Analyzing different Neighbourhoods of New Delhi and finding the best place to start an Italian Restaurant

1. Introduction

1.1. Background

New Delhi is the capital city of India. The city itself has a population of 257,803. However, the much larger metro area has a population that exceeds 26 million. With its diverse culture, comes diverse food items. There are many restaurants in New Delhi, each belonging to different categories like Chinese, Italian, French, Mughlai, North Indian etc.

1.2. The Idea

So in this project, I would need to list and visualize all major parts of the city and find out which part is the go-to place for Italian food so that a future restaurateur who wants to open a Italian cuisine restaurant can find the best part of the city in which the demand for Italian cuisine is very high.

I would need to use Foursquare API to get the location data on nearby venues and their longitudes and other information to make a good analysis of the data that I have and create an efficient cluster model.

Questions a future restaurateur might ask if he/she were to open an Italian cuisine restaurant in New Delhi

- Which neighbourhoods have greater number of restaurants?
- Which neighbourhoods have fewer number of restaurants?
- What neighbourhoods has greater demand for Italian Cuisine?

2. Data acquisition and cleaning

2.1. Data sources

For this project we need the following data:

Delhi Neighbourhood Dataset that contains a list of sort Borough, Neighbourhood, latitude and longitude.

Data source: Delhi Neighbourhood Dataset

Dataset: https://www.kaggle.com/shaswatd673/delhi-neighbourhood-data

This data set contains the required information. And we will use this data set to explore various neighbourhoods of New Delhi city.

Nearby places in each locality of New Delhi city.

Data source: Foursquare API: https://developer.foursquare.com/

By using this API, we can get all the venues info including longitudes and latitudes, reviews and ratings of each venues in the neighbourhood.

2.2. Approach

•Collect the necessary the New Delhi city data from Delhi Neighbourhood Dataset that was downloaded from Kaggle

•Using Foursquare API, we will find all venues for each neighbourhood.

•Filter out all venues that are nearby by the neighbourhood.

•Cluster the neighbourhoods and find the best neighbourhoods in the cluster for opening an Italian Restaurant

