Business/Tech Park In Bengaluru City

{ By: Krishna Ramadas

Problem

- Bengaluru aka Bangalore is one of the fast-growing metro cities in INDIA.

- It is also known as the "Silicon Valley" of India

- Business/Tech parks are changing the outlook of the city

- Find an apt location for the construction of a business/tech park

Data:

- List of neighborhoods in Bengaluru city from Wikipedia

- Latitude and Longitude data from geocoder

- Venue data in Bengaluru city from FourSquareAPI

- The latest property (land) rate in Bengaluru from property guidance sites

Data scraping and wrangling

- Data is scraped using read_html method from Wikipedia page

- 8 administrative zone and associated neighbourhoods were tabulated

	Central	Eastern	North-Eastern	Northern	South-Eastern	Southern	Southern Suburbs	Western
0	Cantonment area	Bellandur	Banaswadi	Hebbal	Bommanahalli	Banashankari	Anjanapura	Basaveshwaranagar
1	Domlur	CV Raman Nagar	HBR Layout	Jalahalli	Bommasandra	Basavanagudi	Arekere	Kamakshipalya
2	Indiranagar	Hoodi	Horamavu	Mathikere	BTM Layout	Girinagar	Begur	Kengeri
3	Jeevanbheemanagar	Krishnarajapuram	Kalyan Nagar	Peenya	Electronic City	J. P. Nagar	Gottigere	Mahalakshmi Layout
4	Malleswaram	Mahadevapura	Kammanahalli	R. T. Nagar	HSR Layout	Jayanagar	Hulimavu	Nagarbhavi

- The data frame is transposed and columns were named as "Zone" and "Neighborhood"

	Zone	Neighborhood
0	Central	Cantonment area
1	Eastern	Bellandur
2	North-Eastern	Banaswadi
3	Northern	Hebbal
4	South-Eastern	Bommanahalli

- The data required for knowing the average price of the property (land} scraped from land guidance website using read_html method

	Area	Residential rates (All numbers in Rs Sq/ft)	Commercial rates(All numbers in Rs Sq/ft)
0	BLR – Central business Districts	NaN	NaN
1	MG Road	NaN	20000
2	Kasturba Rd	NaN	15000
3	Cubbon Rd	12500.0	NaN
4	Church Street	12500.0	15000

- All the neighbourhoods, zone names were under one column "Area", this had to be sliced according to each zone and renamed

- Data cleaned and moulded according to neighbourhood dataset.

	Zone	Average Price per Sq/Ft
0	Central	11428.571429
1	Eastern	4516.666667
2	North-Eastern	5447.368421
3	Northern	8176.470588
4	South-Eastern	7285.714286
5	Southern	6763.157895
6	Southern Suburbs	7285.714286
7	Western	4850.000000

- Geo-coordinates (latitude and longitude) of the neighbourhoods obtained using Python geocoder package

- Final working Data set:

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude
0	Central	Cantonment area	11428.571429	12.99435	77.598390
1	Central	Domlur	11428.571429	12.94330	77.656030
2	Central	Indiranagar	11428.571429	12.97393	77.643900
3	Central	Jeevanbheemanagar	11428.571429	12.96605	77.657650
4	Central	Malleswaram	11428.571429	13.00630	77.568289

