

Analyzing the Neighborhoods in Chennai for Starting a Restaurant



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Introduction

- Chennai is the Health capital of India and 36th-largest urban area by population in the world.
- Chennai is among the most-visited Indian cities by foreign tourists. It was ranked the 43rd-most visited city in the world for the year 2015.
- Business owners and entrepreneurs might be looking to start a new restaurant in Chennai.
- The task is to identify neighborhoods that have the potential of being good locations for starting a new restaurant.

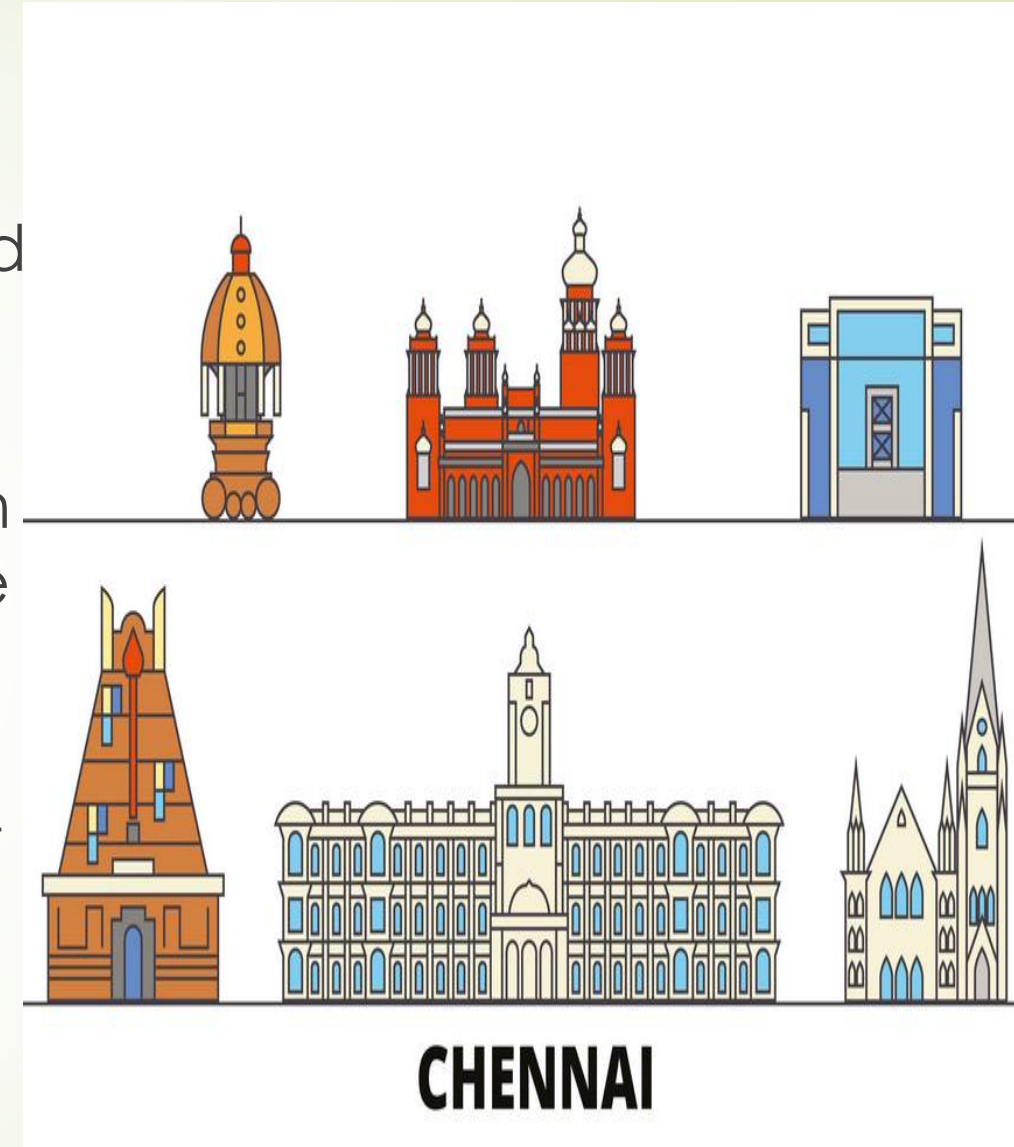


Figure 1: Chennai heritage site graphical view

Data Collection

- The following data was collected for this project:
 - Neighborhood data of Chennai from https://en.wikipedia.org/wiki/List_of_neighborhoods_in_Chennai
 - Geographical coordinates of Chennai and all neighborhoods in Chennai using GeoPy and Geocoder libraries in python
 - Venue data for all neighborhoods in Chennai using Foursquare API
- The data was then cleaned to produce the final datasets shown in the upcoming slides

