

Analyzing the Neighborhoods in Chennai for Starting a Restaurant

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Introduction

- Chennai is one of the metropolitan cities of India and is one of the most densely populated cities in the world.
- The multi-cultural nature of the city brings with it numerous cuisines from all over the globe
- 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 view

Data Collection

- The following data was collected for this project:
 - Neighborhood data of Chennai from https://en.wikipedia.org/wiki/List_of_neighbourhoods_of_Chennai
 - Geographical coordinates of Chennai and all neighborhoods in Chennai using GeoPy and Geocoder libraries in python
 - Venue data for all neighbourhoods 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
Neighbourhood Data frame

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	Adambakkam	Indian Restaurant	Train Station	Supermarket	Department Store	Hotel	Pizza Place	Metro Station	Bakery	Food Truck	Food Service
1	Adyar	Indian Restaurant	Café	Pizza Place	Asian Restaurant	Department Store	Chinese Restaurant	Fast Food Restaurant	Ice Cream Shop	Rock Club	North Indian Restaurant
2	Alandur	Indian Restaurant	Metro Station	Bakery	Train Station	Hotel	Church	Café	Fish Market	Breakfast Spot	Pizza Place
3	Alapakkam	Department Store	Fast Food Restaurant	Bakery	Accessories Store	Sandwich Place	Clothing Store	Business Service	Asian Restaurant	Fried Chicken Joint	Food Truck
4	Alwarthirunagar	Pizza Place	Clothing Store	Fast Food Restaurant	Ice Cream Shop	Tea Room	Chinese Restaurant	Café	Multiplex	Movie Theater	Gym
5	Ambattur	Ice Cream Shop	Movie Theater	Indian Restaurant	Flea Market	Multiplex	River	Asian Restaurant	Department Store	Electronics Store	Event Space
6	Aminjikarai	Fast Food Restaurant	Pizza Place	Electronics Store	Clothing Store	Shopping Mall	Burger Joint	Cosmetics Shop	Bookstore	Furniture / Home Store	Event Space
7	Anna Nagar	Indian Restaurant	Chinese Restaurant	Fast Food Restaurant	Department Store	Vegetarian / Vegan Restaurant	Coffee Shop	Clothing Store	Gym	Bakery	Electronics Store
8	Annanur	Train Station	Platform	Medical Supply Store	Stationery Store	Women's Store	Fast Food Restaurant	Food Truck	Food Service	Food Court	Food & Drink Shop
9	Arumbakkam	Hotel	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Food Court	Scenic Lookout	South Indian Restaurant	Burger Joint	Event Space	Bus Station	Chinese Restaurant
10	Ashok Nagar	Indian Restaurant	Vegetarian / Vegan Restaurant	Pizza Place	Fast Food Restaurant	Sculpture Garden	Coffee Shop	Multicuisine Indian Restaurant	Café	Restaurant	Snack Place

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

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”
- South and east Chennai and North Chennai contain the highest number of neighborhoods