Data Visualization

- Bengaluru city Map with the neighborhoods superimposed on top

- Created using folium library from python.
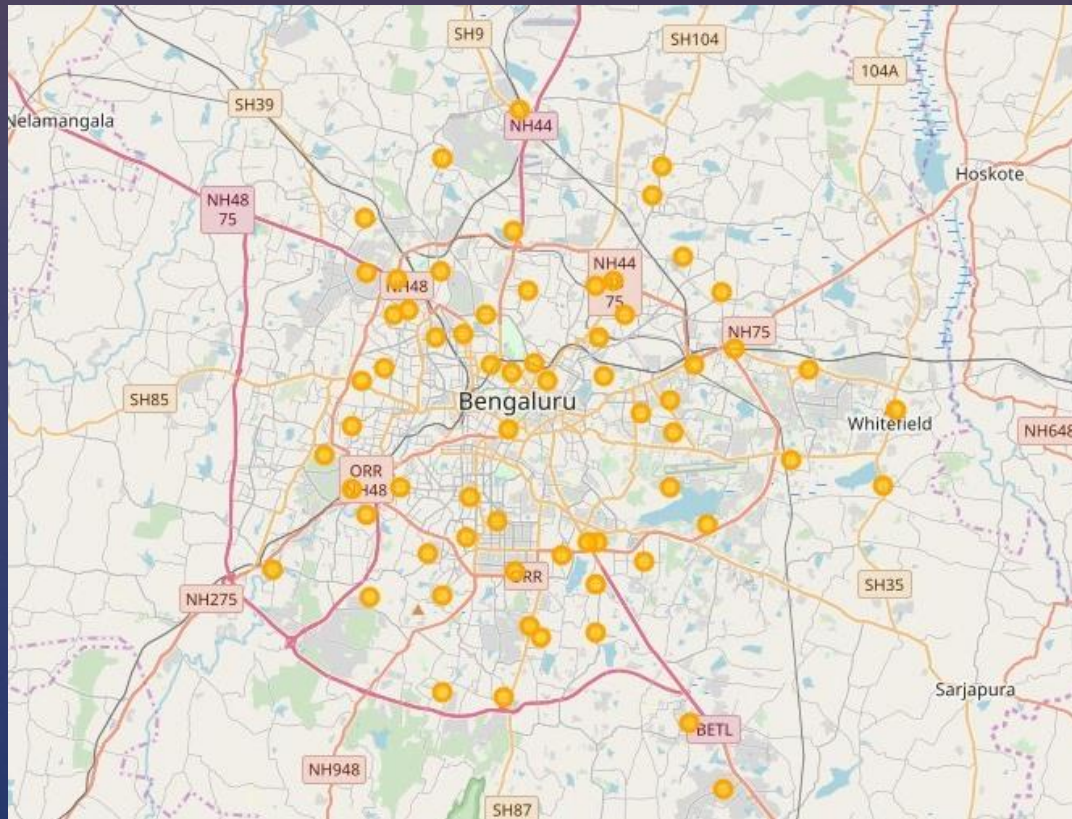
- The Foursquare API is used to extract venue data of each neighborhood

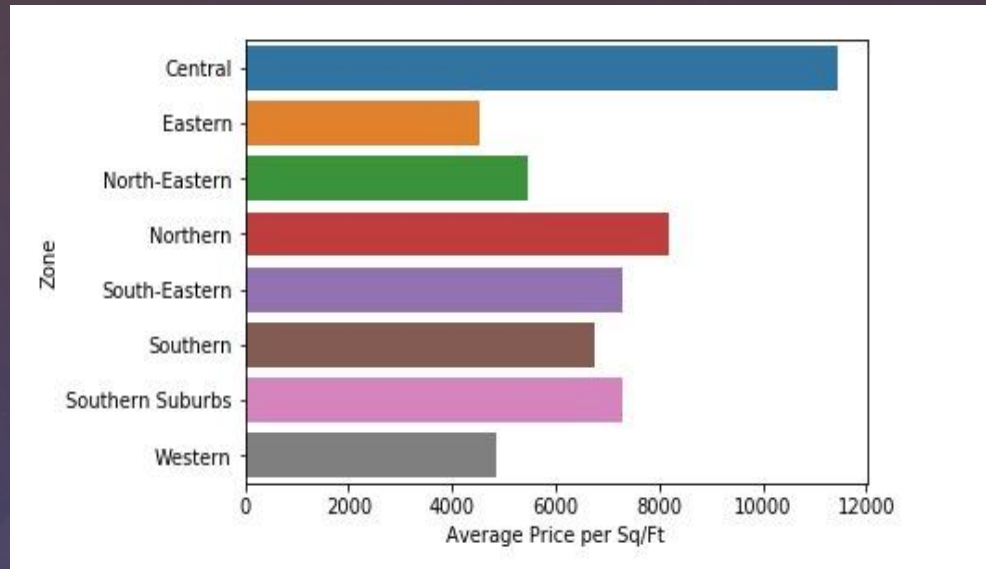- Each neighbourhood is analysed and the top 10 venues are found

