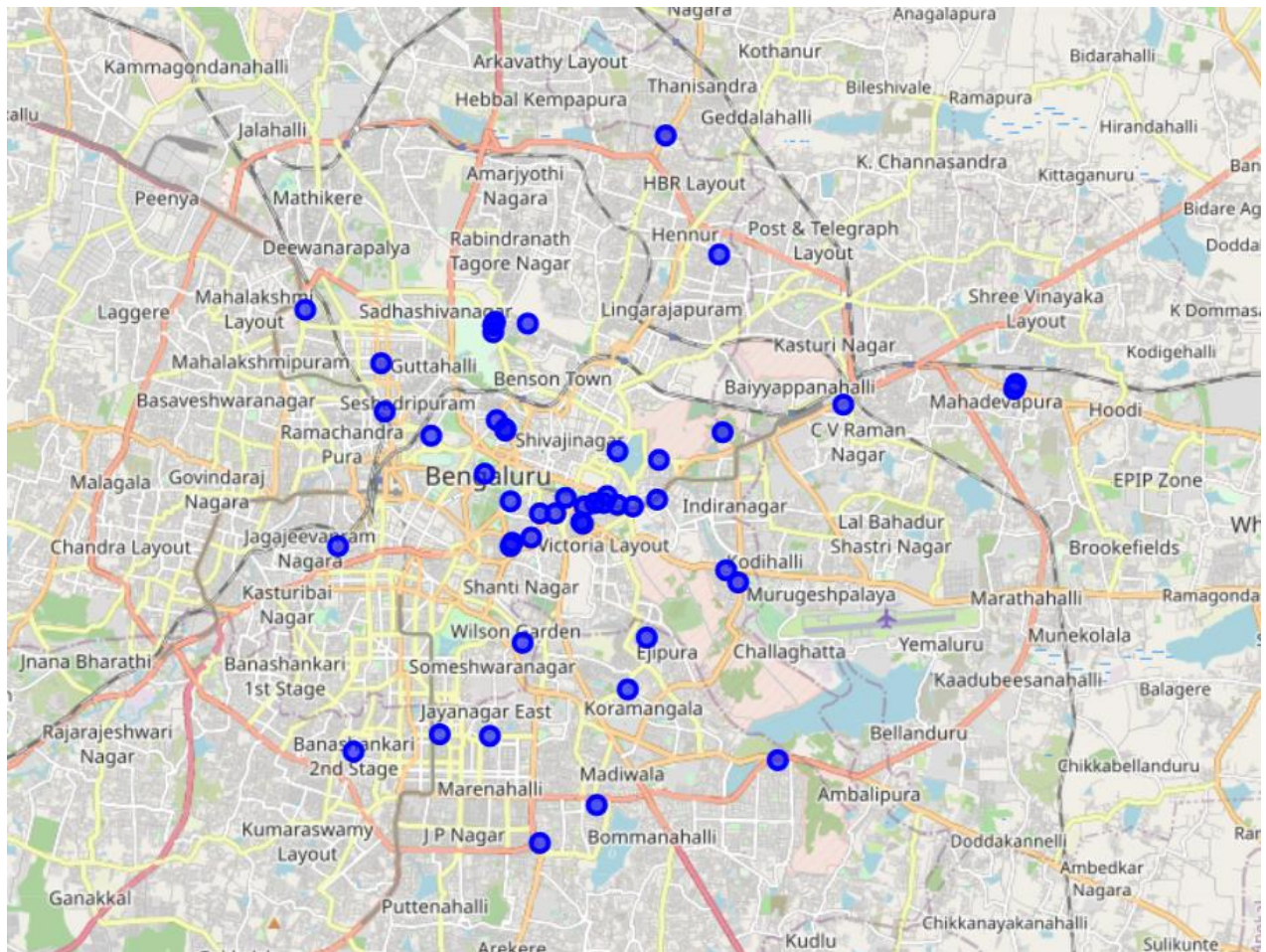
```

Theme Park          3
Recreation Center   3
Gaming Cafe         2
Arcade              2
Bowling Alley       2
General Entertainment 2
Movie Theater       2
Indoor Play Area    2
Indian Restaurant   2
Comfort Food Restaurant 1
Gym / Fitness Center 1
Travel Lounge       1
Surf Spot           1
Name: categories, dtype: int64

```

We see that there are large number of different types of venues to have fun like Theme park, Recreation Centre, Gaming Café, Bowling Alley, Movie Theatre, Gyms and Restaurants.

We also plot the fun places on map of Bangalore.



5) Discussion Section

Given our cluster information for both Bangalore and Delhi, we see that Bangalore and its neighbourhoods are a great place for a foodie with large number of restaurants. Delhi neighborhoods are good for those who like Arts and Crafts, Museums, Water Parks and Pizza places. There is very less in terms of foreign cuisine restaurants in Delhi. Bangalore, on the other hand, has many different types of fun venues like Theme park, Recreation Centre, Gaming Café, Bowling Alley while Delhi has less of them. Delhi is inland and its neighbourhoods have proximity to

Water Parks, Museums and Arts, and Crafts stores. Also we find that Delhi has many railway platforms unlike Bangalore which may prove to be a source of noise pollution and crowded place to its neighbourhoods.

6) Conclusion

In this projects we compared city of Delhi and Bangalore in India. It compares venues and location data of Delhi and Bangalore. With this we try to find how similar or dissimilar neighbourhoods of these cities are. We consider factors like types of venues like food, venues to visit. This project analyses the neighbourhoods in each of these two cities and tries to understand what is popular in them and what they have to offer to someone who is contemplating to make a choice on seeking a life in either of the metro cities.

After analysis we find that Delhi has many museums, parks and is a place historic significance. It has good connectivity of railways.

Bangalore does not have many historic significance venues.

Bangalore has many different categories of venues to offers in comparison to Delhi. Both cities are great for food lovers.

Bangalore has better climate and Delhi has extremes of weather.

These things can also be considered for comparing the two cities.

Hence, if someone who loves art, museum and historic places may find Delhi better. While someone who loves to visit different types of venues and is not interested in museums, parks and historic places may find Bangalore better.