Dataset for Chennai Neighborhoods

	Neighborhood	Location	Latitude	Longitude
0	Adambakkam	South and East Chennai	12.9880	80.2047
1	Adyar	South and East Chennai	13.0012	80.2565
2	Alandur	South and East Chennai	12.9975	80.2006
3	Alapakkam	West Chennai	13.0490	80.1673
4	Alwarthirunagar	West Chennai	13.0426	80.1840
5	Ambattur	West Chennai	13.1143	80.1548
6	Aminjikarai	West Chennai	13.0698	80.2245
7	Anna Nagar	West Chennai	13.0850	80.2101
8	Annanur	West Chennai	13.1184	80.1246
9	Arumbakkam	West Chennai	13.0724	80.2102

Figure 2: First 10 rows of Chennai Neighborhood Dataframe

Dataset for Top 10 Most Common Venues

	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	Amboli	Indian Restaurant	Coffee Shop	Bakery	Bar	Asian Restaurant	Pizza Place	Sandwich Place	Bowling Alley	Bus Station	Bike Rental / Bike Share
1	Chakala, Andheri	Hotel	Indian Restaurant	Café	Fast Food Restaurant	Pizza Place	Asian Restaurant	Hotel Bar	Vegetarian / Vegan Restaurant	Restaurant	Gym
2	D.N. Nagar	Bar	Indian Restaurant	Pub	Gym / Fitness Center	Pizza Place	Lounge	Coffee Shop	Vegetarian / Vegan Restaurant	Snack Place	Gym
3	Four Bungalows	Pub	Café	Indian Restaurant	Gym / Fitness Center	Chinese Restaurant	Bar	Seafood Restaurant	Lounge	Vegetarian / Vegan Restaurant	Coffee Shop
4	Lokhandwala	Indian Restaurant	Chinese Restaurant	Café	Pub	Bakery	Bar	Italian Restaurant	Gym / Fitness Center	Coffee Shop	Asian Restaurant
5	Marol	Indian Restaurant	Hotel	Diner	Bakery	Dance Studio	Ice Cream Shop	Chinese Restaurant	Fast Food Restaurant	Restaurant	Lounge
6	Sahar	Hotel	Café	Indian Restaurant	Lounge	Gym	Asian Restaurant	Pizza Place	Seafood Restaurant	Restaurant	Falafel Restaurant
7	Seven Bungalows	Café	Pub	Seafood Restaurant	Chinese Restaurant	Pizza Place	Coffee Shop	Bar	Ice Cream Shop	Asian Restaurant	Bistro
8	Versova	Café	Ice Cream Shop	Beach	Pizza Place	Coffee Shop	Chinese Restaurant	Salon / Barbershop	Frozen Yogurt Shop	Bistro	Sandwich Place
9	Mira Road	Indian Restaurant	Convenience Store	Coffee Shop	Mexican Restaurant	Fast Food Restaurant	Food Truck	Motorcycle Shop	Movie Theater	Basketball Court	Bar

Figure 3: First 10 rows of top 10 most common venues for all neighborhoods

Methodology

➤ Data Visualization

- Chennai neighborhoods data was plotted for providing a better understanding
- The graph alongside depicts the number of neighborhoods in each location of Chennai
- All neighborhoods on the outskirts of the city have been grouped as “Chennai”
- North Chennai and South East Chennai contain the highest number of neighborhoods

