

**APPLIED CAPESTONE DATA SCIENCE PROJECT**  
**THE BATTLE OF NEIGHBOURHOODS - CHENNAI**

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## **BUSINESS PROBLEM:**

- The following project is on the neighbourhoods of Chennai.
- Chennai has a huge number of hotels, multiplexes, theatres etc everyone around. So, starting a business in a perfect landmark would be a toughest job for one with new business ideas.
- Here using the best ways of Data Science, using clustering algorithm-Battle Of Neighbourhoods, perfect spots to start several hot topic-business can be extracted at ease.
- The following project helps people to start a Hotel, Gym, shopping mall etc in a perfect spot as wished.

## **QUESTIONS:**

- Which is a better spot for opening a Hotel or any business zone?
- Which zones are most likely to be visited by most people(crowded)?

## **SATISFACTIONS TO BE MET:**

- A clear representation on the top best venues for business fields.
- A clustered map showing the best spots for specific business initiation.

## **API & METHODS USED:**

- The Foursquare API is used to access the venues in the neighbourhoods.
- The Foursquare Places API provides location-based experiences with diverse information about venues, users, photos, and check-ins.
- Here only a min number of venues are obtained. So, we analyse areas with countable no. of venues.

- k-means Clustering Algorithm: used to undergo Clustering of Neighbourhoods.
- Silhouette Score: Gives optimal number of clusters.
- Folium visualization library: Used to visualize the clusters superimposed on the map of Chennai city.

### **DATA NEEDED:**

- Dataset with the list of locations in chennai along with their Latitude and Longitude:

[https://chennaiiq.com/chennai/latitude\\_longitude\\_areas.asp](https://chennaiiq.com/chennai/latitude_longitude_areas.asp)

### **DATASET OF NEIGHBOURHOODS – CHENNAI:**

	Neighbourhood	Latitude	Longitude
0	Adyar Bus Debot	12°59'50" N	80°15'25" E
1	Adyar Signal	13°00'23" N	80°15'27" E
2	Alandur	13°00'28" N	80°12'35" E
3	Ambattur	13°06'36" N	80°10'12" E
4	Anna Arch	13°04'28" N	80°13'06" E
5	Anna Nagar Roundana	13°05'04" N	80°13'05" E
6	Anna Nagar West Terminus	13°05'35" N	80°11'55" E
7	Anna Statue	13°04'05" N	80°16'19" E
8	Anna University Entrance	13°00'29" N	80°14'06" E
9	Avadi	13°07'13" N	80°06'36" E
10	AVM Studio	13°02'52" N	80°12'18" E

## **CONVERSION OF deg'min'sec" TO DECIMALS:**

- The values degree, minutes and seconds are converted from their own datatypes to decimals.

	<b>Neighbourhood</b>	<b>Latitude</b>	<b>Longitude</b>
<b>0</b>	Adyar Bus Debot	12.997222	80.256944
<b>1</b>	Adyar Signal	13.006389	80.257500
<b>2</b>	Alandur	13.007778	80.209722
<b>3</b>	Ambattur	13.110000	80.170000
<b>4</b>	Anna Arch	13.074444	80.218333
<b>5</b>	Anna Nagar Roundana	13.084444	80.218056
<b>6</b>	Anna Nagar West Terminus	13.093056	80.198611
<b>7</b>	Anna Statue	13.068056	80.271944
<b>8</b>	Anna University Entrance	13.008056	80.235000
<b>9</b>	Avadi	13.120278	80.110000
<b>10</b>	AVM Studio	13.047778	80.205000

## **FORSQUARE API:**

<https://foursquare.com/>

- The foursquare API is used to get the venue details, latitude and longitudes of venues in neighbourhoods.