•Visualize the neighbourhoods clusters using folium library on a map

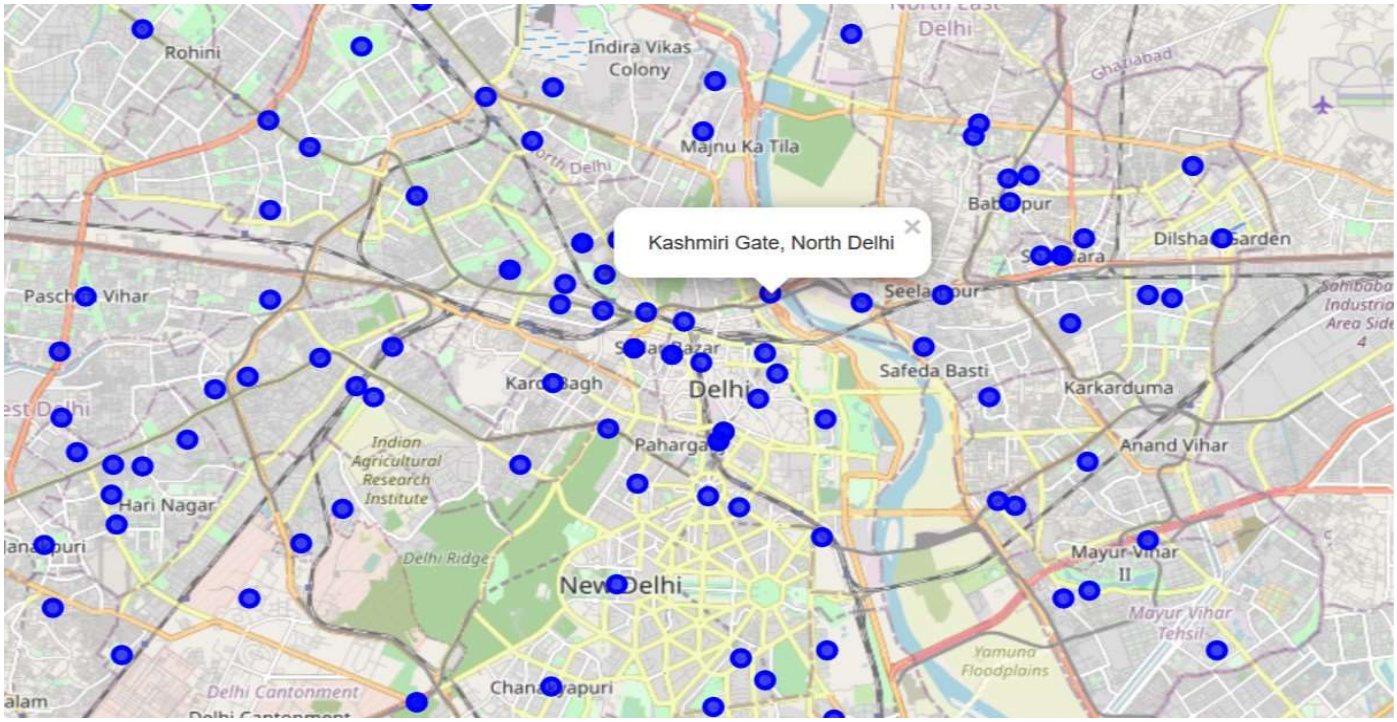
2.3. Data cleaning

After reading the CSV file into a data frame which contains the neighbourhood data of New Delhi, I cleaned the data frame by dropping unnecessary columns and removed Null records or records which had missing values.

The dataset had had 184 records of neighbourhood with longitudes and latitudes. Some of the coordinates were either missing or wrong, so I fixed them by adding correct coordinates.

3. Exploratory Data Analysis

From the map of the New Delhi that I visualized using the folium library, I could observe the different neighbourhoods of New Delhi.