	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	Anjanapura	ATM	Pool	Women's Store	Diner	Falafel Restaurant	Event Space	Electronics Store	Eastern European Restaurant	Donut Shop	Dessert Shop
1	Arekere	Sporting Goods Shop	Indian Restaurant	Gym / Fitness Center	Mughlai Restaurant	Department Store	Chinese Restaurant	Pizza Place	Business Service	Bus Line	Ba
2	BTM Layout	Indian Restaurant	Bakery	Ice Cream Shop	Fast Food Restaurant	Café	Snack Place	Sandwich Place	Chinese Restaurant	Vegetarian / Vegan Restaurant	Restaurant
3	Banashankari	Diner	Ice Cream Shop	Bakery	Indian Restaurant	Seafood Restaurant	Café	Asian Restaurant	Performing Arts Venue	Fast Food Restaurant	Dim Sum Restaurant
4	Banaswadi	Indian Restaurant	Jewelry Store	Liquor Store	South Indian Restaurant	Kids Store	Juice Bar	Karnataka Restaurant	Pizza Place	Clothing Store	Hala Restaurant
5	Basavanagudi	Indian Restaurant	Fast Food Restaurant	Breakfast Spot	Sandwich Place	Restaurant	Department Store	Bakery	Plaza	Donut Shop	Electronic Store

K-Means Clustering

- K-Means is used to cluster the neighbourhoods

- The value of k, is found using the silhouette method

- New data frame is formed with the cluster labels, along with the venue data of each neighbourhood

- The average prices of the land is binned into 5 different levels and a new column "Price Categories" is added to the dataset.

Results and Discussion

- There are **65 neighbourhoods** as listed in the Wikipedia page

- The city is divided into **8 administrative zones**.

- There is **no borough system** in the city division here in Bengaluru

- The central zone is quite expensive almost Rs.12000 per sq/Ft

- **Eastern, Western zones have the lowest land price** almost Rs 5000 per sq/Ft

- The average price is binned into **5 categories.**

- **Categories:**
  - **Low level**
  - **below average**
  - **Average level**
  - **above average**
  - **high level**.