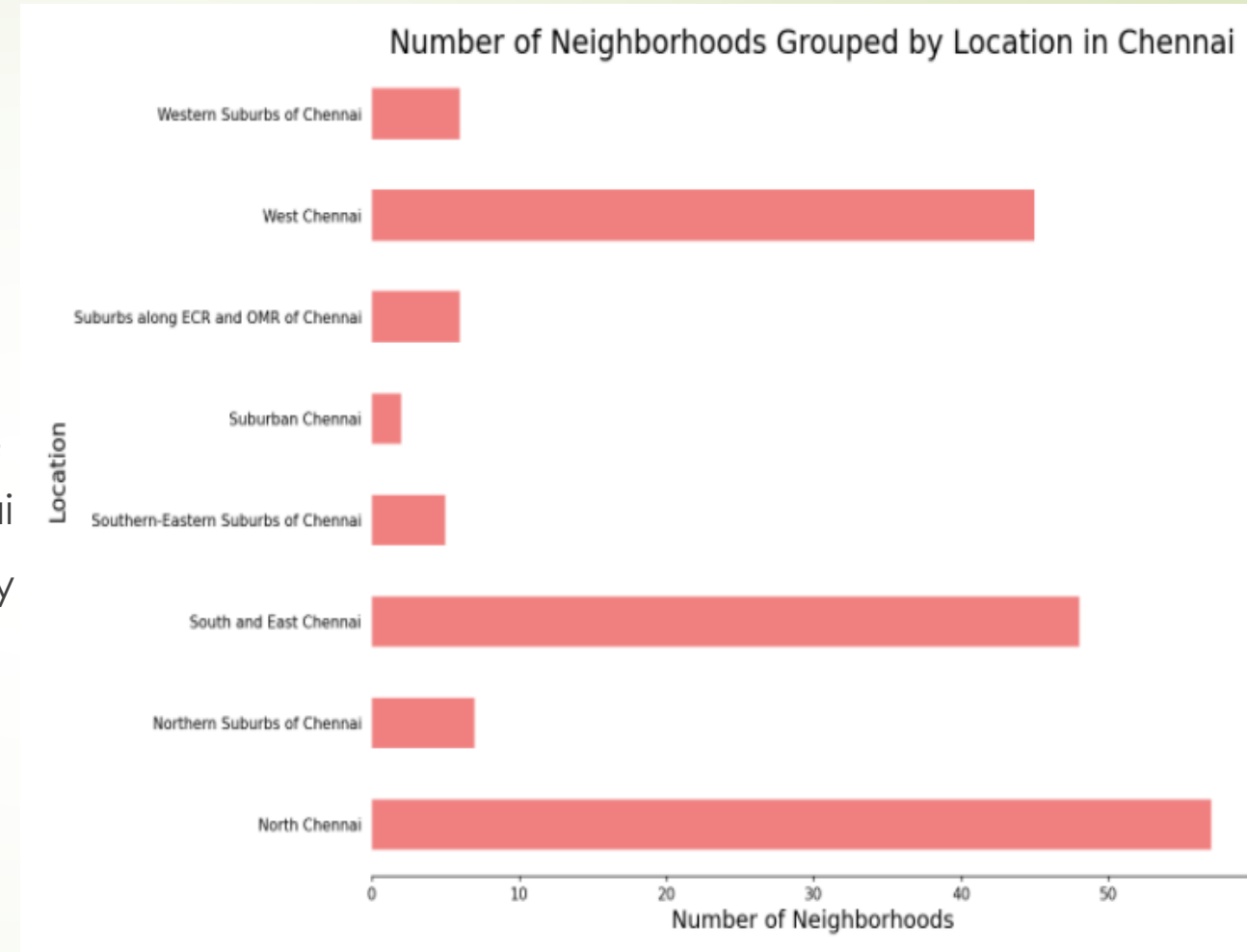


Figure 4: Number of neighborhoods grouped by location

➤ Data Visualization

- The Folium library in python was used to visualize the spread of all neighborhoods across Chennai