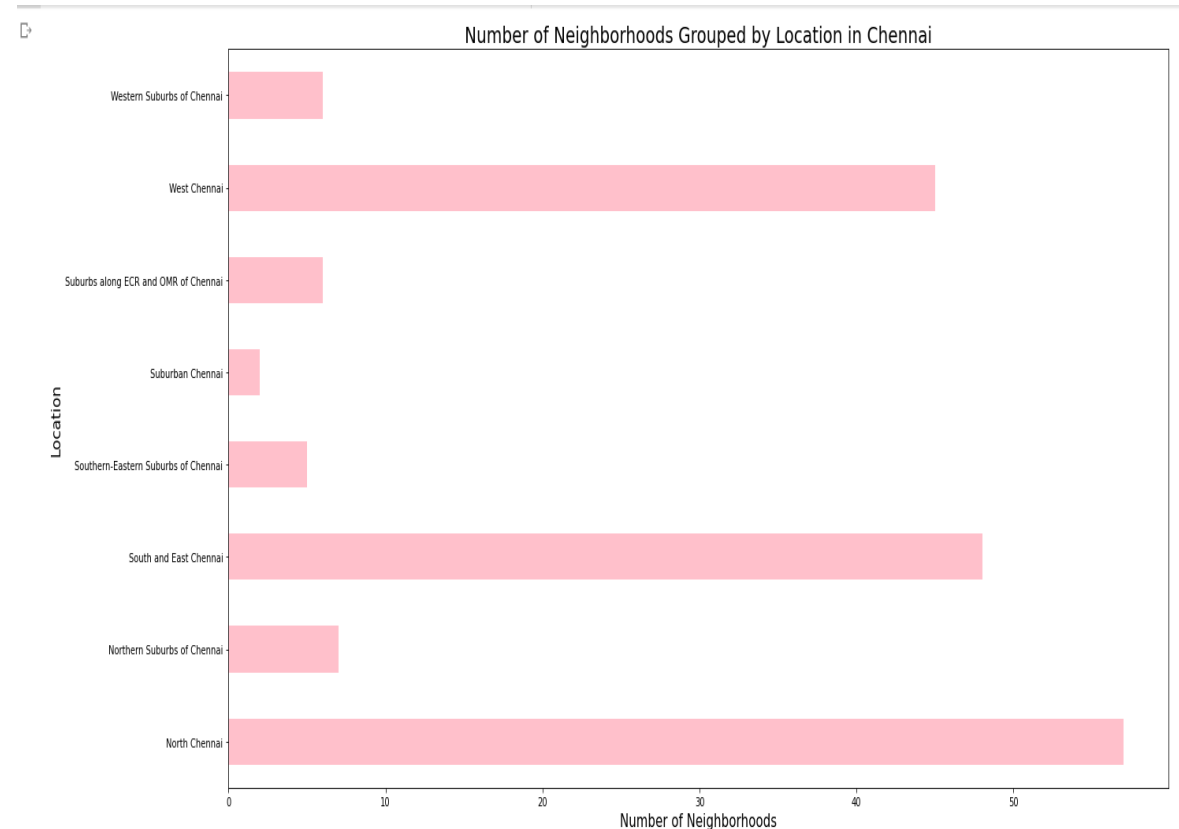


Figure 4: Number of neighbourhoods grouped by location

Methodology Continued

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

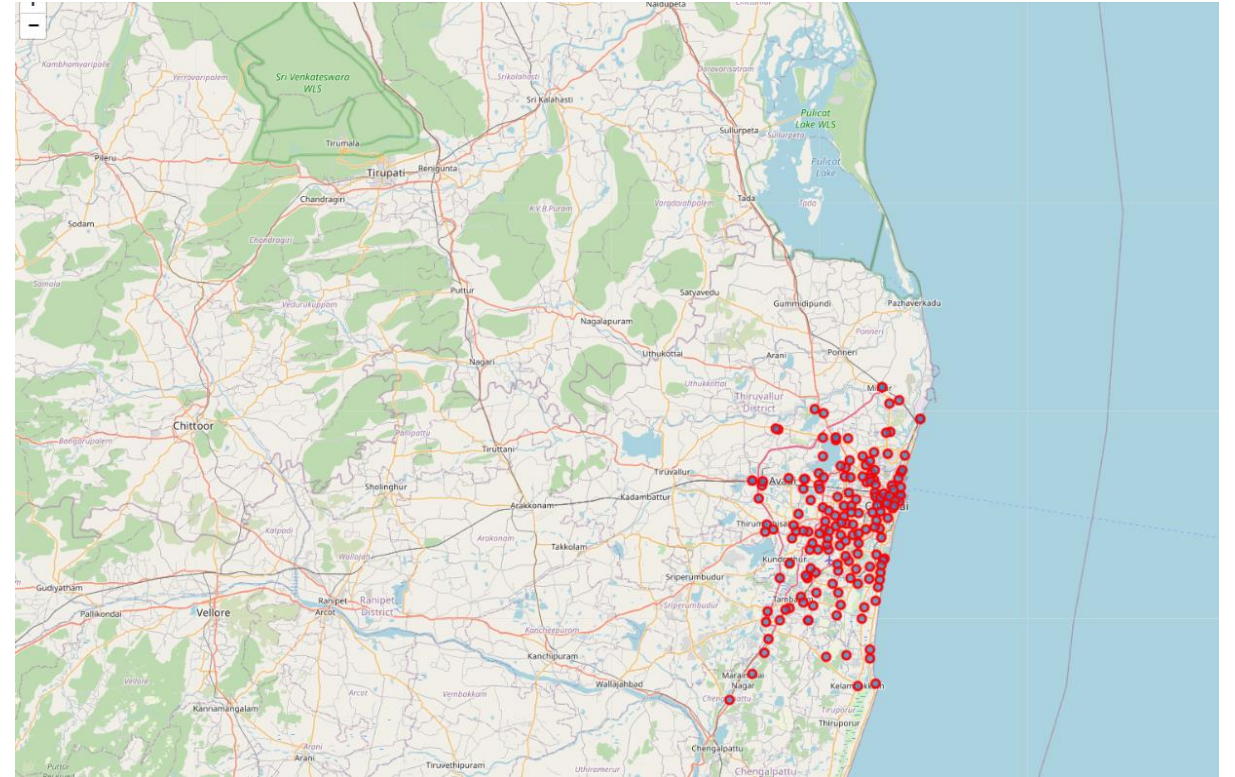


Figure 5: The neighbourhood spread across Chennai

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 data frame shown.

(161, 191)

	Neighborhood	ATM	Accessories Store	Afghan Restaurant	African Restaurant	Airport Terminal	American Restaurant	Amphitheater	Andhra Restaurant	Antique Shop	Arcade	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	BBQ Joint	Bakery
0	Adambakkam	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.100000
1	Adyar	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.014706	0.0	0.044118	0.0	0.014706	0.000000
2	Alandur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.117647
3	Alapakkam	0.0	0.1	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.100000	0.0	0.000000	0.100000
4	Alwarthirunagar	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.000000