Price bins
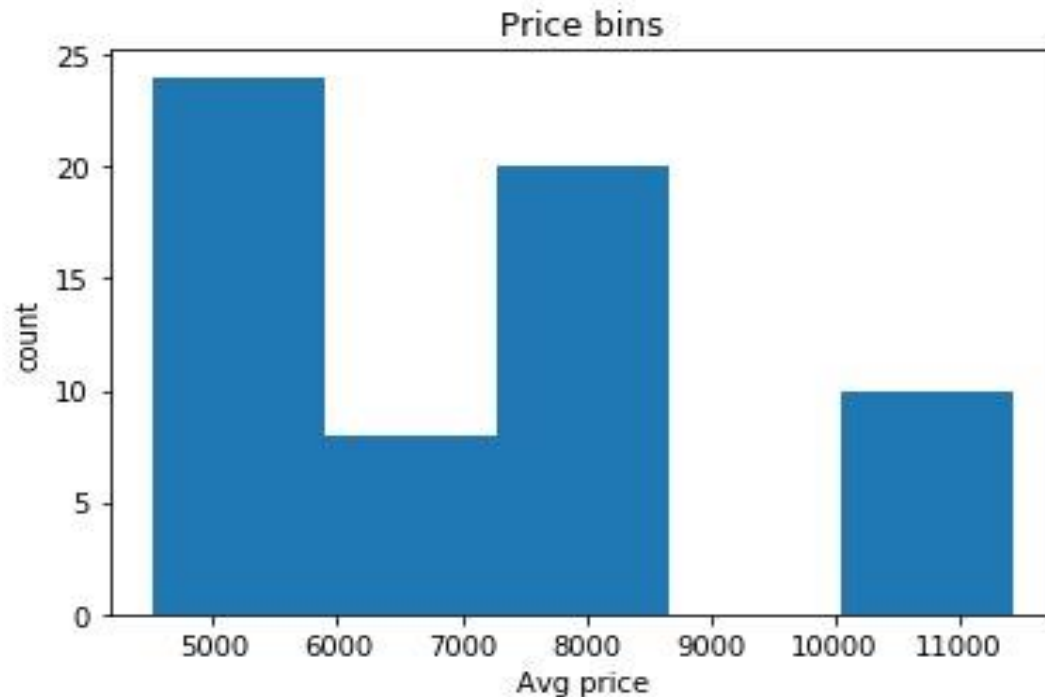
The **silhouette method showed k=7** for the K-Means clustering algorithm
