Determining a expensive, normal & cheap neighbourhood in a City

1. Problem Statement

Objective: To create a view of an expensive, normal & cheap cluster of neighbourhoods in a city for a newcomer to help inhabit the right part of the city.

Users: Any new comer to a city who is trying to start a livelihood in the city.

Background: Every year as cities start to boom with more development and wealth, there is a lot of new population which ventures into the city for the below reasons.

1. Better Jobs
2. Education
3. New Ventures
4. Better livelihood
5. Getting Married to a spouse who lives here

When this population moves to the city, there is very little information available to these people to understand which part of the city should they inhabit. While there is a broad description of what kind of areas suit each of the groups of the population, it is pure hearsay with very less data backing it. More importantly, not everybody has the wherewithal to do the necessary research and analysis to understand the different dynamics of the city and nature of neighbourhood in the city. Wrong decisions at this point will result in moving to a wrong place resulting in movement to a another part later if dissatisfied resulting in financial and mental loss.

This exercise should deliver a clear mapping of neighbourhoods and their characteristics helping the above users to make the right decision by classifying neighbourhoods as

1. Expensive
2. Normal
3. Cheap

2. Data
Datasets used

1. India, Pincode wise data mapping city,division & Lat Long data from Geomapping
2. Foursquare data

Dataset Structure

1. Data Scraping for Lat long - The Mapmyindia data will be scraped to arrive at the below fields. a. Pincode b. City c. Locality d. State e. Latitude f. Longitude
2. Four Square data - to arrive at the details of the venue in the neighbourhood by fetching the below details. a. Neighborhood b. Neighborhood Latitude c. Neighborhood Longitude d. Venue e. Venue Latitude f. Venue Longitude g. Venue Category

Assumption / Hypothesis A neighbourhood will have a select kind of venues basis the kind of people who live there. The venue categories will automatically adjust to the kind of the people who live there. For eg. A bar, wine store,gym,spa etc may not be located in a cheap neighbourhood. Similarly, local restaurants may not be crowded in an expensive neighbourhood & parks, public spaces may be restricted to cheap neighbourhoods. Hence, the exercise will aim to cluster the category of venues in each of the neighbourhoods in the city and understand the kind of neighbourhood.

Data Analysis method.

1. For Lat Long available in the dataset 1 for a select city, the neighbourhood details will be fetched in the dataset 2.
2. For every neighbourhood, the mean occurrence of a venue category will be calculated.
3. Using at least 3 clustering methods, cluster the dataset, predict the Cluster.
4. Basis empirical data, map select localities to the cluster they might belong to.
5. Measure the accuracy of the model by comparing the results of the clustering to the empirical data.

3. Exploratory Data Analysis

<u>**Understanding the variables in the dataset**</u>

There are 9 variables in the dataset as below

- Country
- Pincode
- Locality
- State
- Code
- Province
- Community
- Lat
- Long

Because we have already decided the country & city of interest, the variables we would be using for our working will be

- Locality - Describes the local / sub division of the city

- State - State in the country to which the city belongs to
- Province - City
- Community - Division of the city
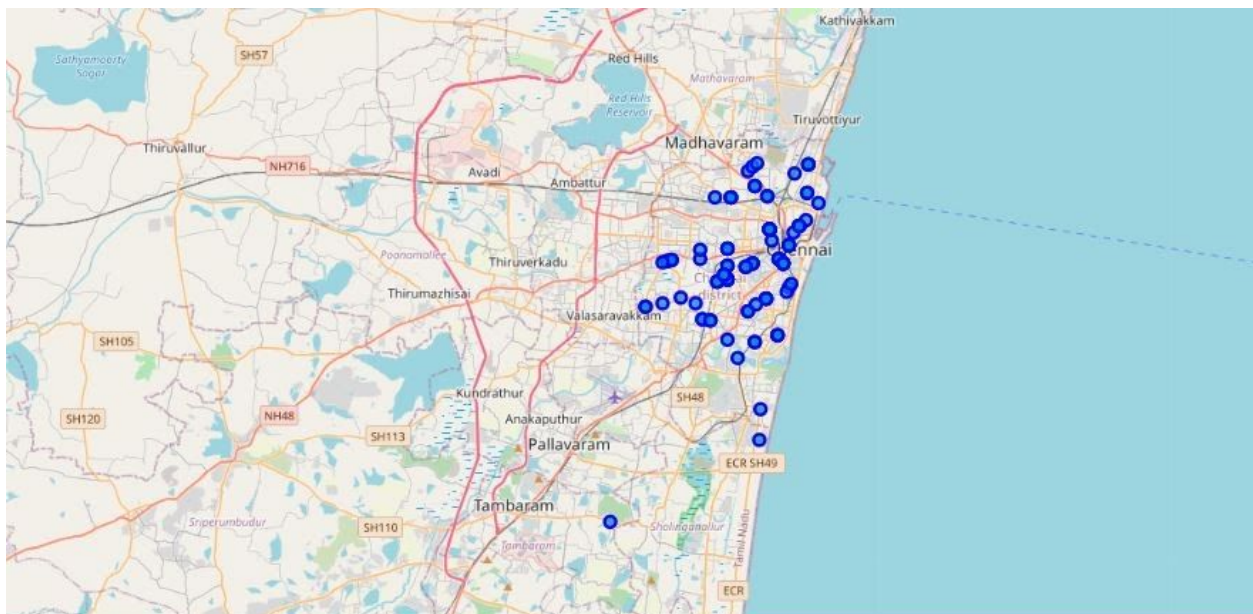- Lat
- Long

Model to be used

Given that we need to segregate the localities into 3 kinds, it is imperative we understand the kind of localities and bucket them. The kind of localities can be understood from the kind of venues that are around each of the localities. Now, by arriving at the top venues which are around a locality once can understand the nature of the localities. By running a clustering algorithm on these venue categories, one categorizes the locality into a particular cluster.