I used the Silhouette Coefficient Method to find the optimal numbers of clusters.

```
For n_clusters = 2 The average silhouette_score is : 0.34537089756093425
For n_clusters = 3 The average silhouette_score is : 0.36161721119535284
For n_clusters = 4 The average silhouette_score is : 0.10731621632154915
For n_clusters = 5 The average silhouette_score is : 0.06852709610470177
For n_clusters = 6 The average silhouette_score is : 0.08850006684555536
For n_clusters = 7 The average silhouette_score is : 0.05839751089096266
For n_clusters = 8 The average silhouette_score is : 0.042941022532143075
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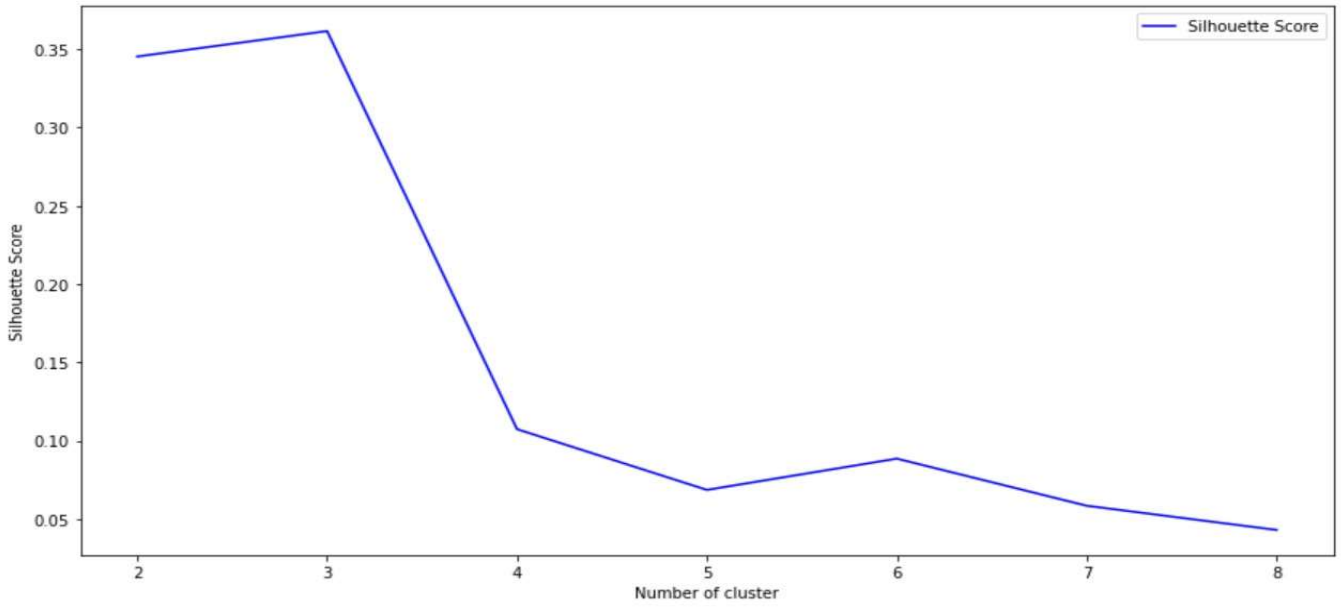
Then I visualized it using matplotlib-

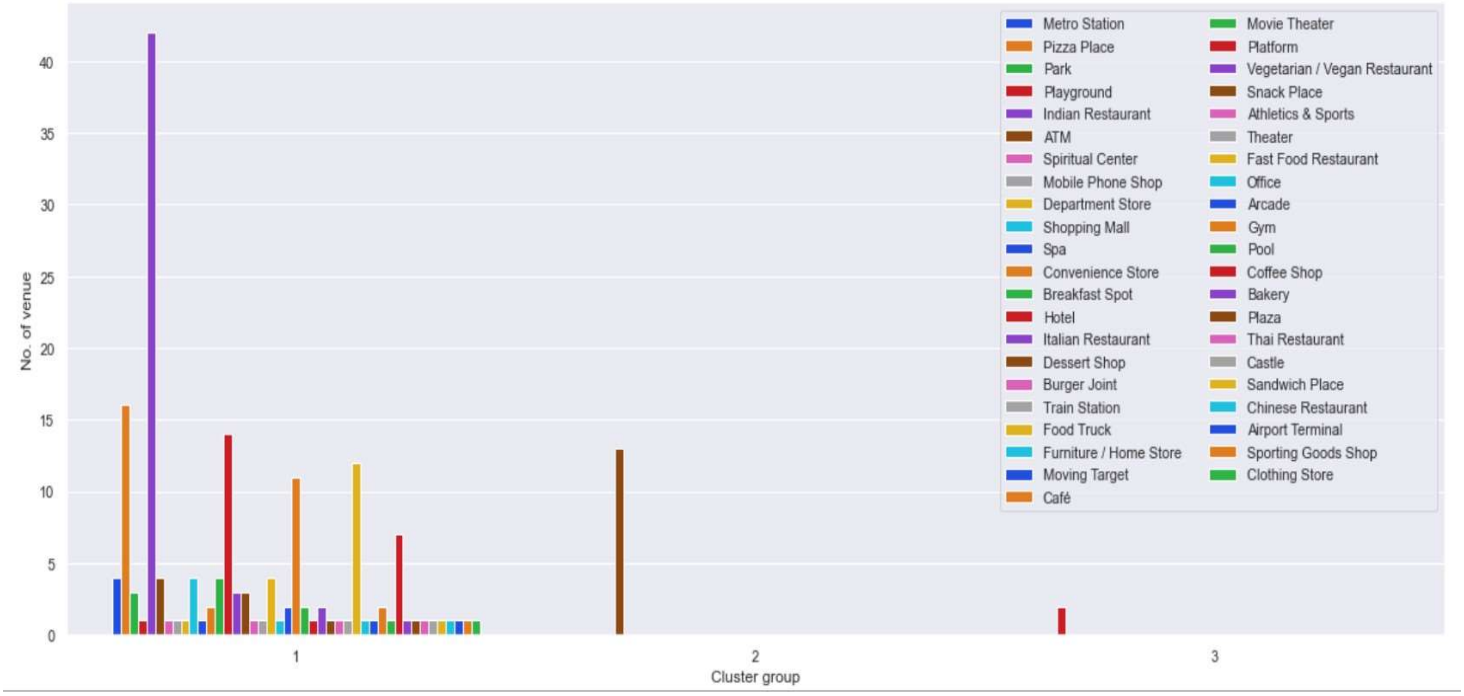


From the above plot, we observe that 3 is the optimal number of clusters.

So, I applied K-Means Cluster to divide the neighbourhoods into three clusters.

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	North West Delhi	Adarsh Nagar	28.614192	77.071541	0	Metro Station	Pool	Indian Restaurant	Gym	Zoo	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food
1	North West Delhi	Ashok Vihar	28.699453	77.184826	0	Pizza Place	Coffee Shop	Snack Place	Fast Food Restaurant	Sandwich Place	Asian Restaurant	Donut Shop	South Indian Restaurant	Indian Restaurant	Discount Store
2	North West Delhi	Azadpur	28.707657	77.175547	0	Park	Indian Restaurant	Bus Station	Zoo	Falafel Restaurant	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop
3	North West Delhi	Bawana	28.799660	77.032885	2	Playground	Zoo	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food
4	North West Delhi	Begum Pur	28.723900	77.060900	0	Indian Restaurant	Food Truck	Restaurant	Bakery	Zoo	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Court
5	North West Delhi	Jahangirpuri	28.725972	77.162658	1	ATM	Light Rail Station	Electronics Store	Farmers Market	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