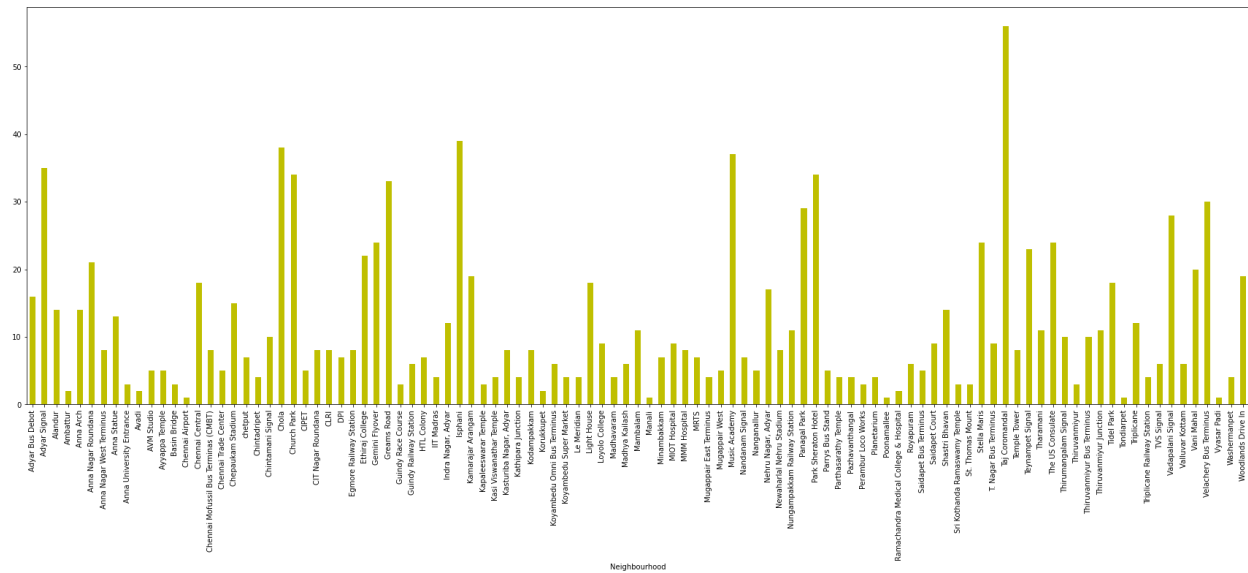
	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Adyar Bus Debot	12.997222	80.256944	Zaitoon Restaurant	12.996861	80.256178	Middle Eastern Restaurant
1	Adyar Bus Debot	12.997222	80.256944	Kuttanadu Restaurant	12.997010	80.257799	Asian Restaurant
2	Adyar Bus Debot	12.997222	80.256944	Zha Cafe	12.999730	80.254806	Café
3	Adyar Bus Debot	12.997222	80.256944	Adyar Ananda Bhavan, Besant Nagar	12.996678	80.258275	Fast Food Restaurant
4	Adyar Bus Debot	12.997222	80.256944	Kovai Pazhamudir Nilayam	12.996522	80.259776	Fruit & Vegetable Store
5	Adyar Bus Debot	12.997222	80.256944	Barbeque N Biryani	12.995907	80.256011	BBQ Joint
6	Adyar Bus Debot	12.997222	80.256944	Subway	12.999040	80.254743	Sandwich Place
7	Adyar Bus Debot	12.997222	80.256944	Domino's Pizza	13.001470	80.256626	Pizza Place
8	Adyar Bus Debot	12.997222	80.256944	Vasanthha Bhavan	13.000444	80.256374	Indian Restaurant
9	Adyar Bus Debot	12.997222	80.256944	The Rock	12.996585	80.255900	Asian Restaurant
10	Adyar Bus Debot	12.997222	80.256944	Mast Kalandar	12.996567	80.260155	Indian Restaurant

- A total of 1167 venues were obtained in the above process using foursquare API.