Mapping the communities to the city using Lat Long Now that we have chosen to use clustering as the method, it is important we look at the distribution of localities in and around the city chennai.

We will use the Folium map to plot these localities in the map alongside the Chennai Lat Long to understand the distribution of the localities. This helps visualize the extent of the city and the general spacing of localities across the cities. If they are sparsely distributed, the clustering will have a difficult time to club them together.

The Venues & Categories using four square data will be around individual localities which might force the Clustering algorithms to create many clusters.

Actual Visualization It is evident from the visualization that the localities are close enough to generate clusters.

Data Exploration on Foursquare data The top venue categories that are prevalent in chennai are as below.

Venue Category	Locality	Locality Latitude	Locality Longitude	Venue	Venue Latitude	Venue Longitude
Indian Restaurant	152	152	152	152	152	152
Vegetarian / Vegan Restaurant	49	49	49	49	49	49
Hotel	29	29	29	29	29	29
Ice Cream Shop	28	28	28	28	28	28
Fast Food Restaurant	28	28	28	28	28	28
Bakery	24	24	24	24	24	24
Bus Station	23	23	23	23	23	23
Clothing Store	23	23	23	23	23	23
Restaurant	23	23	23	23	23	23
Café	23	23	23	23	23	23
Sandwich Place	19	19	19	19	19	19

Below are some venue categories that we could categorize into the final buckets that we want to create.

1. Expensive - 'Shopping Mall', 'Japanese Restaurant', 'Russian Restaurant', 'Mexican Restaurant', 'Gym / Fitness Center', 'Spa', 'Pet Store','Pub', 'Yoga Studio'
2. Normal - 'Indian Restaurant', 'Furniture / Home Store', 'Department Store', 'Ice Cream Shop','Bookstore','Clothing Store','Flower Shop'
3. Cheap - 'Market', 'Train Station', 'Restaurant', 'Pier', 'Movie Theater', 'Bakery', 'Beach', 'Flea Market'

Below are some of the top venue categories in what i think are **expensive** areas in chennai

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
3	Anna Nagar East	Vegetarian / Vegan Restaurant	Food Court	Hotel	Fast Food Restaurant	Bus Station
6	Ashoknagar (Chennai)	Indian Restaurant	Middle Eastern Restaurant	Seafood Restaurant	Shopping Mall	Hotel
31	Indian Institute Of Technology	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
35	Kasturibai Nagar	Indian Restaurant	Japanese Restaurant	Bakery	Sandwich Place	Multicuisine Indian Restaurant
40	Kotturpuram	Department Store	Chinese Restaurant	Market	Grocery Store	Bakery

Below are some of the top venue categories in what i think are **Normal** areas in chennai

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
10	Chetput	Indian Restaurant	Performing Arts Venue	Burger Joint	Ice Cream Shop	Department Store
26	Guindy Industrial Estate	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
40	Kotturpuram	Department Store	Chinese Restaurant	Market	Grocery Store	Bakery
53	Mylapore	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
87	Tiruvanmiyur	Indian Restaurant	Performing Arts Venue	Yoga Studio	Frozen Yogurt Shop	Daycare
96	Virugambakkam	Indian Restaurant	Multiplex	Department Store	Electronics Store	Chinese Restaurant

Below are some of the top venue categories in what i think are **Cheap** areas in chennai

	Locality	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
59	Perambur	Indian Restaurant	Shopping Mall	Vegetarian / Vegan Restaurant	Train Station	Restaurant
64	Puliyanthope	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
68	Rayapuram	Convenience Store	Indian Restaurant	Ice Cream Shop	Spa	Food Court
78	Sowcarpet	Indian Restaurant	Restaurant	Convenience Store	Department Store	Market
95	Vepery	Soccer Stadium	Vegetarian / Vegan Restaurant	Hotel	Stadium	Fast Food Restaurant
100	Washermanpet	Jewelry Store	Bakery	Park	Pier	Accessories Store

We should try to corroborate the above with the actual clusters when they are created.

4. Machine Learning / Clustering

Exploring Clustering methods
The aim of the modelling is to cluster together localities using the kind of venues that are prevalent in the locality & hence take a decision on the poshness of the locality. And we also don't know about the target variable, in this case the cluster.

It falls under the **Unsupervised learning domain** and we will use Clustering as the option.

I have used 2 clustering techniques.