6	North West	Keshav Puram	28.688926	77.161683	0	Indian Restaurant	Department Store	Train Station	Snack Place	Shopping Mall	Basketball Court	Fast Food Restaurant	Light Rail Station	Athletics & Sports	Dumpling Restaurant

I visualized the neighbourhoods clusters with countplot using Seaborn library to check which Cluster has the most numbers of Italian Restaurants.



So, in Cluster 1, we have the highest number of Italian Restaurants and in Cluster 2, we mostly have ATMs and in Cluster 3, we have Playgrounds.

I found the best neighbourhoods for opening an Italian Restaurant by comparing the Most Common Venues between the neighbourhoods which had an Italian Restaurant in Cluster 1. I created three data frames where each of them had "Italian Restaurant" as 1st, 2nd or 3rd Most Common Venues.

Fig 1: Neighbourhoods with "Italian Restaurant" as 1st Most Common Venue

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
17	Chhattarpur	Italian Restaurant	Light Rail Station	Fast Food Restaurant	Flea Market	Café	Hotel	Metro Station	Public Art	Indian Restaurant	Japanese Restaurant
19	Civil Lines	Italian Restaurant	Lake	Flea Market	Café	Asian Restaurant	Hotel	Chinese Restaurant	Convenience Store	Indian Restaurant	Farmers Market
62	Kashmiri Gate	Italian Restaurant	Fast Food Restaurant	Historic Site	Flea Market	Café	Hotel	Light Rail Station	Lake	Bus Station	Boutique

Fig 2: Neighbourhoods with “Italian Restaurant” as 2nd Most Common Venue

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
25	Defence Colony	Indian Restaurant	Italian Restaurant	Café	Bakery	French Restaurant	Market	Pizza Place	Convenience Store	Coffee Shop	Sandwich Place
119	Punjabi Bagh	Fast Food Restaurant	Italian Restaurant	Hookah Bar	Convenience Store	Donut Shop	Coffee Shop	Sandwich Place	Music Venue	Garden Center	Gym / Fitness Center

Fig 3: Neighbourhoods with “Italian Restaurant” as 3rd Most Common Venue

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
70	Kishangarh Village	Chinese Restaurant	Gym / Fitness Center	Italian Restaurant	Park	Cafeteria	Café	Nightclub	Farmers Market	French Restaurant	Food Truck