5	Ambattur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.100000	0.0	0.000000	0.000000
6	Aminjikarai	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.000000
7	Anna Nagar	0.0	0.0	0.0	0.0	0.0	0.014493	0.0	0.0	0.0	0.000000	0.0	0.014493	0.0	0.014493	0.028986
8	Annanur	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.000000
9	Arumbakkam	0.0	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.000000	0.0	0.000000	0.0	0.000000	0.000000

Figure 6: One-hot Encoding
resulting dataframe

Methodology Continued

- **Unsupervised Learning Model**

- K-Means clustering was used to cluster neighborhoods in Chennai based on venue categories
- The plot shows a maximum Silhouette Score for 11 clusters and thus the `n_clusters` parameter in K-Means clustering was set to 11

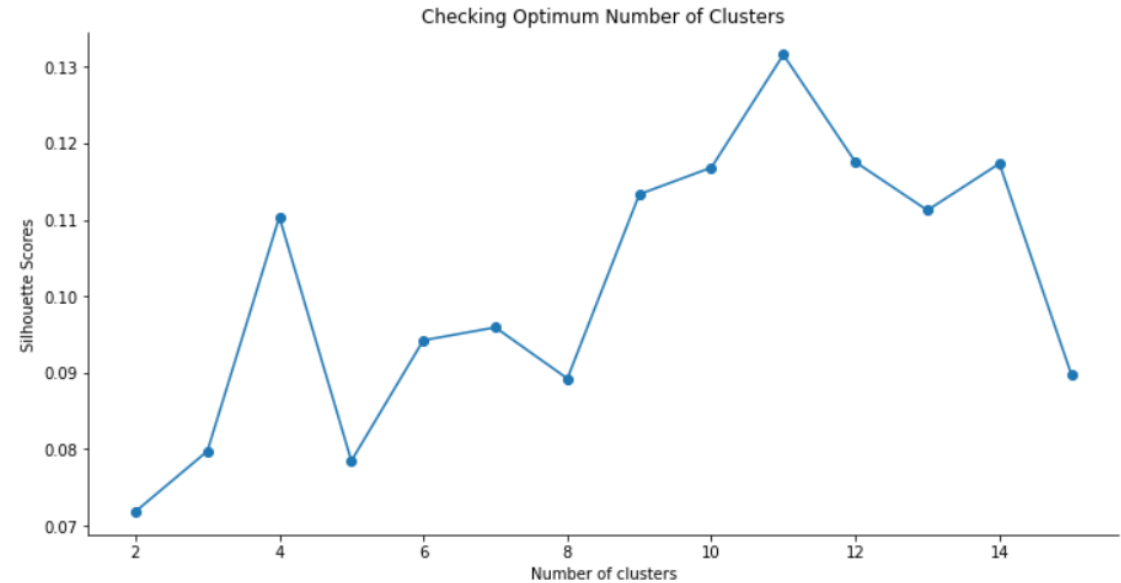


Figure 7: Silhouette scores for varying number of clusters in K-Means clustering

Results

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

Results Continued

(176, 15)