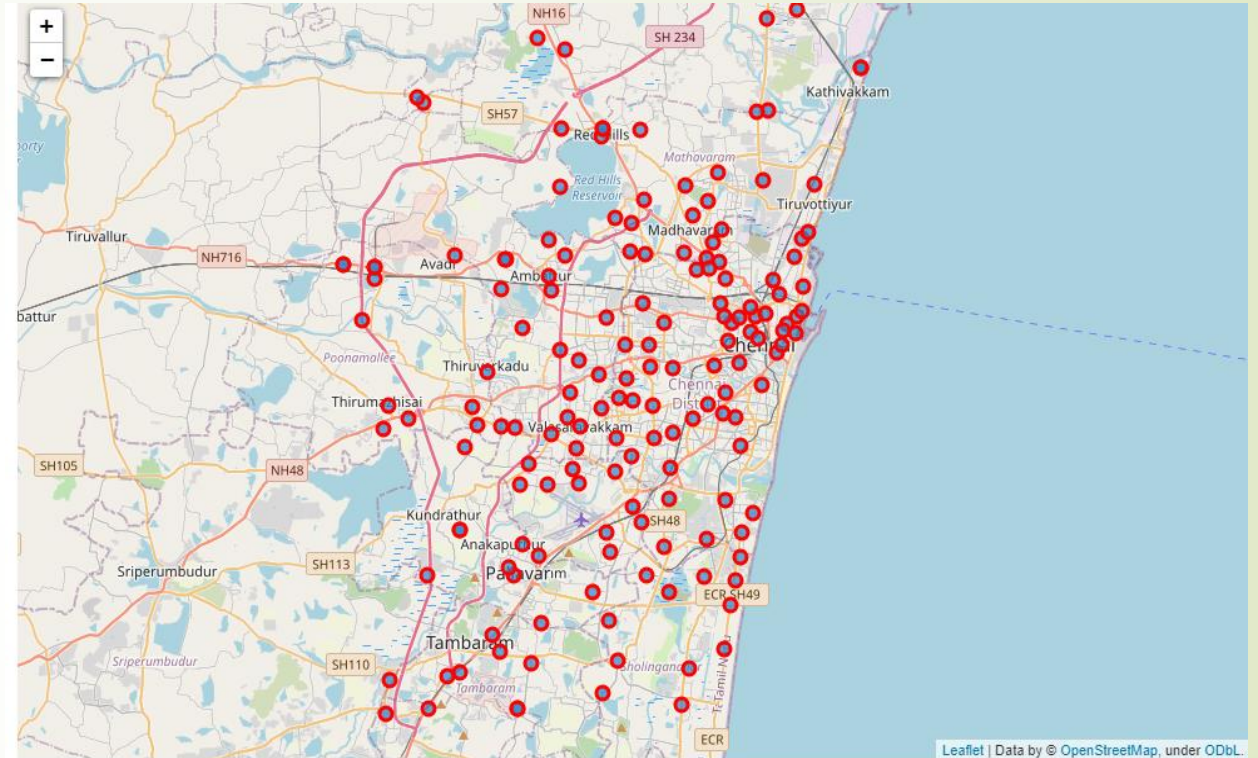


Figure 5: The neighborhood spread across Chennai

Methodology Continued

➤ One-hot Encoding

- One-hot Encoding was used to encode venue categories to numeric values with 1 if a venue belongs to a category and 0 if a venue does not belong to a category for all neighborhoods
- The average is then taken for all venue categories in a neighborhood to produce the dataframe shown

	Neighborhood	ATM	Accessories Store	Afghan Restaurant	African Restaurant	Airport Terminal	American Restaurant	Amphitheater	Andhra Restaurant	Arcade	...	Train	Train Station	Travel & Transport	Vegetarian / Vegetarian Restaurant
0	Adambakkam	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.111111	0.0	0.00
1	Adyar	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.015873	...	0.0	0.000000	0.0	0.01
2	Alandur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.062500	0.0	0.00
3	Alapakkam	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.00
4	Alwarthirunagar	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.00
5	Ambattur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.00
6	Aminjikarai	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.00
7	Anna Nagar	0.0	0.0	0.0	0.0	0.0	0.014706	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.04
8	Annanur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.333333	0.0	0.00
9	Arumbakkam	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.000000	...	0.0	0.000000	0.0	0.13

Figure 6: One-hot Encoding resulting dataframe

Methodology Continued

➤ Unsupervised Learning Model

- KMeans clustering was used to cluster neighborhoods in Chennai based on venue categories
- The plot shows a maximum Silhouette Score for 4 clusters and thus the n_clusters parameter in KMeans clustering was set to 5

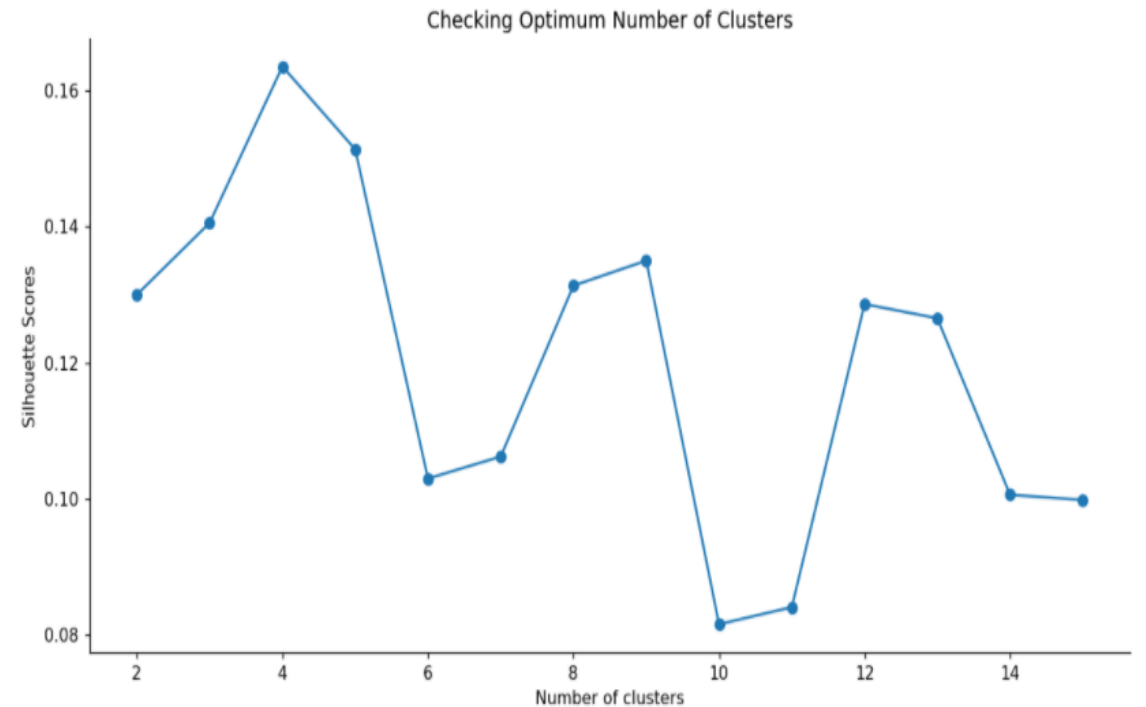


Figure 7: Silhouette scores for varying number of clusters in KMeans clustering

Results

- Each neighborhood received a cluster label based on clustering by the KMeans algorithm
- The Cluster Label column along with the Location, Latitude, and Longitude columns were added to the top 10 most common venues dataframe to provide the final results
- This dataframe is shown on the next slide