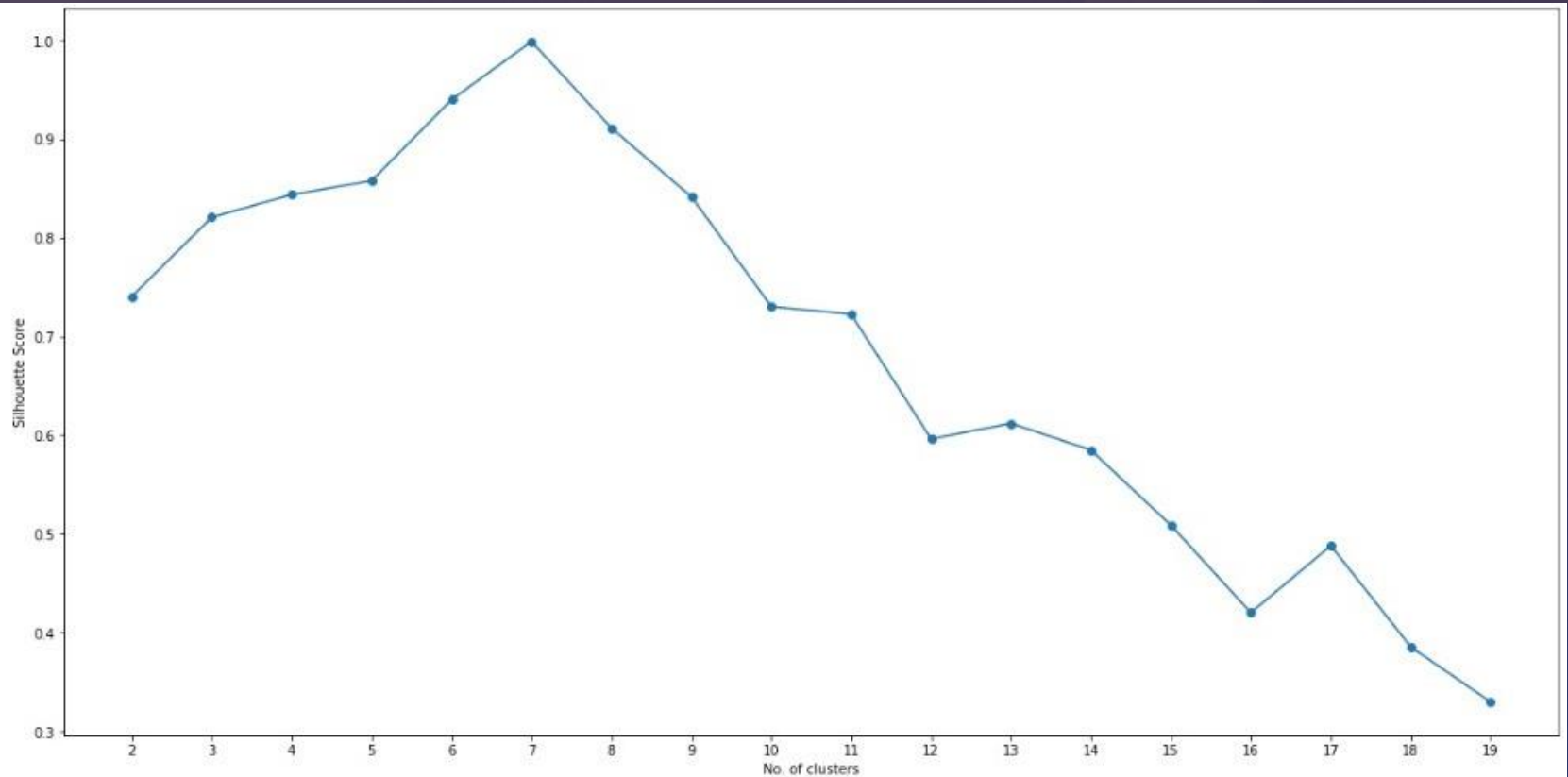
The neighborhoods are divided into **7 clusters**:
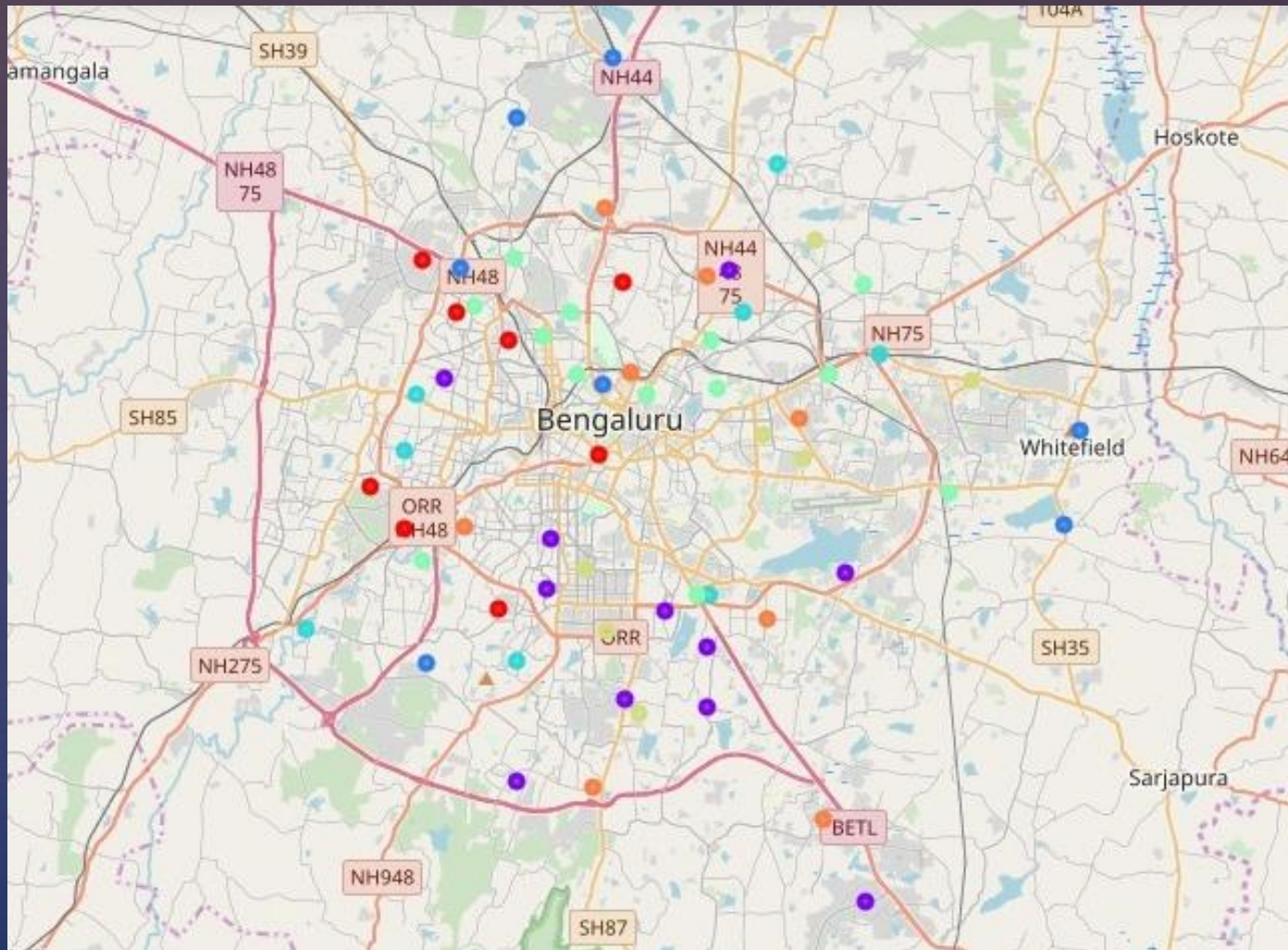
Cluster 1