	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	0.0	Indian Restaurant	Train Station	Supermarket	Department Store	Hotel	Pizza Place	Metro Station	Bakery	Food Truck
1	Adyar	South and East Chennai	13.003	80.2519	0.0	Indian Restaurant	Café	Pizza Place	Asian Restaurant	Department Store	Chinese Restaurant	Fast Food Restaurant	Ice Cream Shop	Rock Club
2	Alandur	South and East Chennai	13.0001	80.2006	0.0	Indian Restaurant	Metro Station	Bakery	Train Station	Hotel	Church	Café	Fish Market	Breakfast Spot
3	Alapakkam	West Chennai	13.0461	80.165	0.0	Department Store	Fast Food Restaurant	Bakery	Accessories Store	Sandwich Place	Clothing Store	Business Service	Asian Restaurant	Fried Chicken Joint
4	Alwarthirunagar	West Chennai	13.0506	80.184	0.0	Pizza Place	Clothing Store	Fast Food Restaurant	Ice Cream Shop	Tea Room	Chinese Restaurant	Café	Multiplex	Movie Theater
5	Ambattur	West Chennai	13.1188	80.1548	0.0	Ice Cream Shop	Movie Theater	Indian Restaurant	Flea Market	Multiplex	River	Asian Restaurant	Department Store	Electronics Store
6	Aminjikarai	West Chennai	13.0714	80.2226	0.0	Fast Food Restaurant	Pizza Place	Electronics Store	Clothing Store	Shopping Mall	Burger Joint	Cosmetics Shop	Bookstore	Furniture / Home Store
7	Anna Nagar	West Chennai	13.0836	80.2101	0.0	Indian Restaurant	Chinese Restaurant	Fast Food Restaurant	Department Store	Vegetarian / Vegan Restaurant	Coffee Shop	Clothing Store	Gym	Bakery

Figure 8: First 10 rows of clustering neighbourhoods in Chennai data frame

Results Continued – Cluster 1

- Analyzing each cluster individually

	Neighborhood	Location	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	Indian Restaurant	Train Station	Supermarket	Department Store	Hotel	Pizza Place	Metro Station	Bakery	Food Truck	Food Service
1	Adyar	South and East Chennai	Indian Restaurant	Café	Pizza Place	Asian Restaurant	Department Store	Chinese Restaurant	Fast Food Restaurant	Ice Cream Shop	Rock Club	North Indian Restaurant
2	Alandur	South and East Chennai	Indian Restaurant	Metro Station	Bakery	Train Station	Hotel	Church	Café	Fish Market	Breakfast Spot	Pizza Place
3	Alapakkam	West Chennai	Department Store	Fast Food Restaurant	Bakery	Accessories Store	Sandwich Place	Clothing Store	Business Service	Asian Restaurant	Fried Chicken Joint	Food Truck
4	Alwarthirunagar	West Chennai	Pizza Place	Clothing Store	Fast Food Restaurant	Ice Cream Shop	Tea Room	Chinese Restaurant	Café	Multiplex	Movie Theater	Gym
5	Ambattur	West Chennai	Ice Cream Shop	Movie Theater	Indian Restaurant	Flea Market	Multiplex	River	Asian Restaurant	Department Store	Electronics Store	Event Space
6	Aminjikarai	West Chennai	Fast Food Restaurant	Pizza Place	Electronics Store	Clothing Store	Shopping Mall	Burger Joint	Cosmetics Shop	Bookstore	Furniture / Home Store	Event Space
7	Anna Nagar	West Chennai	Indian Restaurant	Chinese Restaurant	Fast Food Restaurant	Department Store	Vegetarian / Vegan Restaurant	Coffee Shop	Clothing Store	Gym	Bakery	Electronics Store
9	Arumbakkam	West Chennai	Hotel	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Food Court	Scenic Lookout	South Indian Restaurant	Burger Joint	Event Space	Bus Station	Chinese Restaurant
10	Ashok Nagar	West Chennai	Indian Restaurant	Vegetarian / Vegan Restaurant	Pizza Place	Fast Food Restaurant	Sculpture Garden	Coffee Shop	Multicuisine Indian Restaurant	Café	Restaurant	Snack Place