1. **K-means**

For the K-Means, I started with 3 clusters and continued to play around with 3,5,7 & 10 clusters. After 7 the clusters didn't span out and started to sparse out.
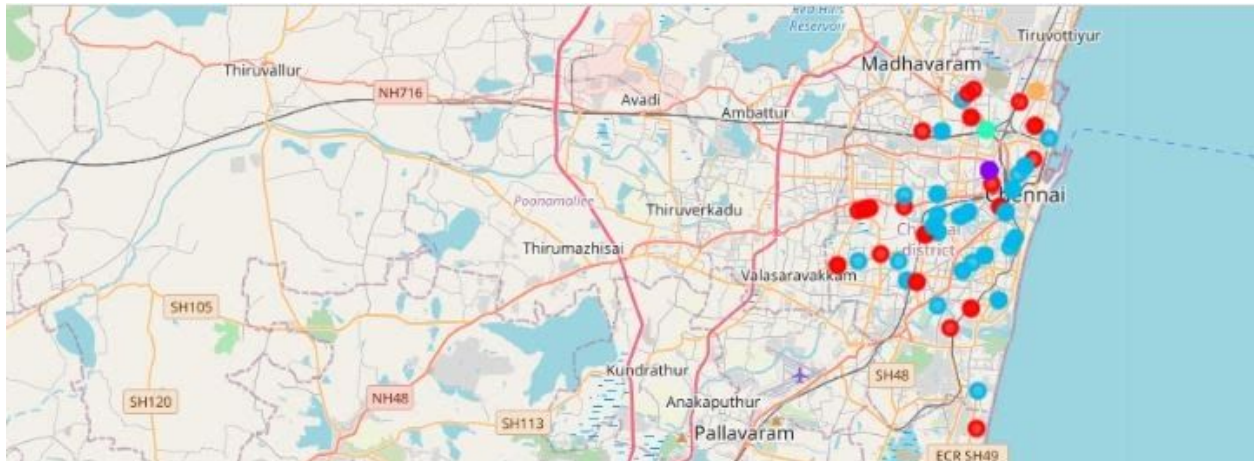
So, the final cluster choice is set to be 7. This was done using observation on grouping of clusters. Given that the clustering is done using the venue category and the assumption is that localities around similar venues will be clustered together, the clusters had to be geographically close to one another. So, the K value which provided such an output was chosen for the final model.