The Average Commercial Land Price = 6743.083812472358

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
4	Central	Pete area	11428.571429	12.96687	77.58734	0	Indian Restaurant	Electronics Store	Rajasthani Restaurant	Bagel Shop	Breakfast Spot	High level
27	Northern	Peenya	8176.470588	13.03184	77.52677	0	Café	Women's Store	Flea Market	Cupcake Shop	Deli / Bodega	Average level
28	Northern	R. T. Nagar	8176.470588	13.02447	77.59587	0	Indian Restaurant	Pizza Place	Food Truck	Chinese Restaurant	Resort	Average level
45	Southern	Padmanabhanagar	6763.157895	12.91547	77.55311	0	Indian Restaurant	Bakery	Convenience Store	Fast Food Restaurant	Snack Place	Below Average
57	Western	Nagarbhavi	4850.000000	12.95624	77.50933	0	Gym	Women's Store	Diner	Fast Food Restaurant	Falafel Restaurant	Low level
58	Western	Nandini Layout	4850.000000	13.01480	77.53890	0	Indian Restaurant	Pool	Café	Park	ATM	Low level
59	Western	Nayandahalli	4850.000000	12.94205	77.52101	0	ATM	Miscellaneous Shop	Women's Store	Donut Shop	Fast Food Restaurant	Low level
60	Western	Rajajinagar	4850.000000	13.00543	77.55682	0	Women's Store	Italian Restaurant	Pizza Place	Pub	Electronics Store	Low level

Cluster 2

The Average Commercial Land Price = 6550.421508316243

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
10	Eastern	Bellandur	4516.666667	12.927350	77.671840	1	Indian Restaurant	Fast Food Restaurant	Café	Pizza Place	Kerala Restaurant	Low level
18	North-Eastern	Banaswadi	5447.368421	13.028473	77.631892	1	Indian Restaurant	Jewelry Store	Liquor Store	South Indian Restaurant	Kids Store	Low level
32	South-Eastern	Bommanahalli	7285.714286	12.903070	77.624410	1	Indian Restaurant	Department Store	Flea Market	Convenience Store	Cupcake Shop	Average level
33	South-Eastern	Bommasandra	7285.714286	12.817540	77.678790	1	Indian Restaurant	ATM	Donut Shop	Film Studio	Fast Food Restaurant	Average level
34	South-Eastern	BTM Layout	7285.714286	12.914890	77.610040	1	Indian Restaurant	Bakery	Ice Cream Shop	Fast Food Restaurant	Café	Average level
39	Southern	Banashankari	6763.157895	12.922280	77.569860	1	Diner	Ice Cream Shop	Bakery	Indian Restaurant	Seafood Restaurant	Below Average
40	Southern	Basavanagudi	6763.157895	12.939000	77.571350	1	Indian Restaurant	Fast Food Restaurant	Breakfast Spot	Sandwich Place	Restaurant	Below Average
47	Southern Suburbs	Anjanapura	7285.714286	12.858100	77.559060	1	ATM	Pool	Women's Store	Diner	Falafel Restaurant	Average level
48	Southern Suburbs	Arekere	7285.714286	12.885640	77.596690	1	Sporting Goods Shop	Indian Restaurant	Gym / Fitness Center	Mughlai Restaurant	Department Store	Average level
49	Southern Suburbs	Begur	7285.714286	12.882490	77.624750	1	Badminton Court	Lake	Women's Store	Eastern European Restaurant	Fast Food Restaurant	Average level
53	Western	Basaveshwaranagar	4850.000000	12.992260	77.534410	1	Indian Restaurant	Gym	Pizza Place	Fast Food Restaurant	Ice Cream Shop	Low level