Figure 9: Cluster 1

Results Continued – Cluster 2, 3

	Neighborhood	Location	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
58	Mangadu	West Chennai	Pharmacy	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
61	Mathur MMDA	North Chennai	Pharmacy	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop

	Neighborhood	Location	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
22	Ennore	North Chennai	Train Station	Women's Store	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
124	Thirunindravur	West Chennai	Train Station	Pharmacy	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
146	Athipattu	Northern Suburbs of Chennai	Train Station	Platform	Women's Store	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food
150	Ennore	Northern Suburbs of Chennai	Train Station	Women's Store	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
153	Thirunindravur	Western Suburbs of Chennai	Train Station	Pharmacy	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop

Figure 10: Cluster 2, 3

Results Continued – Cluster 4

	Neighborhood	Location	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	Indian Restaurant	Market	Department Store	Restaurant	Snack Place	Video Store	Hotel	Fried Chicken Joint	Food Service	Food Court
17	Chetpet	South and East Chennai	Indian Restaurant	Café	Hotel	Coffee Shop	Chinese Restaurant	Restaurant	Seafood Restaurant	Bakery	Ice Cream Shop	Juice Bar
35	Kadaperi	South and East Chennai	Indian Restaurant	Train Station	Jewelry Store	Restaurant	Light Rail Station	Fish Market	Fried Chicken Joint	Food Truck	Food Service	Food Court
36	Karambakkam	West Chennai	Indian Restaurant	Flea Market	Restaurant	Deli / Bodega	Fish Market	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop
41	Kolathur	North Chennai	Indian Restaurant	ATM	Restaurant	Bus Stop	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
43	Kosapet	North Chennai	Indian Restaurant	Department Store	Hotel	Fish Market	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop
57	manapakkam	West Chennai	Indian Restaurant	Afghan Restaurant	Trail	Women's Store	Fast Food Restaurant	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop
59	Manjambakkam	North Chennai	Indian Restaurant	Fish Market	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food	Flower Shop
62	Medavakkam	South and East Chennai	Indian Restaurant	Pizza Place	Chinese Restaurant	Women's Store	Fast Food Restaurant	Food Truck	Food Service	Food Court	Food & Drink Shop	Food
85	Pallikaranai	South and East Chennai	Indian Restaurant	Bar	Gaming Cafe	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food

Figure 11: Cluster 4

Results Continued – Cluster 5

	Neighborhood	Location	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
11	Avadi	West Chennai	IT Services	Department Store	Concert Hall	Park	Breakfast Spot	Women's Store	Fish Market	Food Truck	Food Service	Food Court
12	Ayappakkam	West Chennai	Pharmacy	Department Store	Clothing Store	Print Shop	Medical Supply Store	Supermarket	Fish Market	Food Truck	Food Service	Food Court
31	Irumbuliyur	South and East Chennai	Asian Restaurant	Motorcycle Shop	Bus Station	Coffee Shop	Restaurant	Fish Market	Food Truck	Food Service	Food Court	Food & Drink Shop
38	Keelkattalai	South and East Chennai	Fast Food Restaurant	Pizza Place	Fried Chicken Joint	Electronics Store	Bus Station	Fish Market	Food Truck	Food Service	Food Court	Food & Drink Shop
46	Koyambedu	West Chennai	Vegetarian / Vegan Restaurant	Bus Station	South Indian Restaurant	Fast Food Restaurant	Metro Station	Department Store	Flower Shop	Food Court	Antique Shop	Bus Line
47	Kundrathur	West Chennai	Soup Place	Bus Station	Furniture / Home Store	Fruit & Vegetable Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop	Food
50	M.G.R. Nagar	West Chennai	Thai Restaurant	Bed & Breakfast	Bus Station	Grocery Store	Furniture / Home Store	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food & Drink Shop
52	Madhavaram	North Chennai	Ice Cream Shop	Park	Food & Drink Shop	Bus Station	Fish Market	Fried Chicken Joint	Food Truck	Food Service	Food Court	Food
63	Minjur	North Chennai	Pharmacy	Train Station	Scenic Lookout	Park	Fast Food Restaurant	Food Truck	Food Service	Food Court	Food & Drink Shop	Food
64	Mogappair	West Chennai	Chinese Restaurant	Bakery	Pizza Place	South Indian Restaurant	Bus Station	Food & Drink Shop	Ice Cream Shop	Accessories Store	Donut Shop	Electronics Store
73	Naravarikuppam	North Chennai	Multiplex	Indian Restaurant	Bus Station	Gym	Fruit & Vegetable Store	Food Truck	Food Service	Food Court	Food & Drink Shop	Food

