

Introduction/Business Problem

The remarkable Indian Capital was architecturally designed by the British architect Edwin Lutyens and was named after him. It has a pleasant contrast to the twisted streets of Old Delhi. Enriched with history and culture, the impressive avenues and imperial buildings of New Delhi are included in the list of attractions.

Various shopping malls and local markets are there for the locals and the visitors, providing them a wide option to shop in the city. Other options of entertainment are also available in the city such as discs, cafes, cinema halls. Wide options for eating out in the city are there as the capital city houses numerous eating outlets and restaurants serving relishing and traditional cuisines.

Delhi is well connected with the neighbouring regions and other major cities of India through all modes of transport such as airways, railways and roadways. The traffic of New Delhi remains busy and chaotic because of increased population and vehicles. One needs to negotiate on fare for taxis and autos while hiring to travel within the city. One can also opt for the safest, convenient and quickest mode of transport - the Metro Rail to travel across the city and to its nearby regions.

Through this project I will explore this beautiful city so that the new comers can decide which area/neighbourhood they would want to stay in or figure out the best places to eat or shop during their stay.

The Data Section

There is a python library pgeocode (<https://github.com/symerio/pgeocode>) which is high performance off-line querying of GPS coordinates, region name and municipality name from postal codes. Distances between postal codes as well as general distance queries are also supported. The used GeoNames database includes postal codes for 83 countries.

In this library I will be using 'index postal_codes' function which creates a data frame of unique postal codes of a given country. The data frame consists of following columns:

- country code iso country code, 2 characters
- postal code: postal code
- place name: place name (e.g. town, city etc)
- state_name: 1. order subdivision (state)
- state_code: 1. order subdivision (state)
- county_name: 2. order subdivision (county/province)

- county_code: 2. order subdivision (county/province)
- community_name: 3. order subdivision (community)
- community_code: 3. order subdivision (community)
- latitude: estimated latitude (wgs84)
- longitude: estimated longitude (wgs84)
- accuracy: accuracy of lat/Ing from 1=estimated to 6=centroid

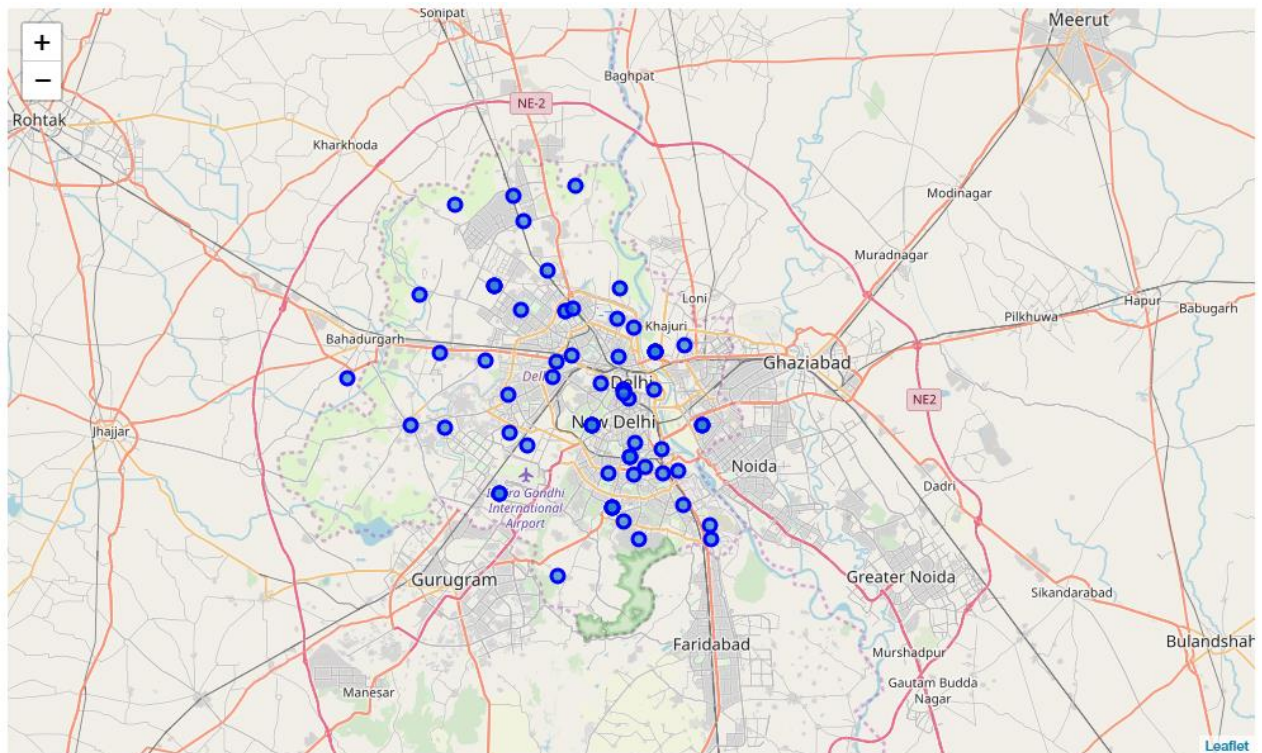
Using this function, Postal code details of entire India were obtained and then query the data to have only postal codes of New Delhi. The data would look like the following:

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New_Delhi.head()
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	country_code	postal_code	place_name	state_name	state_code	county_name	county_code	community_name	community_code	latitude	longitude	accuracy
0	IN	110001	New Delhi G.P.O., Parliament House, Connaught ...	Delhi	7	New Delhi	94.0	New Delhi	NaN	28.6369	77.218229	3
1	IN	110002	Civic Centre, Darya Ganj, I.P.Estate, Ajmeri G...	Delhi	7	New Delhi	94.0	New Delhi Central	NaN	28.6453	77.245600	3
19	IN	110020	F F C Okhla, Okhla Industrial Estate, Tehkhand...	Delhi	7	New Delhi	94.0	New Delhi	NaN	28.5345	77.277900	3
28	IN	110029	Nauroji Nagar, Ansari Nagar, Safdarjung Enclave	Delhi	7	New Delhi	94.0	New Delhi	NaN	28.5650	77.197200	3
42	IN	110043	Gopal Nagar, Shyam Vihar, Arjun Park, Dindarpu...	Delhi	7	New Delhi	94.0	Delhi	NaN	28.6109	76.982976	4

Methodology

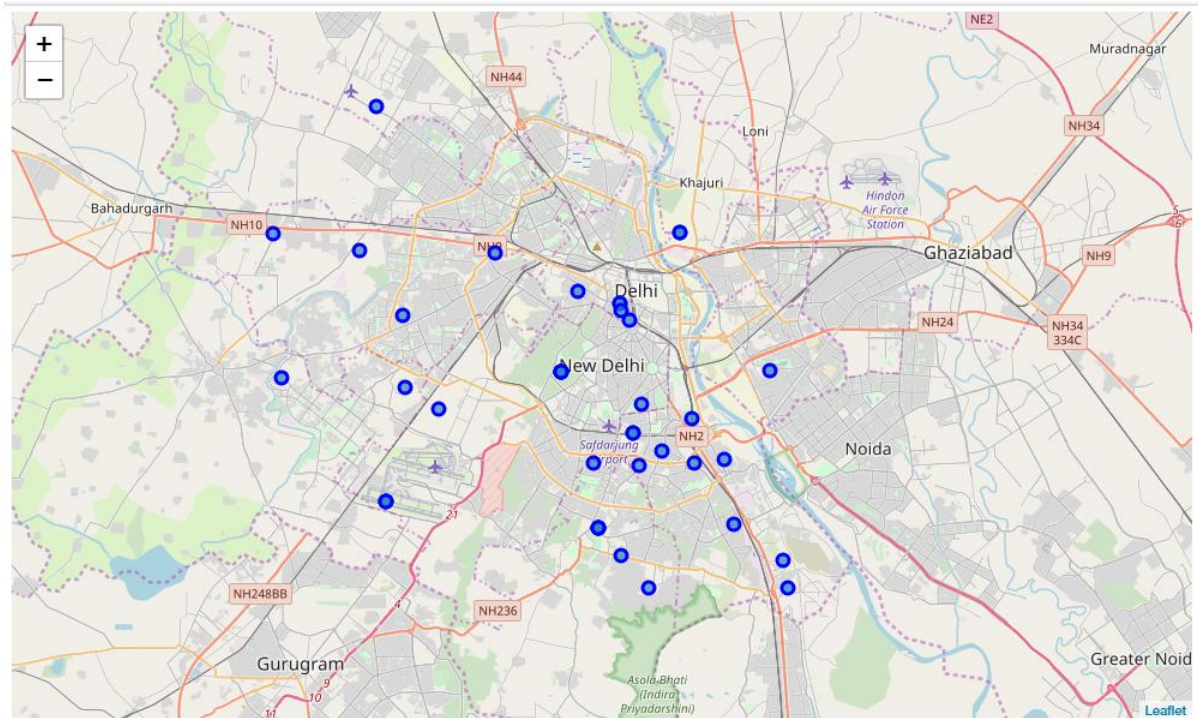
- **Foursquare API** was used to get the most common venues of given community of Delhi.
- Python **folium** library was used to visualize geographic details of Delhi and its places and I created a map of Delhi as shown below:



- As New Delhi had highest number of places, I decided to just focus on New Delhi alone.

	index	postal_code	place_name	latitude	longitude
community_name					
Delhi	25	25	25	25	25
Delhi North East	1	1	1	1	1
East Delhi	1	1	1	1	1
New Delhi	42	42	42	42	42
New Delhi Central	1	1	1	1	1
South Delhi	2	2	2	2	2
South West Delhi	1	1	1	1	1

- Here is the map of the places in New Delhi.



- Details of the venues of New Delhi were retrieved using Foursquare API.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Sagar Ratna	28.635487	77.220650	Indian Restaurant
1	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Nizam's Kathi Kabab निज़ाम काठी कबाब	28.634858	77.219462	Indian Restaurant
2	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Route 04	28.634890	77.220225	Bar
3	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Wenger's	28.633412	77.218292	Bakery
4	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Khan Chacha खान चाचा خان چاچا	28.634202	77.220780	Indian Restaurant
5	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Naturals Ice Cream	28.634455	77.222139	Ice Cream Shop
6	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Immigrants Project - A Cafe in History	28.634055	77.218867	Café
7	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Odeon Social	28.634414	77.220936	Café
8	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Connaught Place कनॉट प्लेस (Connaught Place)	28.632731	77.220018	Plaza
9	New Delhi G.P.O., Parliament House, Connaught ...	28.6369	77.218229	Veda Restaurant	28.635210	77.218079	Indian Restaurant