Results Continued

	Neighborhood	Location	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
0	Adambakkam	South and East Chennai	12.9919	80.206	2.0	Indian Restaurant	Train Station	Metro Station	Supermarket	Hotel	Bakery	Pizza Place	Department Store	Cl
1	Adyar	South and East Chennai	13.003	80.2519	2.0	Indian Restaurant	Café	Fast Food Restaurant	Dessert Shop	Pizza Place	Asian Restaurant	Electronics Store	North Indian Restaurant	Ice C
2	Alandur	South and East Chennai	13.0001	80.2006	2.0	Indian Restaurant	Metro Station	Hotel	Bakery	Supermarket	Breakfast Spot	Church	Café	
3	Alapakkam	West Chennai	13.0461	80.165	2.0	Department Store	Fast Food Restaurant	Clothing Store	Asian Restaurant	Sandwich Place	Chettinad Restaurant	Flower Shop	Furniture / Home Store	Veg
4	Alwarthirunagar	West Chennai	13.0506	80.184	2.0	Clothing Store	Fast Food Restaurant	Chinese Restaurant	Movie Theater	Smoke Shop	Gym	Café	Multiplex	Ice C
5	Ambattur	West Chennai	13.1188	80.1548	2.0	Movie Theater	Flea Market	Ice Cream Shop	Asian Restaurant	River	Bus Station	Multiplex	Department Store	Rest
6	Aminjikarai	West Chennai	13.0714	80.2226	2.0	Fast Food Restaurant	Pizza Place	Furniture / Home Store	Burger Joint	Sporting Goods Shop	Bookstore	Shopping Mall	Café	s
7	Anna Nagar	West Chennai	13.0836	80.2101	2.0	Indian Restaurant	Chinese Restaurant	Fast Food Restaurant	Coffee Shop	Vegetarian / Vegan Restaurant	Clothing Store	Electronics Store	Gym	E
8	Annanur	West Chennai	13.1121	80.129	3.0	Platform	Train Station	Medical Supply Store	Stationery Store	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	
9	Arumbakkam	West Chennai	13.0724	80.2102	2.0	Hotel	Fast Food Restaurant	Vegetarian / Vegan Restaurant	Pool	Bakery	Chinese Restaurant	Clothing Store	Event Space	

Figure 8: First 10 rows of clustering neighborhoods in Chennai dataframe

Results Continued – Cluster 1

- Analyzing each cluster individually

Figure 9: Cluster 1

	Neighborhood	Location	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
15	Broadway	North Chennai	0.0	Indian Restaurant	Video Store	Restaurant	Market	Harbor / Marina	Yoga Studio	Flea Market	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
35	Kadaperi	South and East Chennai	0.0	Indian Restaurant	Jewelry Store	Light Rail Station	Train Station	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
46	Kosapet	North Chennai	0.0	Indian Restaurant	Department Store	Hotel	Yoga Studio	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
57	Madipakkam	South and East Chennai	0.0	Indian Restaurant	Department Store	Convenience Store	Yoga Studio	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
62	manapakkam	West Chennai	0.0	Indian Restaurant	Trail	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
64	Manjambakkam	North Chennai	0.0	Indian Restaurant	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
67	Medavakkam	South and East Chennai	0.0	Indian Restaurant	Vegetarian / Vegan Restaurant	Chinese Restaurant	Pizza Place	Convenience Store	Bakery	Flea Market	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
93	Parry's Corner	North Chennai	0.0	Indian Restaurant	Video Store	Market	Harbor / Marina	Yoga Studio	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
120	Sowcarpet	North Chennai	0.0	Indian Restaurant	Men's Store	Video Store	Restaurant	Market	Harbor / Marina	Outlet Store	Yoga Studio	Fried Chicken Joint	Food Truck
150	Kancheepuram	Suburban Chennai	0.0	Indian Restaurant	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
151	Chengalpattu	Suburban Chennai	0.0	Indian Restaurant	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
159	Tiruvallur	Western Suburbs of Chennai	0.0	Indian Restaurant	Metro Station	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
170	Karapakkam	Suburbs along ECR and OMR of Chennai	0.0	Indian Restaurant	Restaurant	Afghan Restaurant	Vegetarian / Vegan Restaurant	Shopping Plaza	Fast Food Restaurant	Yoga Studio	Flower Shop	Fruit & Vegetable Store	Fried Chicken Joint
172	Muthukadu	Suburbs along ECR and OMR of Chennai	0.0	Indian Restaurant	Museum	Coffee Shop	Hotel	Theme Park	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck

Results Continued – Cluster 2

Figure 10: Cluster 2

	Neighborhood	Location	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
38	Kathirvedu	North Chennai	1.0	ATM	Snack Place	Food & Drink Shop	Cricket Ground	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
41	Kodungaiyur	North Chennai	1.0	ATM	Pharmacy	Coffee Shop	Bank	Food	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
43	Kolathur	North Chennai	1.0	ATM	Indian Restaurant	Bus Stop	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
44	Korattur	West Chennai	1.0	ATM	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop
48	Kovilambakkam	South and East Chennai	1.0	ATM	Indian Restaurant	Bar	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
50	Kundrathur	West Chennai	1.0	ATM	Soup Place	Bus Station	Garden	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
51	Lakshmipuram	North Chennai	1.0	ATM	Department Store	Intersection	Indian Restaurant	Photography Studio	Hotel	Flea Market	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
63	Mangadu	West Chennai	1.0	ATM	Pharmacy	Fast Food Restaurant	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
70	Moolakadaai	North Chennai	1.0	ATM	Coffee Shop	Gym	Bakery	Currency Exchange	Electronics Store	Donut Shop	Gaming Cafe	Dessert Shop	Furniture / Home Store
72	Mudichur	South and East Chennai	1.0	Breakfast Spot	Pharmacy	Yoga Studio	Food	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
75	Nagalkeni	South and East Chennai	1.0	Supermarket	Pharmacy	Yoga Studio	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
91	Pammal	South and East Chennai	1.0	ATM	South Indian Restaurant	Warehouse Store	Bus Station	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service

Results Continued – Cluster 3

	Neighborhood	Location	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	Adambakkam	South and East Chennai	2.0	Indian Restaurant	Train Station	Metro Station	Supermarket	Hotel	Bakery	Pizza Place	Department Store	Fried Chicken Joint	Food Truck
1	Adyar	South and East Chennai	2.0	Indian Restaurant	Café	Fast Food Restaurant	Dessert Shop	Pizza Place	Asian Restaurant	Electronics Store	North Indian Restaurant	Ice Cream Shop	Chinese Restaurant
2	Alandur	South and East Chennai	2.0	Indian Restaurant	Metro Station	Hotel	Bakery	Supermarket	Breakfast Spot	Church	Café	Pizza Place	Train Station
3	Alapakkam	West Chennai	2.0	Department Store	Fast Food Restaurant	Clothing Store	Asian Restaurant	Sandwich Place	Chettinad Restaurant	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint
4	Alwarthirunagar	West Chennai	2.0	Clothing Store	Fast Food Restaurant	Chinese Restaurant	Movie Theater	Smoke Shop	Gym	Café	Multiplex	Ice Cream Shop	Pizza Place
...
168	Urapakkam	Southern-Eastern Suburbs of Chennai	2.0	South Indian Restaurant	Juice Bar	Department Store	Indian Restaurant	Coffee Shop	Flower Shop	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
169	Guduvanchery	Southern-Eastern Suburbs of Chennai	2.0	Department Store	Indie Movie Theater	Indian Restaurant	North Indian Restaurant	Bakery	Food	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck
171	Kanathur	Suburbs along ECR and OMR of Chennai	2.0	Movie Theater	Café	Whisky Bar	Juice Bar	Food	Garden	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint
173	Kelambakkam	Suburbs along ECR and OMR of Chennai	2.0	Indian Restaurant	Bus Station	Coffee Shop	Fast Food Restaurant	Café	Yoga Studio	Food	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint
174	Kovalam	Suburbs along ECR and OMR of Chennai	2.0	Indian Restaurant	Seafood Restaurant	Café	Hotel	Resort	Restaurant	Surf Spot	Beach	Bar	Yoga Studio

127 rows × 13 columns

Figure 11: Cluster 3

Results Continued – Cluster 4

	Neighborhood	Location	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
8	Annanur	West Chennai	3.0	Platform	Train Station	Medical Supply Store	Stationery Store	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
22	Ennore	North Chennai	3.0	Train Station	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
68	Minjur	North Chennai	3.0	Train Station	Scenic Lookout	Park	Yoga Studio	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
131	Thirunindravur	West Chennai	3.0	Train Station	Pharmacy	Yoga Studio	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
154	Athipattu	Northern Suburbs of Chennai	3.0	Train Station	Platform	Yoga Studio	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
156	Minjur	Northern Suburbs of Chennai	3.0	Train Station	Scenic Lookout	Park	Yoga Studio	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service
158	Ennore	Northern Suburbs of Chennai	3.0	Train Station	Yoga Studio	Flower Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court
161	Thirunindravur	Western Suburbs of Chennai	3.0	Train Station	Pharmacy	Yoga Studio	Flea Market	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court

Figure 12: Cluster 4

Results Continued

- Visualization of neighborhood clusters was done using Folium in python
- Different clusters correspond to different colors