## **METHODS:**

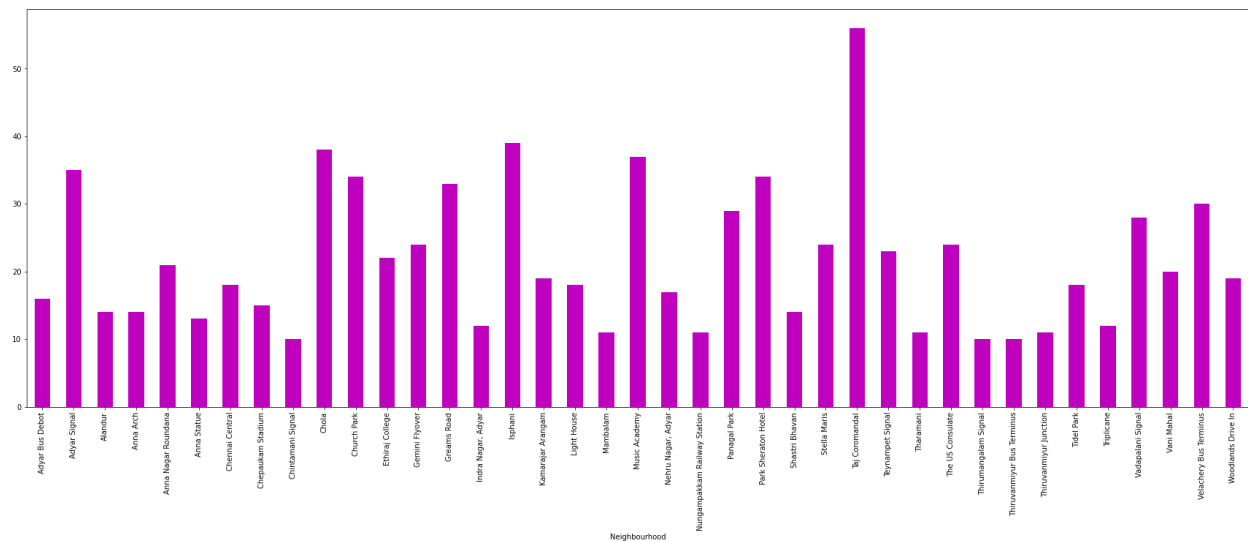
- Neighbourhood Data of Chennai: (105 neighbourhoods).
- We also have the most popular venues in each neighbourhood obtained using Foursquare API.
- Total Venues: 1130
- Unique Category: 145
- We have neighbourhoods with < 10 venues. So we will consider only a good count.
- One hot encoding: Used to find the 10 most common venue category in each neighbourhood. K - Nearest Neighbour: Clustering of one hot encoded dataset.
- Silhouette Score: To find the optimal number of clusters

### ANALYSIS & VISUALIZATION OF NO. OF VENUES:



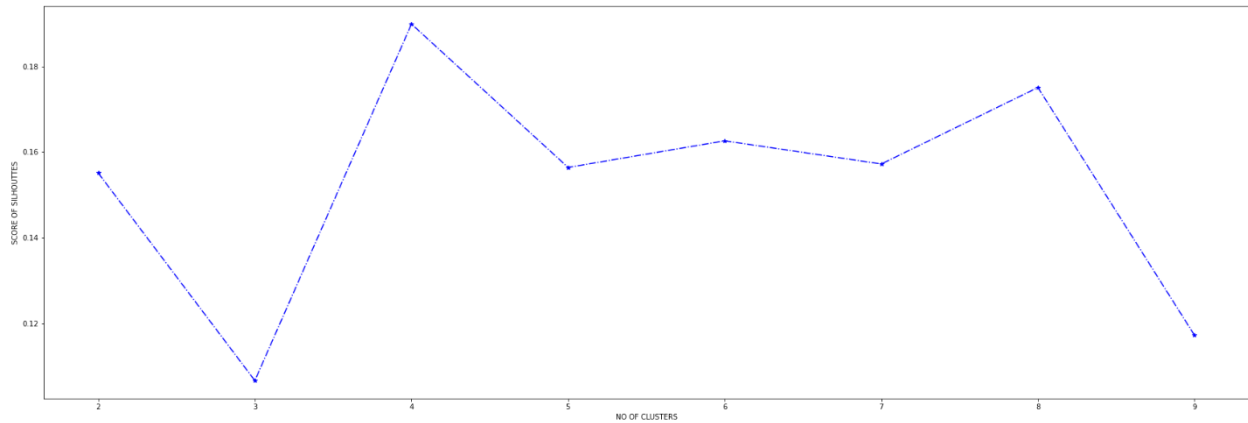
## ANALYSIS & VISUALIZATION OF NO. OF VENUES