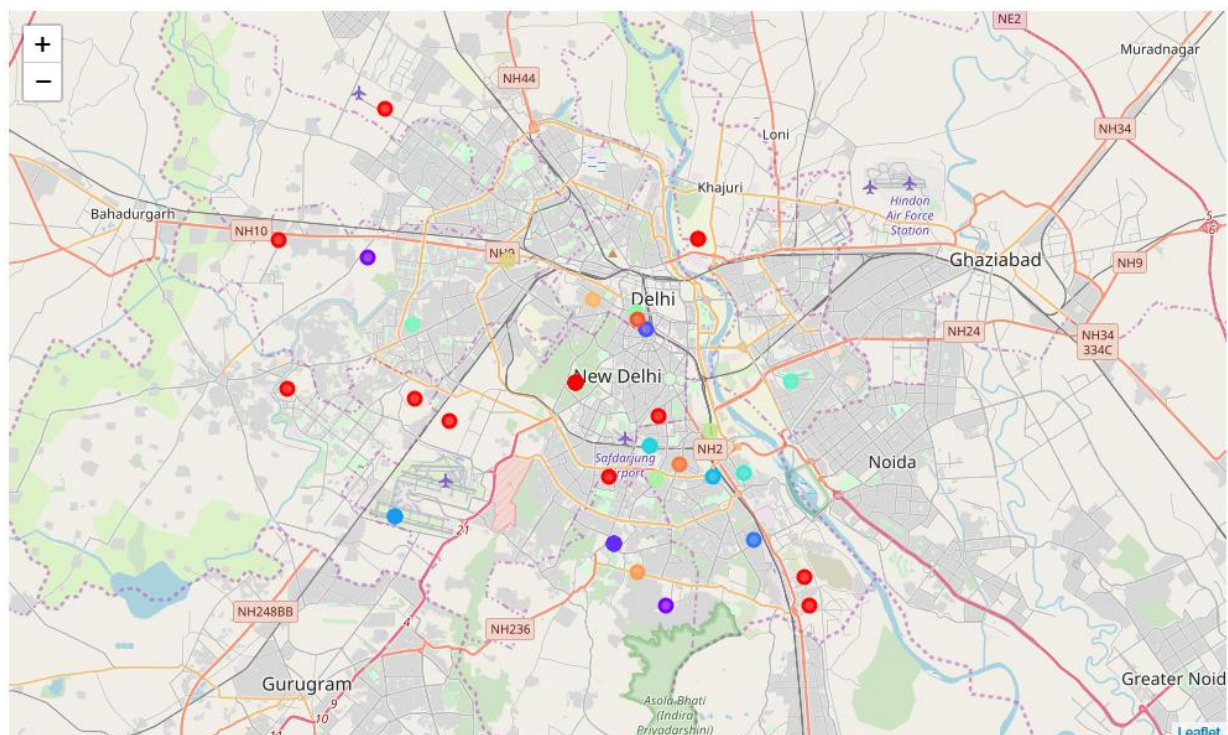
Results

In Summary, for every Neighbourhood the most common places were returned using the Foursquare API. These can be seen in the following table:

	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	A.K.Market, Pahar Ganj, Swami Ram Tirth Nagar,...	Hotel	Indian Restaurant	Café	Tibetan Restaurant	Fast Food Restaurant	Indian Chinese Restaurant	Snack Place	Bakery	Bar	Sandwich Place
1	AMPC Delivery	Tea Room	Athletics & Sports	Snack Place	Smoke Shop	Train Station	Food	Department Store	Dessert Shop	Donut Shop	Falafel Restaurant
2	Abul Fazal Enclave-I, New Friends Colony, Zaki...	Hotel	Indian Restaurant	Deli / Bodega	Ice Cream Shop	Hostel	Gym / Fitness Center	Gym	Food Court	Food & Drink Shop	Food
3	Defence Colony (South Delhi), Lajpat Nagar (So...	Indian Restaurant	Sandwich Place	Light Rail Station	Market	Donut Shop	Ice Cream Shop	Cocktail Bar	Convenience Store	Boutique	Bar
4	Deoli, Khanpur (South Delhi), Dakshinipuri Phas...	ATM	Deli / Bodega	Ice Cream Shop	Hotel	Hostel	Gym / Fitness Center	Gym	Food Court	Food & Drink Shop	Food
5	Dwarka Sec-6, District Court Complex Dwarka, A...	Supplement Shop	Train Station	Convenience Store	Hotel	Hostel	Gym / Fitness Center	Gym	Food Court	Food & Drink Shop	Food
6	F F C Okhla, Okhla Industrial Estate, Tehkhand...	Accessories Store	Train Station	Deli / Bodega	Ice Cream Shop	Hotel	Hostel	Gym / Fitness Center	Gym	Food Court	Food & Drink Shop
7	Hari Nagar BE Block, Hari Nagar Dadb Block, Ha...	Pub	Boutique	Restaurant	Food	Dessert Shop	Donut Shop	Falafel Restaurant	Fast Food Restaurant	Train Station	Deli / Bodega
8	Hazrat Nizamuddin, Dargah Sharif	Train Station	Food Court	Café	Moving Target	Deli / Bodega	Hotel	Hostel	Gym / Fitness Center	Gym	Food & Drink Shop
9	Karol Bagh, Sat Nagar, Anand Parbat, Anand Par...	Fast Food Restaurant	Snack Place	Indian Restaurant	Coffee Shop	Jewelry Store	Bakery	Food & Drink Shop	Donut Shop	Falafel Restaurant	Food

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- There were some common venue categories in neighbourhoods. For that reason unsupervised learning **K-means algorithm** was used to cluster the neighbourhoods. K-Means algorithm is one of the most common cluster methods of unsupervised learning.
- Visualization the data and clustering information on the New Delhi map.



Conclusion

People can achieve better outcomes through their access to the platforms where such information is provided.

Not only for investors but also city managers can manage the city more regularly by using similar data analysis types or platforms.