Cluster 3

The Average Commercial Land Price = 7393.496345906785

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
9	Central	Vasanth Nagar	11428.571429	12.99073	77.58856	2	Coffee Shop	Hotel	Restaurant	Café	Indian Restaurant	High level
16	Eastern	Varthur	4516.666667	12.94348	77.74703	2	Indian Restaurant	Department Store	Lake	Donut Shop	Fast Food Restaurant	Low level
17	Eastern	Whitefield	4516.666667	12.97517	77.75227	2	Hotel	Indian Restaurant	Chinese Restaurant	Market	Eastern European Restaurant	Low level
29	Northern	Vidyaranyapura	8176.470588	13.07927	77.55912	2	Pizza Place	Indian Restaurant	Bus Station	Chinese Restaurant	Department Store	Average level
30	Northern	Yelahanka	8176.470588	13.09932	77.59260	2	Smoke Shop	Ice Cream Shop	American Restaurant	Train Station	Chinese Restaurant	Average level
31	Northern	Yeshwanthpur	8176.470588	13.02954	77.54022	2	Indian Restaurant	Spa	Wine Bar	Food Court	Light Rail Station	Average level
46	Southern	Uttarahalli	6763.157895	12.89760	77.52822	2	Park	Film Studio	Tailor Shop	Convenience Store	Cupcake Shop	Below Average

Cluster 4

The Average Commercial Land Price = 5805.748746867167

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
13	Eastern	Krishnarajapuram	4516.666667	13.00040	77.68378	3	Ice Cream Shop	Intersection	Bus Station	Diner	Falafel Restaurant	Low level
21	North-Eastern	Kalyan Nagar	5447.368421	12.96819	77.52114	3	Indian Restaurant	Nightclub	Bus Station	Café	Supermarket	Low level
22	North-Eastern	Kammanahalli	5447.368421	13.01428	77.63675	3	Kerala Restaurant	Indian Restaurant	Burger Joint	Juice Bar	Fast Food Restaurant	Low level
37	South-Eastern	Koramangala	7285.714286	12.92005	77.62543	3	Indian Restaurant	Park	Film Studio	Convenience Store	Cupcake Shop	Average level
44	Southern	Kumaraswamy Layout	6763.157895	12.89818	77.55929	3	Market	Fast Food Restaurant	Bakery	Chaat Place	Café	Below Average
52	Southern Suburbs	Kothnur	7285.714286	13.06434	77.64853	3	Convenience Store	Gym / Fitness Center	Pizza Place	Italian Restaurant	Coffee Shop	Average level
54	Western	Kamakshipalya	4850.000000	12.98699	77.52482	3	Hotel	Bus Station	Women's Store	Donut Shop	Fast Food Restaurant	Low level
55	Western	Kengeri	4850.000000	12.90872	77.48719	3	Indian Restaurant	Bar	Sports Club	Flea Market	Fast Food Restaurant	Low level

Cluster 5

The Average Commercial Land Price = 7864.085553249641

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
3	Central	Malleswaram	11428.571429	13.00630	77.568289	4	Ice Cream Shop	Indian Restaurant	Coffee Shop	Café	South Indian Restaurant	High level
5	Central	Sadashivanagar	11428.571429	13.01482	77.577710	4	Hotel	Bed & Breakfast	Playground	Liquor Store	Women's Store	High level
6	Central	Seshadripuram	11428.571429	12.99357	77.579890	4	Art Gallery	Indian Restaurant	Chaat Place	Lounge	Asian Restaurant	High level
7	Central	Shivajinagar	11428.571429	12.98719	77.604000	4	Indian Restaurant	Tea Room	Café	Cupcake Shop	Deli / Bodega	High level
8	Central	Ulsoor	11428.571429	12.98916	77.627980	4	Café	Paper / Office Supplies Store	Department Store	Women's Store	Film Studio	High level
14	Eastern	Mahadevapura	4516.666667	12.99410	77.666350	4	Pizza Place	Shopping Mall	Snack Place	Department Store	Dessert Shop	Low level
15	Eastern	Marathahalli	4516.666667	12.95467	77.707520	4	Indian Restaurant	Sports Bar	Pizza Place	Bakery	Department Store	Low level
23	North-Eastern	Lingarajapuram	5447.368421	13.00555	77.625970	4	Convenience Store	New American Restaurant	Café	Hotel	Cupcake Shop	Low level
24	North-Eastern	Ramamurthy Nagar	5447.368421	13.02378	77.677870	4	Indian Restaurant	Supermarket	Bakery	IT Services	ATM	Low level
26	Northern	Mathikere	8176.470588	13.03236	77.558650	4	Indian Restaurant	Fast Food Restaurant	Diner	Bus Station	Bakery	Average level
38	South-Eastern	Madiwala	7285.714286	12.92050	77.620900	4	Indian Restaurant	Café	Sandwich Place	Indie Movie Theater	Intersection	Average level
56	Western	Mahalakshmi Layout	4850.000000	13.01636	77.544810	4	Bar	Café	Smoke Shop	Women's Store	Eastern European Restaurant	Low level
61	Western	Rajarajeshwari Nagar	4850.000000	12.93162	77.526990	4	Coffee Shop	Flea Market	Convenience Store	Cupcake Shop	Deli / Bodega	Low level