**(DROPPING NEIGHBOURHOODS WITH VENUES < 10):**



## CLUSTERING OF NEIGHBOURHOODS:

Technique Used: k-nearest



- Here the best silhouette score is equal to 8.
- So, a total of 8 number of clusters are going to be formed.
- By adding cluster\_labels and with a new dataframe Chennai\_merged, a table with the 10 most common venues have been obtained.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
0	Adyar Bus Debot	12.997222	80.256944	0	Indian Restaurant	Fast Food Restaurant	Asian Restaurant	BBQ Joint
1	Adyar Signal	13.006389	80.257500	0	Indian Restaurant	North Indian Restaurant	Coffee Shop	Vegetarian / Vegan Restaurant
2	Alandur	13.007778	80.209722	7	Indian Restaurant	South Indian Restaurant	Bus Station	Hotel
3	Anna Arch	13.074444	80.218333	6	Fast Food Restaurant	Clothing Store	Café	Mediterranean Restaurant
4	Anna Nagar Roundana	13.084444	80.218056	0	Indian Restaurant	Chinese Restaurant	Clothing Store	South Indian Restaurant



## CLUSTERING:

### CLUSTER 1

Top 2 venues : Indian Restaurant, Coffee Shop

	Neighbourhood	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
0	Adyar Bus Debot	Indian Restaurant	Fast Food Restaurant	Asian Restaurant	BBQ Joint	Pizza Place	Café	Bus Station	Br Sp
1	Adyar Signal	Indian Restaurant	North Indian Restaurant	Coffee Shop	Vegetarian / Vegan Restaurant	Electronics Store	Bakery	Dessert Shop	Me Th
4	Anna Nagar Roundana	Indian Restaurant	Chinese Restaurant	Clothing Store	South Indian Restaurant	Coffee Shop	Electronics Store	Fast Food Restaurant	Bo
6	Chennai Central	Indian Restaurant	Train Station	Platform	Bookstore	Metro Station	Bus Station	Café	Sa Pl
7	Chepaukam Stadium	Indian Restaurant	Mediterranean Restaurant	Electronics Store	Bar	Breakfast Spot	Multiplex	Music Store	Ge Er
8	Chintamani Signal	Indian Restaurant	Restaurant	Bakery	Electronics Store	Middle Eastern Restaurant	Coffee Shop	Gym	Ho
24	Shastri Bhavan	Indian Restaurant	Chinese Restaurant	Japanese Restaurant	Theater	Coffee Shop	Hotel	Convenience Store	Mt Ino Ré
30	Thirumangalam Signal	Indian Restaurant	Jewelry Store	Smoke Shop	Vegetarian / Vegan Restaurant	Mobile Phone Shop	Café	Print Shop	Pi
37	Velachery Bus Terminus	Indian Restaurant	Fast Food Restaurant	Chinese Restaurant	Restaurant	Accessories Store	Shoe Store	Juice Bar	Ke Ré

### CLUSTER 2

Top 2 venues : Sandwich Place, Fast Food Restaurant

	Neighbourhood	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
17	Light House	Fast Food Restaurant	Food Court	Coffee Shop	Department Store	Bar	Sandwich Place	Sculpture Garden	Shoppin Mall
28	Tharamani	Café	Fast Food Restaurant	Indian Restaurant	Bakery	Office	Sandwich Place	Food Court	Vegetari / Vegan Restaur
33	Tidel Park	Food Court	Office	Café	Sandwich Place	Fast Food Restaurant	Indian Restaurant	Chinese Restaurant	Bus Station



### CLUSTER 3

Top 2 venues : Sandwich Place, Indian Restaurant

	Neighbourhood	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
14	Indra Nagar, Adyar	Café	Women's Store	Sandwich Place	Juice Bar	Pizza Place	Indian Restaurant	Chinese Restaurant	Breakfast Spot
20	Nehru Nagar, Adyar	Café	Indian Restaurant	Pizza Place	Chinese Restaurant	Women's Store	Bookstore	Ice Cream Shop	South Indian Restaurant