72	Kotla Mubarakpur	Indian Restaurant	Coffee Shop	Italian Restaurant	Sandwich Place	Bakery	Clothing Store	Market	English Restaurant	Pizza Place	Deli / Bodega
74	Krishna Nagar	Indian Restaurant	Coffee Shop	Italian Restaurant	Lounge	Café	Breakfast Spot	Snack Place	Scandinavian Restaurant	Chinese Restaurant	Restaurant
153	Sundar Nagar	Indian Restaurant	Hotel	Italian Restaurant	Chinese Restaurant	Café	Zoo	Bakery	Convenience Store	North Indian Restaurant	Restaurant

The data frames with the Clusters are:

Fig 4: Data frame containing neighbourhoods of Cluster 1

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Adarsh Nagar	Metro Station	Pool	Indian Restaurant	Gym	Zoo	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food
1	Ashok Vihar	Pizza Place	Coffee Shop	Snack Place	Fast Food Restaurant	Sandwich Place	Asian Restaurant	Donut Shop	South Indian Restaurant	Indian Restaurant	Discount Store
2	Azadpur	Park	Indian Restaurant	Bus Station	Zoo	Falafel Restaurant	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop
4	Begum Pur	Indian Restaurant	Food Truck	Restaurant	Bakery	Zoo	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Court
6	Keshav Puram	Indian Restaurant	Department Store	Train Station	Snack Place	Shopping Mall	Basketball Court	Fast Food Restaurant	Light Rail Station	Athletics & Sports	Dumpling Restaurant
...	...	...	...	...	...	...	...	...	...	...	...
174	Shivaji Place	Fast Food Restaurant	Indian Restaurant	Light Rail Station	Café	Garden	Diner	Hotel	Shopping Mall	Chinese Restaurant	Snack Place
175	Tihar Village	Fast Food Restaurant	Restaurant	Shopping Mall	Multiplex	Café	Donut Shop	Coffee Shop	Indian Restaurant	Gym / Fitness Center	Food Court
176	Tilak Nagar	Clothing Store	Fast Food Restaurant	Furniture / Home Store	Farmers Market	Fried Chicken Joint	Donut Shop	Light Rail Station	Café	Frozen Yogurt Shop	French Restaurant

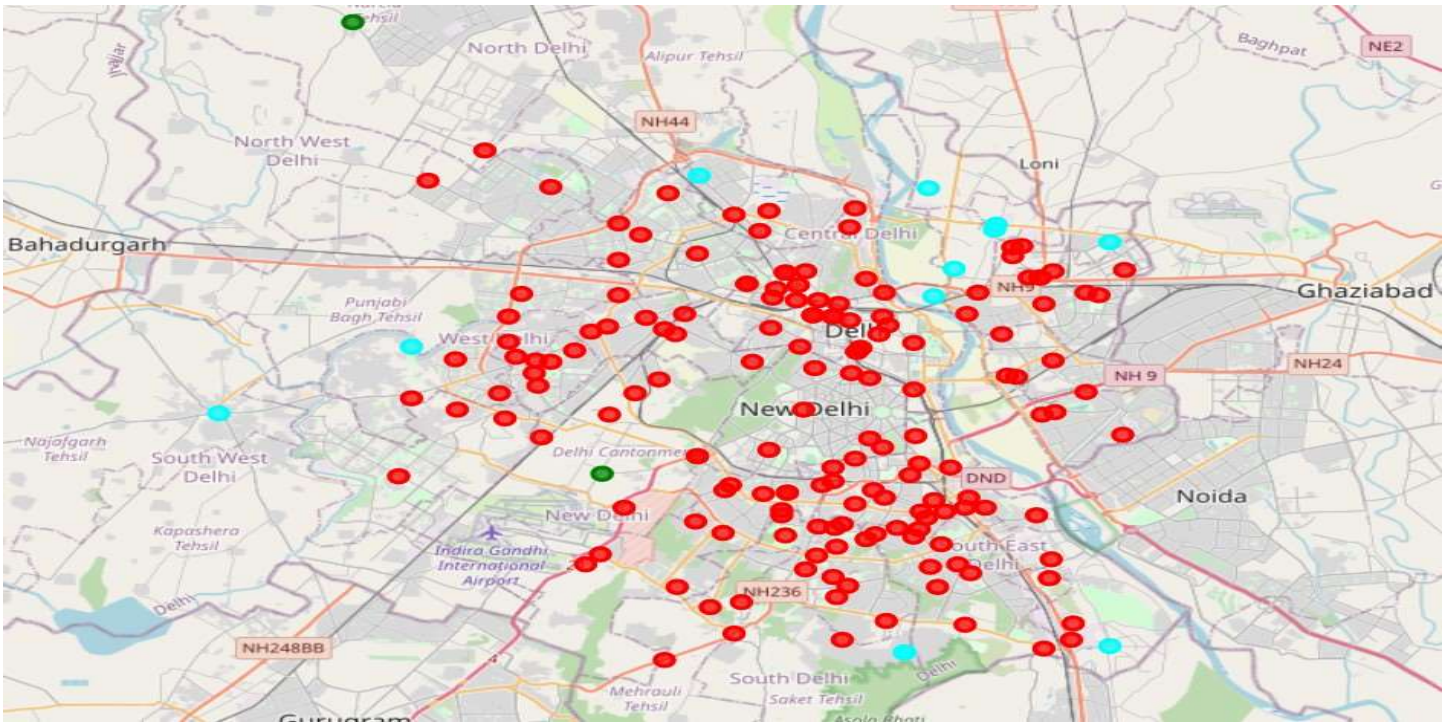
Fig 5: Data frame containing neighbourhoods of Cluster 2

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