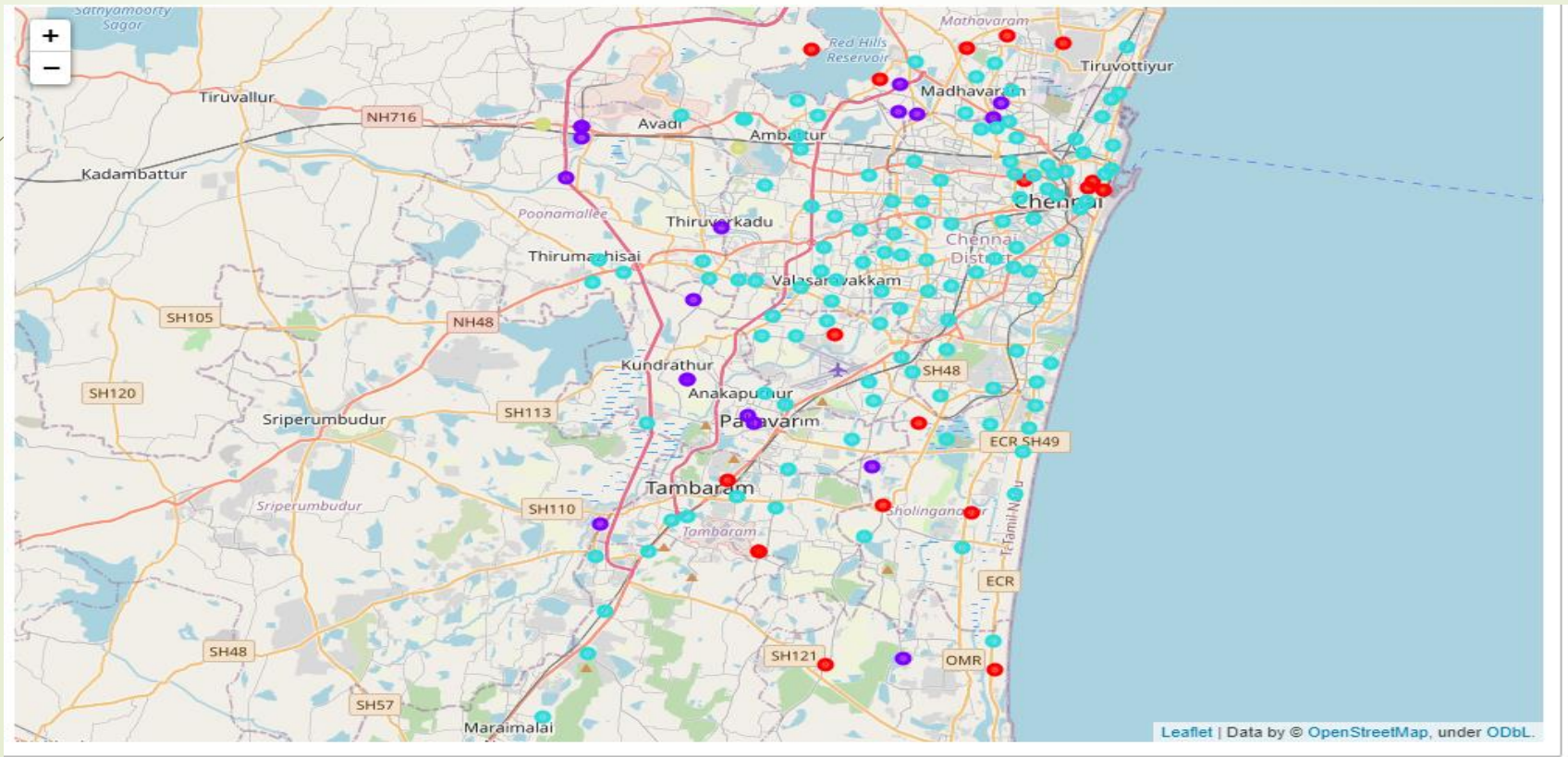


Figure 14: Visualizing the clustering of neighborhoods in Chennai

Discussion

- By analysing the five clusters obtained we can see that some of the clusters are more suited for restaurants and hotels, whereas, other clusters are less suited.
- Neighborhoods in clusters 3, 4 contain a small percentage of restaurants, hotels, cafe and pubs in their top 10 common venues. These clusters contain a higher degree of other venues like train station, bus station, fish market, gym, performing arts venue and smoke shop, to name a few.
- Thus, they are not well suited for opening a new restaurant. On the other hand, neighborhoods in clusters 1 and 2 contain a much higher degree of restaurants, hotels, multiplex, cafes, bars and other food joints.
- Thus, the neighborhoods in these clusters would be well suited for opening a new restaurant.