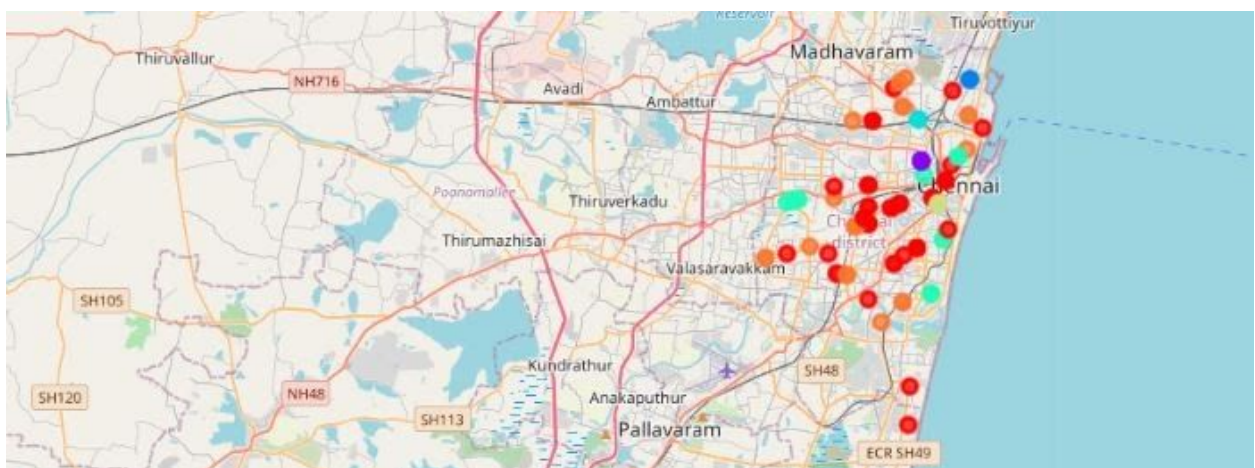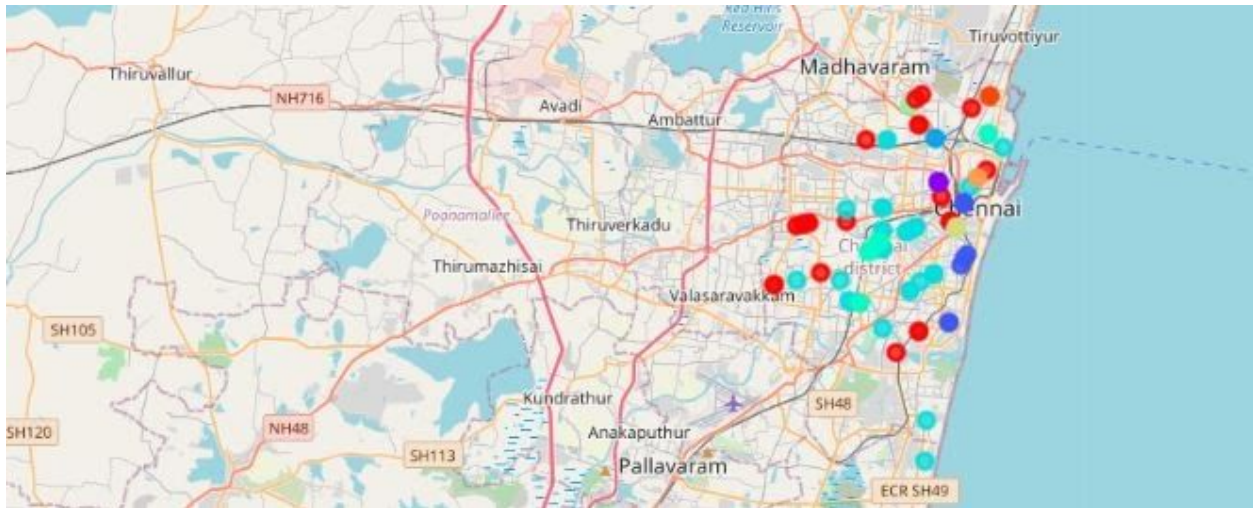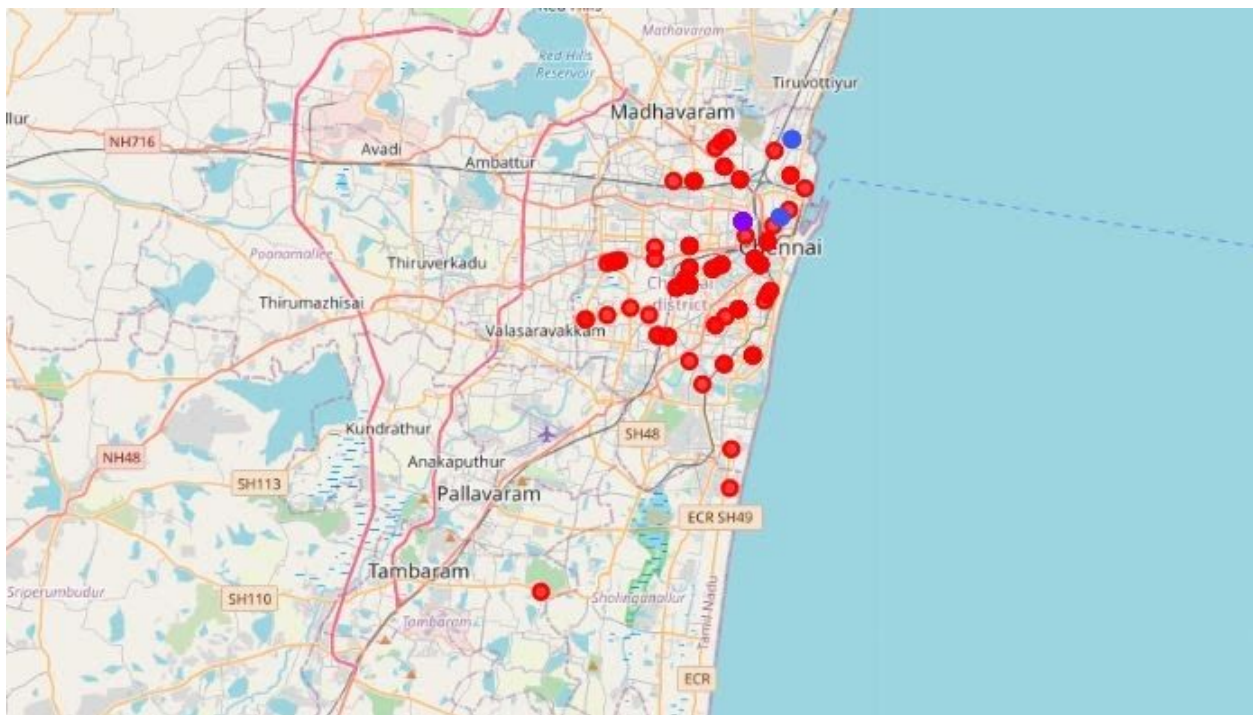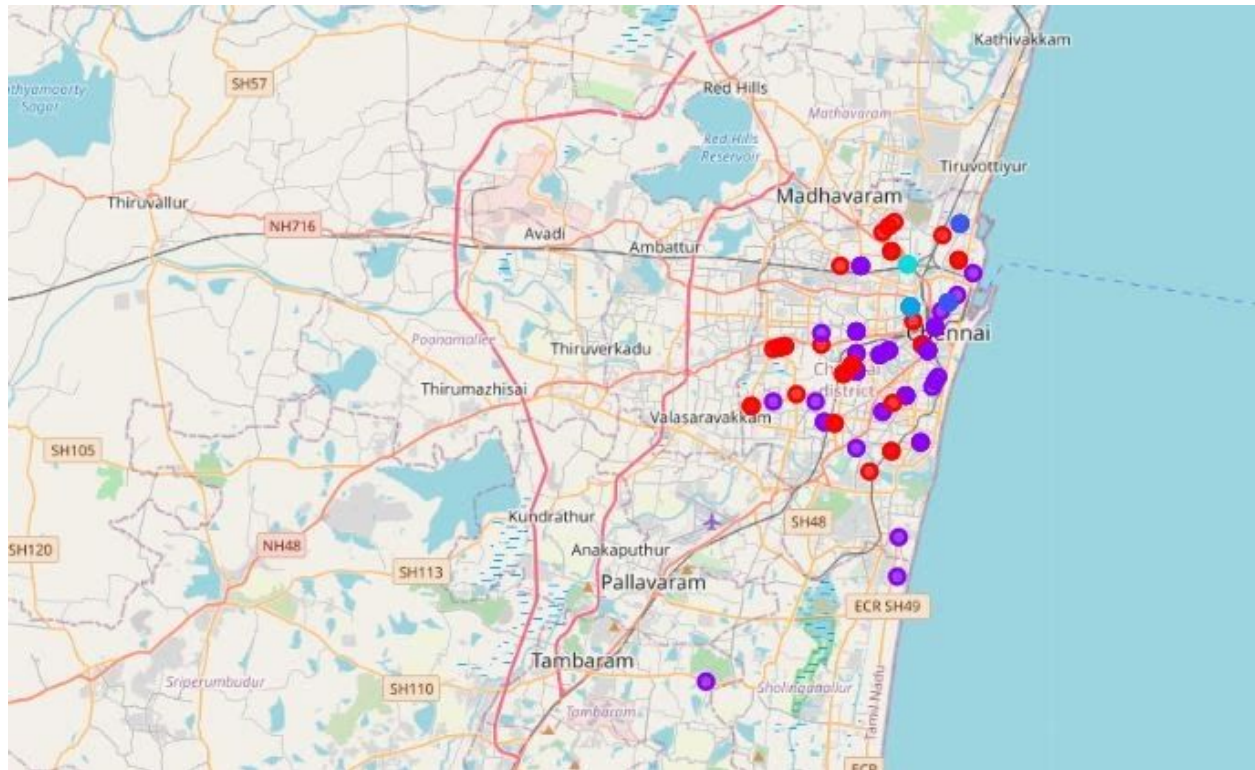Below is the output at various k levels.

