

Capstone Project

The Battle of Neighborhoods

Opening a Restaurant in karnataka, India

1. Introduction

Background/Business Problem

Karnataka is a state in India. It is mainly centered in South India. It is known for its cultural, industrial, and financial centre. Bangalore is the capital of Karnataka and is a IT hub. Karnataka is located in the south of the country, at coordinates 15.3173° N, 75.7139° E.

Karnataka is the center of economy and industry. Karnataka has **6 crore** populations and consists of **32 neighborhoods(districts)**. 5 of them are shown below:[1]

	Neighborhood	Latitude	Longitude
0	► Karnataka district templates (29 P)	16.00000	75.00000
1	► Categories of Karnataka by district (9 C)	16.00000	75.00000
2	► Bagalkot district (6 C, 6 P)	16.15394	75.73525
3	► Bangalore Rural district (8 C, 5 P)	12.54620	77.42284
4	► Bangalore Urban district (7 C, 13 P)	13.00000	77.58333

Problem

The main aim of this project is to open a restaurant in a suitable and populated neighborhood in karnataka which offers various various cuisines especially karnatic cuisine. The districts are ranked based on their population and variety of cultures.

Interest

The interests of this project is:

- **Distribution of neighbourhoods inKarnataka.**
- **Finding the** similarities of neighborhoods which will help me to choose location for opening a new restaurant
- Ratings which may help in opening a good restaurant
- **Exploring the most popular venues around the areas of interest**

2. Data

2.1 Data sources

To consider the problem we can list the data as below:

- I get the neighborhood data of Karnataka from Wikipedia
- I use python geocoder library to get geographical coordinates of neighborhoods(districts)
- I use **Foursquare API venues explore** method to get the venues of given neighborhoods of Karnataka
- I use **Foursquare API venues method** to get ranks and likes of restaurants by given venue id

2.2 Feature Selection and Data Usage

I will use neighborhood location values to analyze Karnataka's geographical structure. I will use folium library of python to draw maps by using given latitude and longitudes of neighborhoods. Selected features will be as below

	Neighborhood	Latitude	Longitude
0	► Karnataka district templates (29 P)	16.00000	75.00000
1	► Categories of Karnataka by district (9 C)	16.00000	75.00000
2	► Bagalkot district (6 C, 6 P)	16.15394	75.73525
3	► Bangalore Rural district (8 C, 5 P)	12.54620	77.42284
4	► Bangalore Urban district (7 C, 13 P)	13.00000	77.58333

I will use populations of neighborhoods who has big population may need a new restaurant.

	Rank(2011)	City	District	Population2011	Neighborhood	Latitude	Longitude
0	1.0	Bengaluru	Bengaluru Urban	8495492.0	► Karnataka district templates (29 P)	16.00000	75.00000
1	2.0	Hubli-Dharwad	Dharwad	943788.0	► Categories of Karnataka by district (9 C)	16.00000	75.00000
2	3.0	Mysuru	Mysuru	920550.0	► Bagalkot district (6 C, 6 P)	16.15394	75.73525
3	4.0	Mangaluru	Dakshina Kannada	623841.0	► Bangalore Rural district (8 C, 5 P)	12.54620	77.42284
4	5.0	Belagavi	Belagavi	610350.0	► Bangalore Urban district (7 C, 13 P)	13.00000	77.58333

I will also classify neighborhoods by using venues distribution and counts. In this way, I will find similarities of neighborhoods which will help me to choose location for opening a new restaurant. Similar structured neighborhoods may handle same type of venue.

	Neighborhood	Indian Restaurant	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Hotel	Nightclub	Café	Ice Cream Shop	Pub	Restaurant	
0	► Bangalore Rural district (8 C, 5 P)	3	1	1	0	0	0	0	0	0	
1	► Bangalore Urban district (7 C, 13 P)	6	0	1	2	1	3	1	1	1	
2	► Chikkaballapur district (5 C, 3 P)	0	0	0	0	0	0	0	0	0	
3	► Dakshina Kannada district (8 C, 16 P)	0	0	0	0	0	0	0	0	0	
4	► Dharwad district (6 C, 6 P)	0	0	0	0	0	1	0	0	0	

ratings and likes of restaurants in the areas. It may help me to find location with bad rating restaurants which may need a new restaurant.