Figure 12: Cluster 5

Results Continued

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

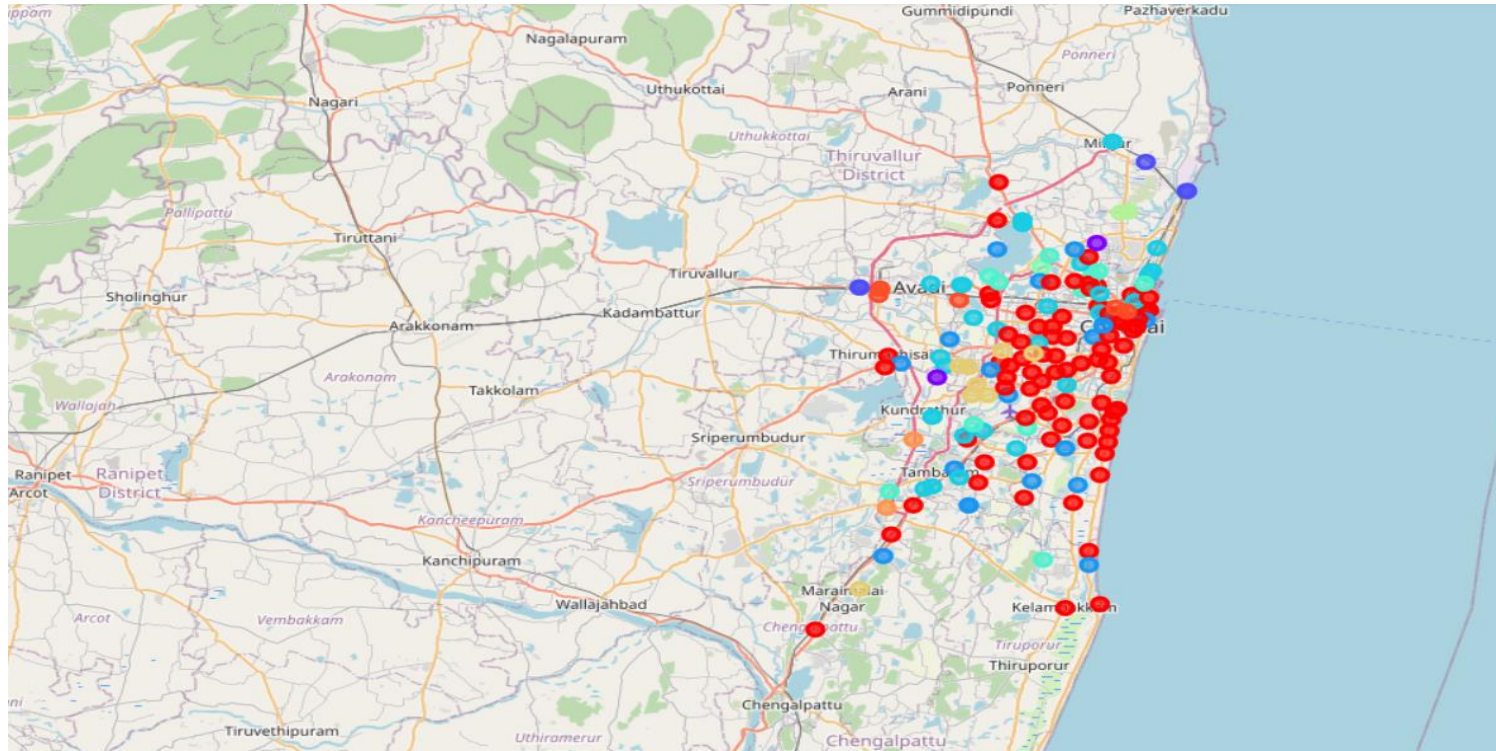


Figure 13: Visualizing the clustering of neighbourhoods in Chennai

Discussion

- By analyzing the clusters, it is evident that neighborhoods in cluster 2, 3, and 4 are not well suited for a new restaurant since they contain a high degree of other venues like train station, bus station, fish market, gym and smoke shop.
- Comparing clusters 1 and 5, we find that neighborhoods in cluster 1 contain a much higher degree of food joints
- Neighborhoods in cluster 5 contain many other venues like soccer field, flea market, smoke shop, gym, train station, dance studio and music store