K=3

K=5

K=7

K=10

2. Hierarchical Clustering

For hierarchical clustering a similar approach was used to arrive at the no of levels. Below are the results of the hierarchical clustering.
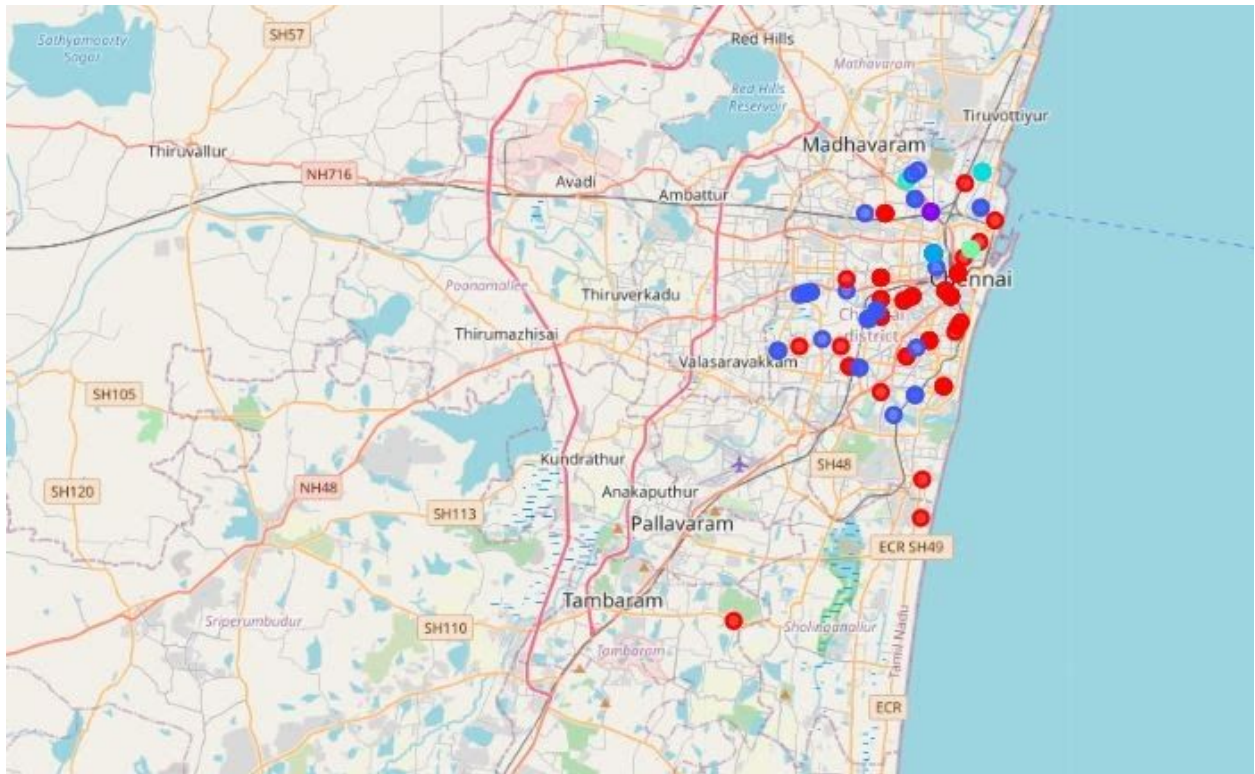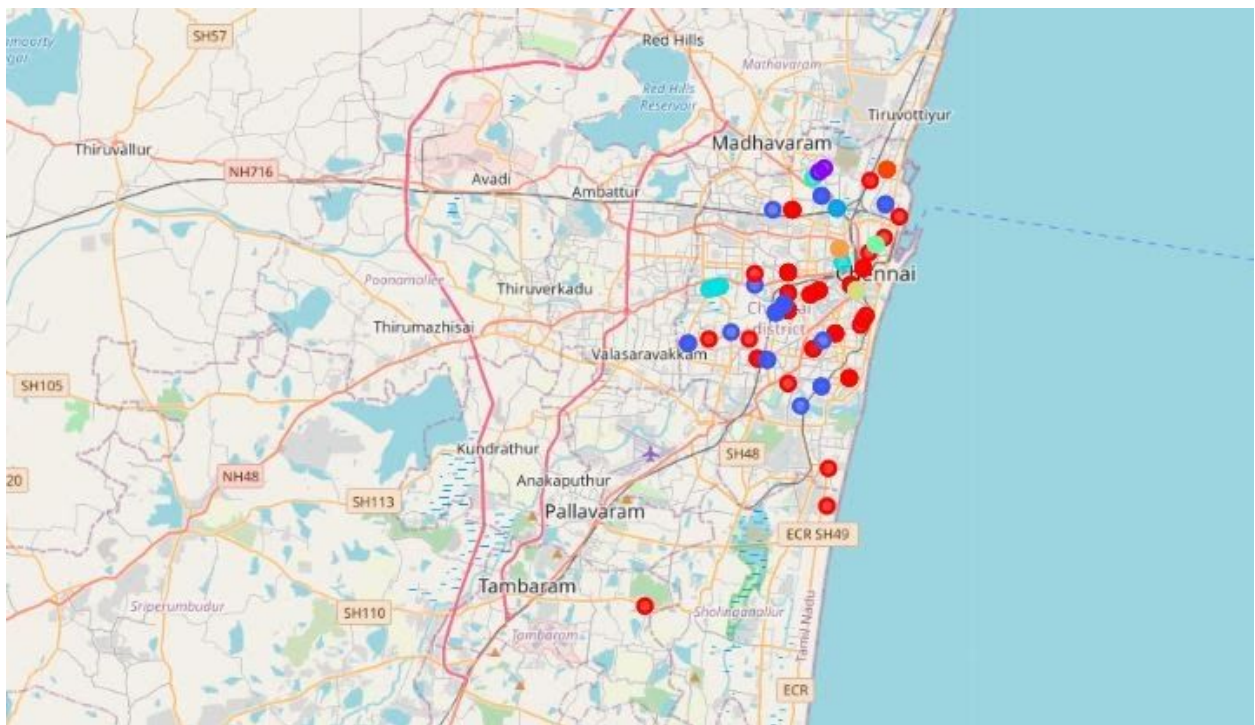
K=3