Discussion Continued

- Plotting final results using Folium library in python

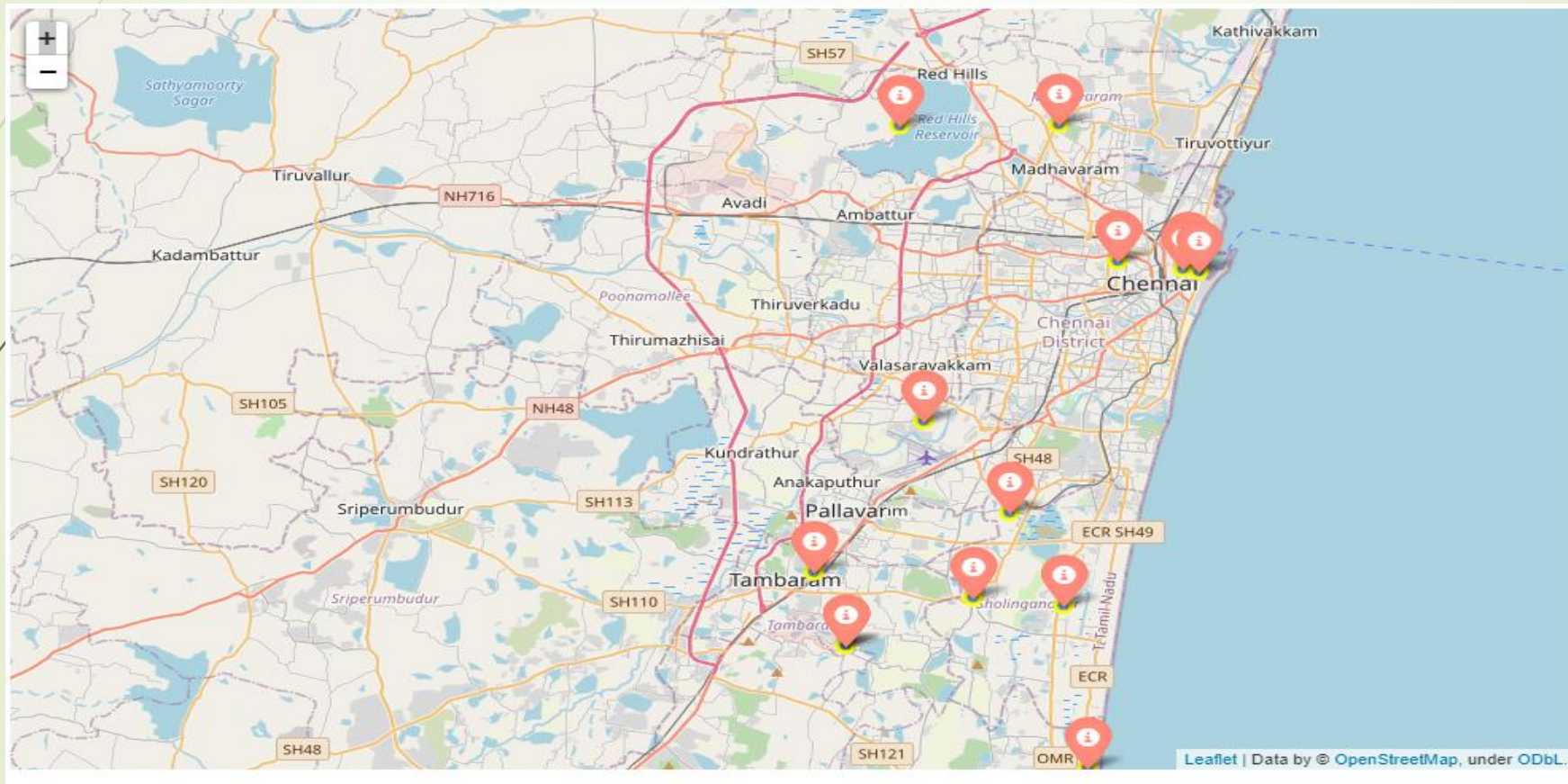


Figure 15: Neighborhoods in Chennai that are most suited for starting a new restaurant (Cluster 1)

All these places first choice of shop is Indian Restaurant .

- Broadway
- Kadaperi
- Kosapet
- Madipakkam
- manapakkam
- Manjambakkam
- Medavakkam
- Parry's Corner
- Sowcarpet
- Kancheepuram
- Chengalpattu
- Tiruvallur
- Karapakkam
- Muthukadu

Conclusion

- In this project, the neighborhoods in Chennai, India have been successfully analysed for determining which would be the best neighborhoods for opening a new restaurant.
- Based on the analysis carried out, neighborhoods in cluster 1 are recommended as locations for the new restaurant.
- The stakeholders and investors can further tune this by considering various other factors like transport, legal requirements, and costs associated which were out of the scope for this project and thus were not considered.

Thank you

- Github link :

https://github.com/yankarto/Coursera_Capstone/blob/main/final_project_week5/Neighborhoods%20in%20Chennai%20to%20Open%20a%20Restaurant.ipynb

- IBM Cloud link : its better for MAP viewing

https://eu-gb.dataplatform.cloud.ibm.com/analytics/notebooks/v2/fe94db64-64d3-4154-8862-a39fd77dd718/view?access_token=50c7269f87cd7c18f0117087493b8b74d50dfc22fd353e4c70a207604215682b