### CLUSTER 4

Top 2 venues : Indian Restaurant, Hotel

	Neighbourhood	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
9	Chola	Indian Restaurant	Hotel	Ice Cream Shop	Restaurant	Concert Hall	Tea Room	Lounge	Comfort Food Restaurant
11	Ethiraj College	Hotel	Indian Restaurant	Pizza Place	Juice Bar	Kebab Restaurant	Café	Korean Restaurant	Middle Eastern Restaurant
19	Music Academy	Indian Restaurant	Hotel	Café	Concert Hall	Restaurant	Women's Store	Mexican Restaurant	Comfort Food Restaurant
25	Stella Maris	Indian Restaurant	Hotel	Women's Store	Bar	Italian Restaurant	Juice Bar	Kerala Restaurant	Garden
27	Teynampet Signal	Indian Restaurant	Hotel	Lounge	Pub	Italian Restaurant	Pizza Place	Bowling Alley	Diner

## **CLUSTER 5**

Top 2 venues : Multiplex, Indian Restaurant

	Neighbourhood	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
10	Church Park	Multiplex	Indian Restaurant	Chinese Restaurant	Café	Movie Theater	Middle Eastern Restaurant	Bakery	Fast Food Restaurant
13	Greens Road	Multiplex	Indian Restaurant	Café	Middle Eastern Restaurant	Bakery	Juice Bar	Movie Theater	Bistro
31	Thiruvannamiyur Bus Terminus	Indian Restaurant	Juice Bar	Multiplex	Hotel Bar	Hotel	Chinese Restaurant	Gym	Pizza Place
32	Thiruvannamiyur Junction	Indian Restaurant	Multiplex	Chinese Restaurant	Hotel Bar	Hotel	Gym	Pharmacy	Pizza Place
35	Vadapalani Signal	Multiplex	Fast Food Restaurant	Clothing Store	Indian Restaurant	Vegetarian / Vegan Restaurant	Asian Restaurant	South Indian Restaurant	Hotel

## **CLUSTER 6**

Top 2 venues : Indian Restaurant, Botique

	Neighbourhood	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
18	Mambalam	Clothing Store	Jewelry Store	Asian Restaurant	Miscellaneous Shop	Road	Boutique	South Indian Restaurant	Indian Restaurant
22	Panagal Park	Clothing Store	Indian Restaurant	Jewelry Store	Pizza Place	BBQ Joint	Boutique	Café	Coffee Shop

## CLUSTER 7

Top 2 venues : Electronics Store, Mediterranean Restaurant

	Neighbourhood	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
3	Anna Arch	Fast Food Restaurant	Clothing Store	Café	Mediterranean Restaurant	Multiplex	Pub	Bookstore	Electronics Store

## CLUSTER 8

Top 2 venues : Indian Restaurant, Hotel

	Neighbourhood	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
2	Alandur	Indian Restaurant	South Indian Restaurant	Bus Station	Hotel	Restaurant	Electronics Store	Metro Station	Bar
12	Gemini Flyover	Indian Restaurant	Hotel	Coffee Shop	Nightclub	Sandwich Place	Bar	Lounge	Department Store
15	Isphani	Indian Restaurant	Chinese Restaurant	Café	Hotel	Coffee Shop	Lounge	Nightclub	Pizza Place
16	Kamarajar Arangam	Indian Restaurant	Café	Hotel	Lounge	Pizza Place	BBQ Joint	Nightclub	Coffee Shop
21	Nungampakkam Railway Station	Chinese Restaurant	Asian Restaurant	Vegetarian / Vegan Restaurant	Ice Cream Shop	Department Store	Clothing Store	Italian Restaurant	Bus Station
23	Park Sheraton Hotel	Café	Hotel	Chinese Restaurant	Italian Restaurant	Nightclub	Dessert Shop	Restaurant	Japanese Restaurant
26	Taj Coromandal	Indian Restaurant	Café	Chinese Restaurant	Italian Restaurant	Sandwich Place	Asian Restaurant	Ice Cream Shop	Hotel
29	The US Consulate	Indian Restaurant	Hotel	Coffee Shop	Nightclub	Sandwich Place	BBQ Joint	Lounge	Department Store
36	Vani Mahal	Hotel	Indian Restaurant	Coffee Shop	Clothing Store	Department Store	Bar	Recreation Center	BBQ Joint
38	Woodlands Drive In	Indian Restaurant	Hotel	Nightclub	BBQ Joint	Lounge	Department Store	Coffee Shop	Park