K=5

K=7

K=10

5. Results

1. K Means

Basis the above modelling in K-Means, the key clusters that are generated are as below.

Cluster 0:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82502	Sowcarpet	0	Indian Restaurant	Restaurant	Convenience Store	Department Store	Market
82506	Anna Road	0	NaN	NaN	NaN	NaN	NaN
82507	Chintadripet	0	NaN	NaN	NaN	NaN	NaN
82508	Madras Electricity System	0	NaN	NaN	NaN	NaN	NaN
82509	Edapalayam	0	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82510	Park Town	0	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82511	Ripon Buildings	0	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82512	Madras Medical College	0	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82518	Chepauk	0	Platform	Beach	Light Rail Station	Cricket Ground	Seafood Restaurant
82524	Egmore	0	Indian Restaurant	Shopping Mall	Juice Bar	Seafood Restaurant	Fast Food Restaurant
82525	Egmore ND	0	Indian Restaurant	Shopping Mall	Juice Bar	Seafood Restaurant	Fast Food Restaurant
82526	Ethiraj Salai	0	Indian Restaurant	Shopping Mall	Juice Bar	Seafood Restaurant	Fast Food Restaurant
82528	Kilpauk	0	Indian Restaurant	Ice Cream Shop	South Indian Restaurant	Juice Bar	Gym / Fitness Center
82529	Medavakkam Tank Road	0	Indian Restaurant	Ice Cream Shop	South Indian Restaurant	Juice Bar	Gym / Fitness Center
82530	Kilpauk Medical College	0	Indian Restaurant	Ice Cream Shop	South Indian Restaurant	Juice Bar	Gym / Fitness Center
82531	Perambur	0	Indian Restaurant	Shopping Mall	Vegetarian / Vegan Restaurant	Train Station	Restaurant
82532	Perambur North	0	Indian Restaurant	Shopping Mall	Vegetarian / Vegan Restaurant	Train Station	Restaurant
82533	Sembiam	0	Indian Restaurant	Shopping Mall	Vegetarian / Vegan Restaurant	Train Station	Restaurant
82537	Rayapuram	0	Convenience Store	Indian Restaurant	Ice Cream Shop	Spa	Food Court
82538	Triplicane South	0	Indian Restaurant	Smoke Shop	Arts & Crafts Store	Record Shop	Fruit & Vegetable Store
82539	Royapettah	0	Indian Restaurant	Smoke Shop	Arts & Crafts Store	Record Shop	Fruit & Vegetable Store

Cluster 1:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82534	Perambur Barracks	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82535	Venkatesapuram	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82536	Puliyanthope	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82542	Saidapet (Chennai)	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82543	Guindy North	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82548	Thygarayanagar North ND	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82549	Hindi Prachar Sabha	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82550	Thygarayanagar	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82551	Thygarayanagar South NDS.O	1	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store