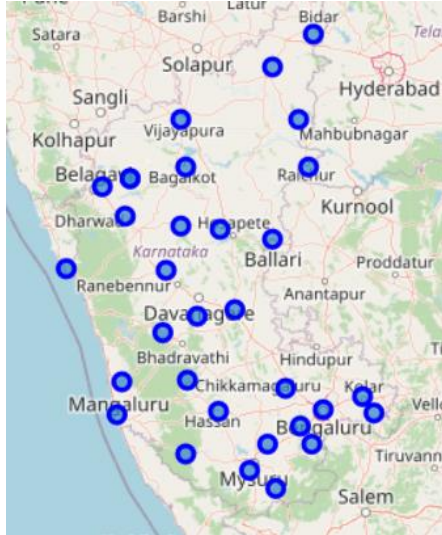
	Venueld	VenueRating	VenueLikes
0	4d98162bc19fb60c1c4ca765	6.2	3.0
1	4dea20ecb0fb8293f7cb60f0	5.8	3.0

Clustering

	Neighborhood	Total Number of Venues	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant
0	► Bangalore Rural district (8 C, 5 P)	5	Indian Restaurant	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Seafood Restaurant	Gym
1	► Bangalore Urban district (7 C, 13 P)	32	Indian Restaurant	Café	Hotel	Department Store	Nightclub
2	► Chikkaballapur district (5 C, 3 P)	3	Market	Burger Joint	Pharmacy	Indie Movie Theater	Gym
3	► Dakshina Kannada district (8 C, 16 P)	1	Cricket Ground	Indie Movie Theater	Monument / Landmark	Women's Store	Coffee Shop
4	► Dharwad district (6 C, 6 P)	2	Asian Restaurant	Café	Department Store	Gym	Monument / Landmark

3. Methodology

- I used GitHub repository for code versioning.
- The Karnataka data is available with the neighborhood name in wikipedia. Location information (latitude and longitude) of neighborhoods are taken from geocoder library.
- I took neighborhood from wikipedia and put blue dots on Karnataka map to see centers of neighborhoods. There are **40** neighborhoods in Bucharest



- By using Foursquare API I got venues **1 km** around center of each neighborhood with limit **38 venue categories**. I merged data with Neighborhood data. Head of the merged data is as below

There are 38 unique venue categories. Some of them are as below:

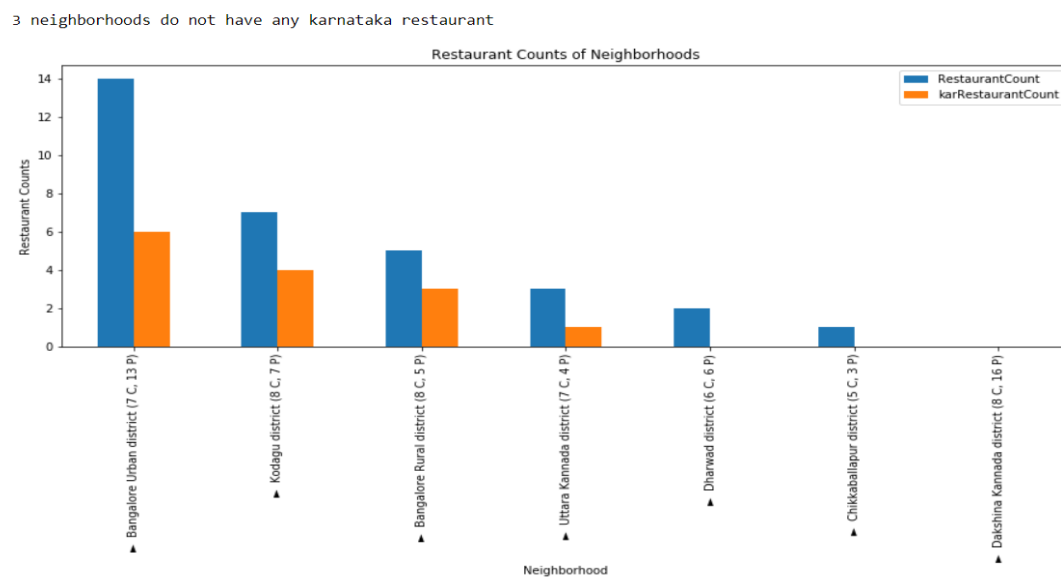
	Neighborhood	Latitude	Longitude	VenueName	VenueId	VenueLatitude	VenueLongitude	VenueDistance	VenueCategory
0	► Bangalore Rural district (8 C, 5 P)	12.5462	77.42284	Vasu Hotel	4d98162bc19fb60c1c4ca765	12.549483	77.424050	388	Indian Restaurant
1	► Bangalore Rural district (8 C, 5 P)	12.5462	77.42284	Sri Srinivasa Sagar	4dea20ecb0fb8293f7cb60f0	12.546743	77.423936	133	Indian Restaurant
2	► Bangalore Rural district (8 C, 5 P)	12.5462	77.42284	Rathna Upahar	50548d88e4b08e1d3d330fb8	12.545859	77.423543	85	Indian Restaurant
3	► Bangalore Rural district (8 C, 5 P)	12.5462	77.42284	Gokul Vegetarian	4ec8791a49010f98cdc77958	12.544063	77.418054	571	Vegetarian / Vegan Restaurant
4	► Bangalore Rural district (8 C, 5 P)	12.5462	77.42284	Udupi Upahara Veg	50a70aa1498ea24de04a971c	12.553102	77.424603	791	Fast Food Restaurant

- There are 36 unique venue categories in Karnataka and top 10 venue counts is as below

Top 10 distinct venue counts are as below

VenueCategory	Count
Indian Restaurant	14
Café	5
Asian Restaurant	3
Hotel	3
Department Store	2
Coffee Shop	2
Market	2
Fast Food Restaurant	2
Karnataka Restaurant	2
Restaurant	1

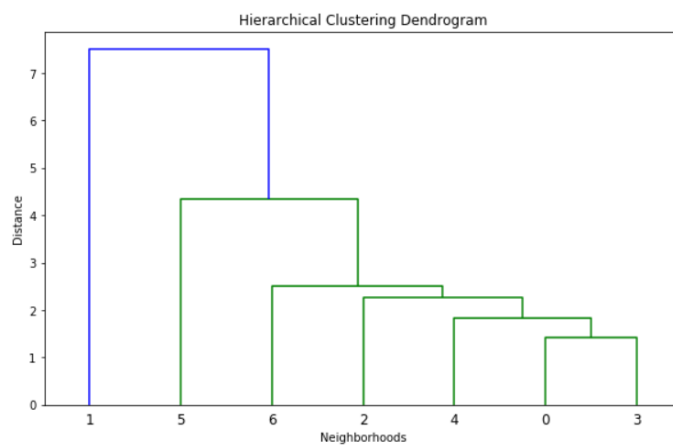
- I filtered All restaurants and Karnataka restaurant. We can see from histogram of restaurants, **3** neighborhoods has **not** any karnataka restaurant



- I used foursquare to get restaurant ratings by using venueid

	VenueId	VenueRating	VenueLikes
0	4d98162bc19fb60c1c4ca765	6.2	3.0
1	4dea20ecb0fb8293f7cb60f0	5.8	3.0
2	50548d88e4b08e1d3d330fb8	NaN	NaN
3	4ec8791a49010f98cdc77958	NaN	NaN
4	50a70aa1498ea24de04a971c	NaN	NaN

- I used Agglomerative Clustering to cluster neighborhoods according to count of venue categories in each neighborhood. According to the below graph, I decided to separate our neighborhoods into 6 clusters (cut at distance of 20, horizontal black line).