5	Jahangirpuri	ATM	Light Rail Station	Electronics Store	Farmers Market	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
33	Sangam Vihar	ATM	Athletics & Sports	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food
47	Nand Nagri	ATM	Recording Studio	Department Store	Accessories Store	Irani Cafe	Event Space	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
49	New Usmanpur	ATM	Circus	Tourist Information Center	Dessert Shop	Diner	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
51	Sonia Vihar	ATM	Garden	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food	Flea Market
52	Shastri Park	ATM	Fast Food Restaurant	Metro Station	Farmers Market	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
53	Yamuna Vihar	ATM	Pizza Place	Mobile Phone Shop	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop
72	Brij Puri	ATM	Pizza Place	Mobile Phone Shop	Astrologer	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court
104	Jaitpur	ATM	Business Service	Garden	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food

Fig 6: Data frame containing neighbourhoods of Cluster 3

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
3	Bawana	Playground	Zoo	Falafel Restaurant	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food
142	Delhi Cantonment	Playground	Multiplex	Zoo	Falafel Restaurant	Fried Chicken Joint	French Restaurant	Food Truck	Food Court	Food & Drink Shop	Food

And then I visualized the clusters into the map of New Delhi using Folium library to find the similarities between neighbourhoods.



4. Conclusion

- In Cluster 1:
  - Chhatarpur, Civil Lines and Kashmiri Gate are the best place to start a new Italian cuisine restaurant.
  - Defence Colony and Panjabi Bagh, Krishna Nagar, Kotla Mubarakpur and Sundar Nagar are good alternatives.
- Cluster 2 and Cluster 3 mostly has Pizza places and Fast Food Restaurants. So, if an in-depth survey is done on the neighbourhoods of Cluster 2, we can find out if there are any interest in Italian Restaurants there.