Cluster 2:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82725	Tondiarpet Bazaar	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare
82726	Tondiarpet	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare
82727	Tondiarpet West	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare

Cluster 3:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82587	Vyasar Nagar Colony	3	Market	Yoga Studio	Fruit & Vegetable Store	Daycare	Department Store
82588	Vyasarpadi	3	Market	Yoga Studio	Fruit & Vegetable Store	Daycare	Department Store

Cluster 4:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82499	Chennai G.P.O.	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82500	MPT AO	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82501	Flower Bazaar	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82504	Govt Stanley Hospital	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82505	Mint Building	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82513	Vivekananda College Madras	4	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82514	Mylapore	4	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82515	Mandaveli	4	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82516	Madras University	4	Vegetarian / Vegan Restaurant	Indian Restaurant	Platform	Train Station	Flea Market
82517	Tiruvallikkeni	4	Vegetarian / Vegan Restaurant	Platform	Train Station	Indian Restaurant	Flea Market
82523	Vepery	4	Soccer Stadium	Vegetarian / Vegan Restaurant	Hotel	Stadium	Fast Food Restaurant
82762	Anna Nagar Western Extn	4	Vegetarian / Vegan Restaurant	Food Court	Hotel	Fast Food Restaurant	Bus Station
82763	Anna Nagar East	4	Vegetarian / Vegan Restaurant	Food Court	Hotel	Fast Food Restaurant	Bus Station
82768	High Court Building (Chennai)	4	Vegetarian / Vegan Restaurant	Food Court	Hotel	Fast Food Restaurant	Bus Station
82769	D G Vaishnav College	4	Vegetarian / Vegan Restaurant	Food Court	Department Store	Hotel	Fast Food Restaurant
82770	Arumbakkam	4	Vegetarian / Vegan Restaurant	Food Court	Department Store	Hotel	Fast Food Restaurant
82771	Koyambedu	4	Vegetarian / Vegan Restaurant	Food Court	Hotel	Fast Food Restaurant	Bus Station

Cluster 5:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82519	Teynampet West	5	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82520	Greams Road	5	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82521	Old College Buildings	5	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82522	Shastri Bhavan	5	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82527	Fort St George	5	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio

Cluster 6:

	Locality	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82503	Mannady (Chennai)	6	Kebab Restaurant	Ice Cream Shop	Chinese Restaurant	Motorcycle Shop	Yoga Studio
82562	Washermanpet East	6	Jewelry Store	Bakery	Park	Pier	Accessories Store
82563	Washermanpet	6	Jewelry Store	Bakery	Park	Pier	Accessories Store
82568	Vadapalani	6	Multiplex	Indian Restaurant	Clothing Store	Fast Food Restaurant	Ice Cream Shop
82569	Raja Annamalaipuram	6	Department Store	Yoga Studio	Snack Place	Indian Restaurant	Italian Restaurant
82570	Ramakrishna Nagar (Chennai)	6	Department Store	Yoga Studio	Snack Place	Indian Restaurant	Italian Restaurant
82571	Aminjikarai	6	Fast Food Restaurant	Pizza Place	Bookstore	Shopping Mall	Clothing Store
82579	Nungambakkam High Road	6	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82580	Nungambakkam	6	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82581	Loyola College	6	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82728	G K M Colony	6	Department Store	Ice Cream Shop	Bus Station	Yoga Studio	Frozen Yogurt Shop
82729	Agaram	6	Indie Movie Theater	Department Store	Clothing Store	Gym	Multiplex
82731	Jawahar Nagar (Chennai)	6	Department Store	Ice Cream Shop	Bus Station	Yoga Studio	Frozen Yogurt Shop
82735	Kotturpuram	6	Department Store	Chinese Restaurant	Market	Grocery Store	Bakery
82747	Virugambakkam	6	Indian Restaurant	Multiplex	Department Store	Electronics Store	Chinese Restaurant
82748	Koyambedu Wholesale Market Com	6	Indian Restaurant	Multiplex	Department Store	Electronics Store	Chinese Restaurant
82774	TTTI Taramani	6	Clothing Store	Jewelry Store	South Indian Restaurant	Women's Store	Miscellaneous Shop
82775	Tidel Park	6	Clothing Store	Jewelry Store	South Indian Restaurant	Women's Store	Miscellaneous Shop
82784	Rv Nagar	6	Pizza Place	Park	Food Court	Cricket Ground	Daycare
82785	Kodungaiyur	6	Pizza Place	Restaurant	Concert Hall	Convenience Store	Cricket Ground

2.Hierarchical Clustering

CLuster 0:

	Locality	Hier Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82506	Anna Road	0	NaN	NaN	NaN	NaN	NaN
82507	Chintadripet	0	NaN	NaN	NaN	NaN	NaN
82508	Madras Electricity System	0	NaN	NaN	NaN	NaN	NaN
82523	Vepery	0	Soccer Stadium	Vegetarian / Vegan Restaurant	Hotel	Stadium	Fast Food Restaurant
82562	Washermanpet East	0	Jewelry Store	Bakery	Park	Pier	Accessories Store
82563	Washermanpet	0	Jewelry Store	Bakery	Park	Pier	Accessories Store
82568	Vadapalani	0	Multiplex	Indian Restaurant	Clothing Store	Fast Food Restaurant	Ice Cream Shop
82569	Raja Annamalaipuram	0	Department Store	Yoga Studio	Snack Place	Indian Restaurant	Italian Restaurant
82570	Ramakrishna Nagar (Chennai)	0	Department Store	Yoga Studio	Snack Place	Indian Restaurant	Italian Restaurant
82571	Aminjikarai	0	Fast Food Restaurant	Pizza Place	Bookstore	Shopping Mall	Clothing Store
82575	Ekkaduthangal	0	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
82576	Guindy Industrial Estate	0	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
82579	Nungambakkam High Road	0	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82580	Nungambakkam	0	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82581	Loyola College	0	Ice Cream Shop	Vegetarian / Vegan Restaurant	Clothing Store	Gym	South Indian Restaurant
82583	Indian Institute Of Technology	0	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
82586	Icf Colony	0	Concert Hall	Vegetarian / Vegan Restaurant	Indian Restaurant	Clothing Store	Gourmet Shop
82589	Anna Nagar (Chennai)	0	NaN	NaN	NaN	NaN	NaN
82594	Velacheri	0	NaN	NaN	NaN	NaN	NaN
82728	G K M Colony	0	Department Store	Ice Cream Shop	Bus Station	Yoga Studio	Frozen Yogurt Shop

Cluster 1:

	Locality	Hier Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82502	Sowcarpet	1	Indian Restaurant	Restaurant	Convenience Store	Department Store	Market
82503	Mannady (Chennai)	1	Kebab Restaurant	Ice Cream Shop	Chinese Restaurant	Motorcycle Shop	Yoga Studio
82509	Edapalayam	1	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82510	Park Town	1	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82511	Ripon Buildings	1	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82512	Madras Medical College	1	Indian Restaurant	Train Station	Platform	Vegetarian / Vegan Restaurant	Outlet Store
82513	Vivekananda College Madras	1	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82514	Mylapore	1	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82515	Mandaveli	1	Convenience Store	Vegetarian / Vegan Restaurant	Juice Bar	Indian Restaurant	Food Court
82516	Madras University	1	Vegetarian / Vegan Restaurant	Indian Restaurant	Platform	Train Station	Flea Market
82517	Tiruvallikkeni	1	Vegetarian / Vegan Restaurant	Platform	Train Station	Indian Restaurant	Flea Market
82518	Chepauk	1	Platform	Beach	Light Rail Station	Cricket Ground	Seafood Restaurant
82519	Teynampet West	1	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82520	Greams Road	1	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82521	Old College Buildings	1	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82522	Shastri Bhavan	1	Indian Restaurant	Train	Hotel	Flea Market	Yoga Studio
82524	Egmore	1	Indian Restaurant	Shopping Mall	Juice Bar	Seafood Restaurant	Fast Food Restaurant
82525	Egmore ND	1	Indian Restaurant	Shopping Mall	Juice Bar	Seafood Restaurant	Fast Food Restaurant

Cluster 2:

	Locality	Hier Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82499	Chennai G.P.O.	2	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82500	MPT AO	2	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82501	Flower Bazaar	2	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82504	Govt Stanley Hospital	2	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82505	Mint Building	2	Vegetarian / Vegan Restaurant	Indian Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground
82725	Tondiarpet Bazaar	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare
82726	Tondiarpet	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare
82727	Tondiarpet West	2	Vegetarian / Vegan Restaurant	Yoga Studio	Frozen Yogurt Shop	Cricket Ground	Daycare

Cluster 3:

	Locality	Hier Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82534	Perambur Barracks	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82535	Venkatesapuram	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82536	Puliyanthope	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82542	Saidapet (Chennai)	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82543	Guindy North	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82548	Thygarayanagar North ND	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82549	Hindi Prachar Sabha	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82550	Thygarayanagar	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store
82551	Thygarayanagar South NDS.O	3	Pet Store	Yoga Studio	Frozen Yogurt Shop	Daycare	Department Store

Cluster 4:

	Locality	Hier Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
82587	Vyasar Nagar Colony	4	Market	Yoga Studio	Fruit & Vegetable Store	Daycare	Department Store
82588	Vyasarpadi	4	Market	Yoga Studio	Fruit & Vegetable Store	Daycare	Department Store

Comparing these to the initial hypothesis & classification on what could be an expensive/normal/cheap that was setup in the exploratory data analysis step, below are the findings.

K Means

1. Expensive - Cluster 1
2. Normal - Cluster 6,
3. Cheap - Cluster 4
4. Expensive / Normal - Cluster 0

The other clusters are relatively small and not worth exploring.

Hierarchical Clustering

1. Expensive - Cluster 3, Cluster 2
2. Normal - Cluster 0
3. Cheap - Cluster 1

6. Conclusion & Next Steps

Most of the areas that were identified as expensive, normal, cheap in the Exploratory data analysis section using basic understanding of the city have fallen into the right clusters.
And more importantly, the usual suspects in terms of what kinds of venue categories are generally found around expensive areas have been clubbed into 1 cluster and others into their respective clusters.

This proves that the model has done a good approximation of the venue categories into the kind of localities / neighbourhoods they belong to.

The model can be further improved by adding additional variables of schools, hospitals, amenities etc which add to the value of a locality. These are other parameters that people might look for when they choose to stay in a particular locality. By building a clustering algo using these variables, the efficacy of the model can certainly be improved.