- Clustering

	Neighborhood	Total Number of Venues	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
0	► Bangalore Rural district (8 C, 5 P)	5	Indian Restaurant	Vegetarian / Vegan Restaurant	Fast Food Restaurant	Seafood Restaurant	Gym	Monument / Landmark	Women's Store	Coffee Shop	Art Gallery	Chinese Restaurant
1	► Bangalore Urban district (7 C, 13 P)	32	Indian Restaurant	Café	Hotel	Department Store	Nightclub	Fast Food Restaurant	Ice Cream Shop	Pub	Restaurant	Asian Restaurant
2	► Chikkaballapur district (5 C, 3 P)	3	Market	Burger Joint	Pharmacy	Indie Movie Theater	Gym	Women's Store	Coffee Shop	Art Gallery	Chinese Restaurant	Seafood Restaurant
3	► Dakshina Kannada district (8 C, 16 P)	1	Cricket Ground	Indie Movie Theater	Monument / Landmark	Women's Store	Coffee Shop	Art Gallery	Chinese Restaurant	Seafood Restaurant	Department Store	Restaurant
4	► Dharwad district (6 C, 6 P)	2	Asian Restaurant	Café	Department Store	Gym	Monument / Landmark	Women's Store	Coffee Shop	Art Gallery	Chinese Restaurant	Seafood Restaurant

NeighborhoodCluster	1st Most Common Restaurant	Neighborhood Count	\
0.0	Cricket Ground	1	
	Indian Restaurant	1	
1.0	Indie Movie Theater	1	
2.0	Indian Restaurant	1	
3.0	Indian Restaurant	1	
4.0	Market	1	
5.0	Asian Restaurant	1	

NeighborhoodCluster	1st Most Common Restaurant	Neighborhood Count
0.0	Cricket Ground	1
	Indian Restaurant	1
1.0	Indie Movie Theater	1
2.0	Indian Restaurant	1
3.0	Indian Restaurant	1
4.0	Market	1
5.0	Asian Restaurant	1

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NeighborhoodCluster	2nd Most Common Restaurant	Neighborhood Count	Neighborhood Count
0.0	Indie Movie Theater	1	1
	Vegetarian / Vegan Restaurant	1	1
1.0	Karnataka Restaurant	1	1
2.0	Bus Station	1	1
3.0	Café	1	1
4.0	Burger Joint	1	1
5.0	Café	1	1

4. Results

I investigated that the Indian restaurants in Karnataka counts is **43.75**

- Total number of restaurants: 32
- Total number of Turkish restaurants: 14

From bar chart, we can see;

- Bangalore Urban district is the neiighborhood having most restaurants
- Dharwad has restaurants , but no karnataka style restaurant
- dakshina kannada district has no restaurants.
- 3 neiighborhoods do not have any karnataka restaurant.

5. Discussion

NeighborhoodCluster	1st Most Common Restaurant	Neighborhood Count
0	Indian Restaurant	1
	Snack Place	1
1	Indie Movie Theater	1
2	Indian Restaurant	1
3	Indian Restaurant	1
4	Asian Restaurant	1
5	Indian Restaurant	1

NeighborhoodCluster	2nd Most Common Restaurant	Neighborhood Count
0	Fast Food Restaurant	1
	Pharmacy	1
1	Karnataka Restaurant	1
2	Udupi Restaurant	1
3	Café	1
4	Café	1
5	Café	1

Cluster 0: Indian Restaurant, Fast food restaurant

Cluster 1 : Karnataka Restaurant

Cluster 2 : udupi Restaurant

Cluster 3 : café, Indian Restaurant

Cluster 4 : Asian restaurant

Cluster 5 : Indian Restaurant

6. Conclusion

I have chosen cluster 4 and cluster 5 as there is only one restaurant there and it would be more easy to open a restaurant as there is less competition which is managable.