- Thus, the most optimal neighborhoods for starting a restaurant are in cluster 1

Discussion Continued

- Plotting final results using Folium library in python

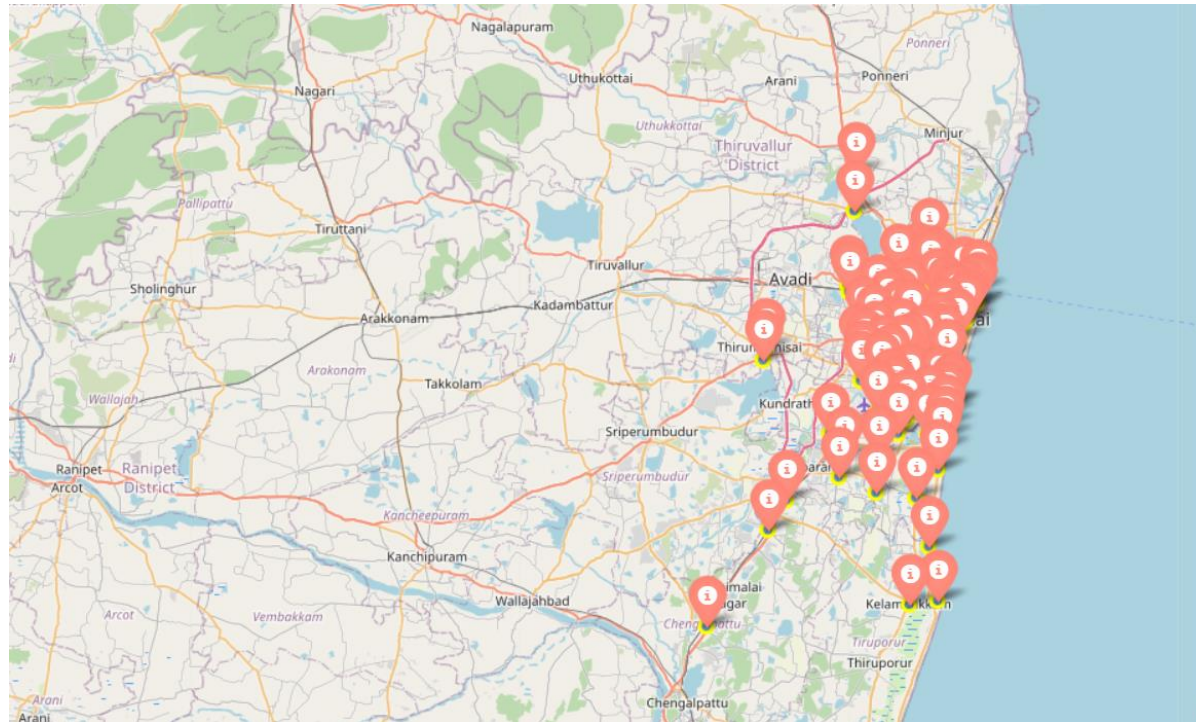


Figure 14: Neighbourhoods in Chennai that are most suited for starting a new restaurant (Cluster 1)

Conclusion

- In this project, the neighbourhoods in Chennai, India have been successfully analysed for determining which would be the best neighbourhoods for opening a new restaurant
- Based on the analysis carried out, neighbourhoods 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