## DISCUSSION:

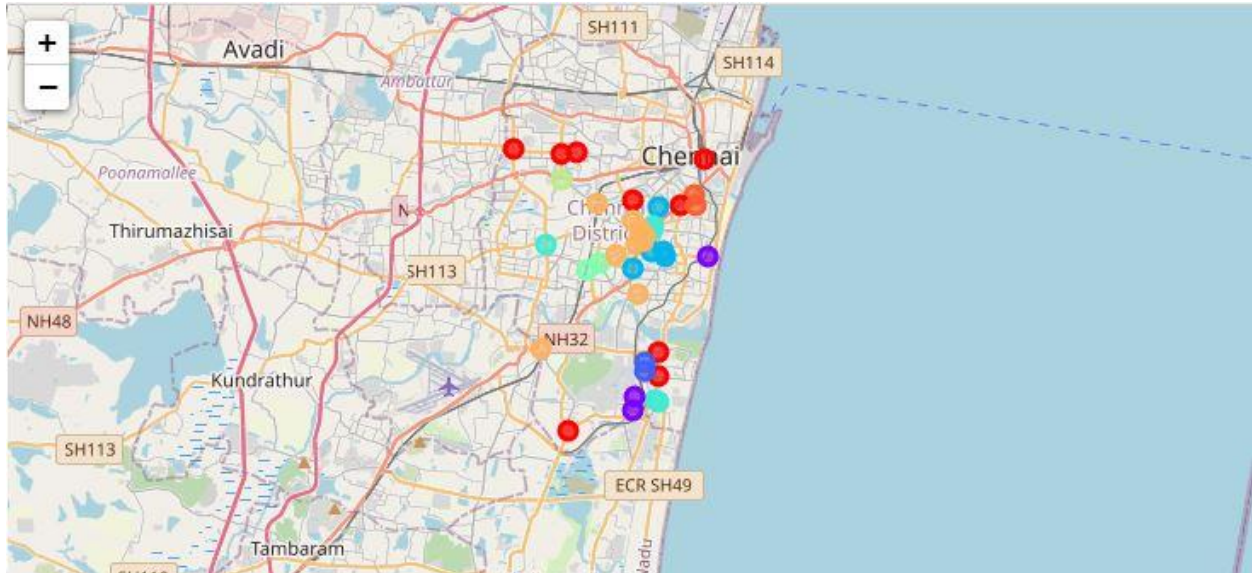


## HOTELS:

As we see, since **Cluster 1** and **Cluster 8** have huge number of hotels, it would be the wrong choice for opening a hotel. So, the perfect option would be **Cluster 4** and **Cluster 5** as it has a decent number of hotels and most importantly other entertainment zones that also attracts wayfarers towards the hotel.



## **CLUSTERED MAP FOR SEVERAL BUSINESS FILEDS:**



## **CONCLUSION:**

- Thus a clustering model(Battle of neighborhoods) has been successfully developed which is tremendously useful for people with ideas of starting a Business in the discussed fields.
- The data related to the Neighborhoods of Chennai has been obtained and Foursquare API was used to find the venues of neighborhoods.
- As there were certain neighborhoods with venues < 10 they were dropped and venues > 10 were taken into account.
- Clustering is done by using k-nearest algorithm and optimal no. of clusters by silhouette scoring.
- An example for the project has been discussed. This would be so much useful for people with new and fresh business ideas.