Cluster 6

The Average Commercial Land Price = 7661.88686000716

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
1	Central	Indiranagar	11428.571429	12.97393	77.64390	5	Indian Restaurant	Café	Pub	Lounge	Ice Cream Shop	High level
2	Central	Jeevanbheemanagar	11428.571429	12.96605	77.65765	5	Indian Restaurant	Dessert Shop	Bakery	Café	Department Store	High level
12	Eastern	Hoodi	4516.666667	12.99197	77.71504	5	Indian Restaurant	Furniture / Home Store	Yoga Studio	Vegetarian / Vegan Restaurant	IT Services	Low level
20	North-Eastern	Horamavu	5447.368421	13.03868	77.66187	5	Warehouse Store	Women's Store	Diner	Fast Food Restaurant	Falafel Restaurant	Low level
42	Southern	J. P. Nagar	6763.157895	12.90831	77.59017	5	Indian Restaurant	Fast Food Restaurant	Coffee Shop	Café	Bakery	Below Average
43	Southern	Jayanagar	6763.157895	12.92870	77.58279	5	Indian Restaurant	Café	Juice Bar	Fast Food Restaurant	Sandwich Place	Below Average
51	Southern Suburbs	Hulimavu	7285.714286	12.88063	77.60146	5	Halal Restaurant	Women's Store	Diner	Fast Food Restaurant	Falafel Restaurant	Average level

Cluster 7

The Average Commercial Land Price = 7273.672232050714

	Zone	Neighborhood	Average Price per Sq/Ft	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Price-Categories
0	Central	Cantonment area	11428.571429	12.994350	77.598390	6	Indian Restaurant	Tea Room	Pub	Music Venue	Event Space	High level
11	Eastern	CV Raman Nagar	4516.666667	12.978898	77.656129	6	Indian Restaurant	Office	Food Truck	Sandwich Place	Coffee Shop	Low level
19	North-Eastern	HBR Layout	5447.368421	13.026420	77.624320	6	Indian Restaurant	Shopping Mall	Optical Shop	Department Store	Donut Shop	Low level
25	Northern	Hebbal	8176.470588	13.049690	77.589510	6	Café	Food Court	Fast Food Restaurant	Bakery	Women's Store	Average level
35	South-Eastern	Electronic City	7285.714286	12.845470	77.664300	6	Indian Restaurant	Hotel	Food Court	Bakery	Ice Cream Shop	Average level
36	South-Eastern	HSR Layout	7285.714286	12.912160	77.644900	6	Indian Restaurant	Café	Pizza Place	Bakery	Gym / Fitness Center	Average level
41	Southern	Girinagar	6763.157895	12.942780	77.541210	6	Smoke Shop	Fast Food Restaurant	Breakfast Spot	Park	Donut Shop	Below Average
50	Southern Suburbs	Gottigere	7285.714286	12.855660	77.585500	6	Indian Restaurant	Department Store	Pharmacy	Accessories Store	Flea Market	Average level

Conclusion

- The ample location is preferably in cluster 5, but the land price is the highest for this cluster.

- Cluster 3. Since we can't reject this location based on not having a public transport. Maybe there will be one top 10. The price of land is also on the fair side here.

- Following up with the above point, clusters 4, 6 and 7 also comes in the prospective location list. They all lack one amenity or the other. But the price is also on a fair side.

- The preference list for the location can be listed as follows:
  - Cluster 5
  - Cluster 3
  - Cluster 7
  - Cluster 4
  - Cluster 6

- Analysis is performed on limited data.

- May be right or maybe wrong.

- If a good amount of data is available there is scope to come up with better results.

Thank You