Capstone Project - Explore the optimal location for a restaurant in Mangalore

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1. Introduction

1.1 Background

Mangalore, officially known as Mangaluru, is the chief port city of the Indian state of Karnataka. Mangalore is the state's only city to have all four modes of transport—air, road, rail and sea. The population of the urban agglomeration is nearly a million.

Mangalore is also the administrative headquarters of the Dakshina Kannada district. This city's International Airport is the second-largest airport in Karnataka state. Mangalore is a **commercial, industrial, educational, healthcare and startup hub**. Day by day the population of the city is increasing and there are more visitors to the city. This leads to a good business opportunity. There is ample scope for opening restaurants.

1.2 Business Problem

In this project we will try to find a good location for a restaurant in Mangalore city. There are many restaurants in the city. But, we would like to identify a crowded location where there is no restaurant or just one.

Identifying the **optimal location for opening a new restaurant** is the business problem of this project.

Restaurants around **colleges, healthcare, factories, government buildings and schools** normally do good business. Such locations are normally crowded. Project

should propose an optimal location, that should be **within the 200meters (walkable distance)** from the main spot such as college/hospital etc.

1.3 Business Stakeholders

Business entities are obviously interested to know such a location. There are many individuals who might have already searched for such places but could not identify the one. This project will help all such interested individuals or business entities who are looking for an optimal location to open a restaurant in a crowded place.

2. Data

2.1 Data requirement

Based on our business problem, we need following data:

a) Identify top 5 locations for Colleges, Hospitals, Government buildings, Factories and Schools in Mangalore.
b) For each such location, identify the existing restaurants within 200meter radius.
c) Analyze the obtained data to identify the optimal location

2.2 Data source

Following data sources will be needed to get the required information:

a) Coordinates of Mangalore city center is obtained from **Google Maps**
b) **Foursquare API** is used to get the top 5 locations for Colleges, Hospitals, Government buildings, Factories and Scholls. Also to get the nearby restaurants for each such location.
c) To get the latitude and longitude based on the address, we use **Geopy Nominatim**

Foursquare API is the main API source with which we get all the top locations for various categories and then the nearby restaurants for each such location. We use venues/search API for category specific search based on latitude and longitude. We get the category id for 5 categories and the Food category from Foursquare API documentation.

3. Methodology

In this project we will put our efforts on identifying the optimal location for a restaurant in Mangalore city within 5km range.

We first identified the categories which are usually crowded. These are **Colleges, Hospital, Schools, Factories and Government Buildings.** These 5 categories are more crowded compared to other categories such as Art, Museum, Pool etc.

a) In the first step we have collected top 100 locations data for different categories. We then cleaned the data to include only the top 5 locations for each category. Details for each location includes name, latitude, longitude and category name. Plot these locations on the map with Orange color.
b) Second step in our analysis will be getting the nearby restaurants within 200m distance from each of these locations. We feel 200m is a reasonable walkable distance from any location. Then plotting these locations on the map to display the nearby restaurants along with locations.
c) Third step is to analyse the consolidated data which we obtained in step 2. This analysis will shed light on the recommended locations.
d) Final step is to recommend the optimal location to the stakeholders.

4. Analysis

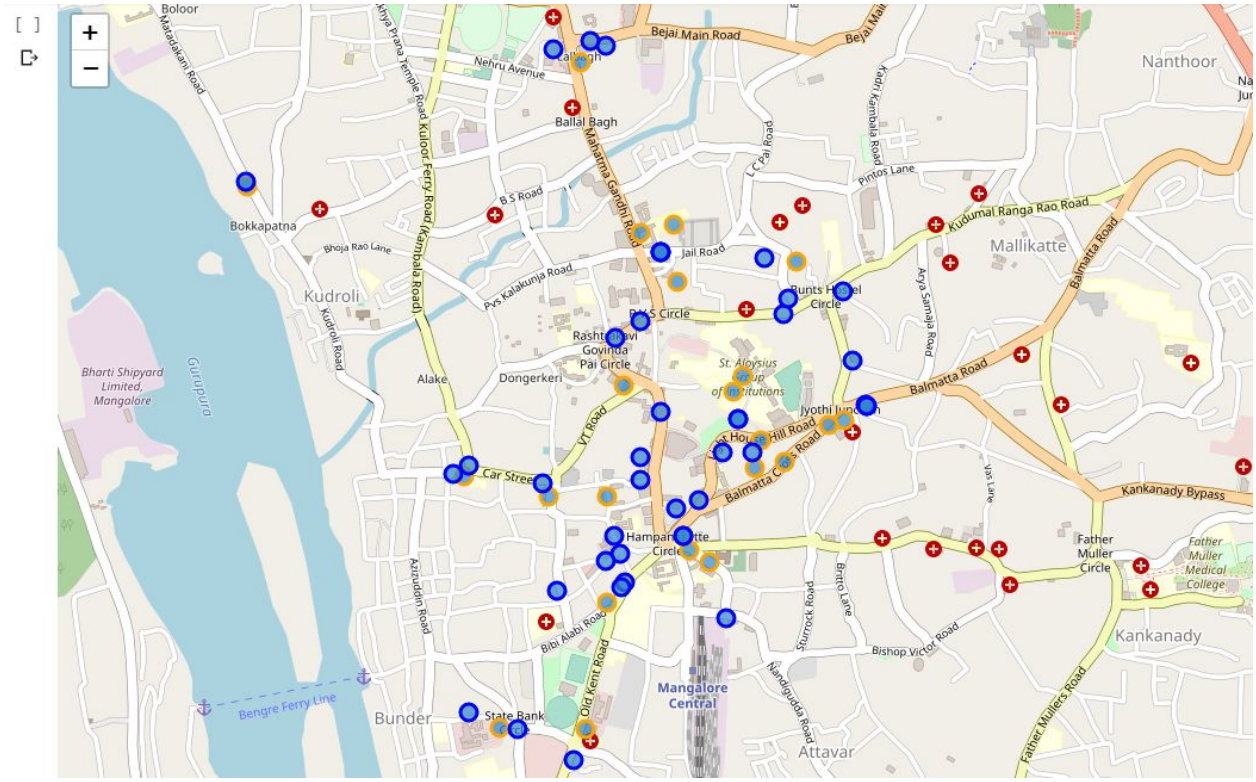
Let's perform some basic exploratory data analysis and derive some additional info from our raw data.

Let's view the snapshot of the list of restaurants which we obtained based on locations for 5 categories.

	location	location_category	location_lat	location_lng	name	categories	lat	lng
0	RTO	Government Building	12.861331	74.839396	New Danish Arabian Treat	Middle Eastern Restaurant	12.860274	74.838933
1	Mangalore City Corporation	Government Building	12.884741	74.839219	Chicken Tikka Halal	Middle Eastern Restaurant	12.885498	74.839540
2	Mangalore City Corporation	Government Building	12.884741	74.839219	Mathura Vegetarian	Vegetarian / Vegan Restaurant	12.885307	74.840130
3	Mangalore City Corporation	Government Building	12.884741	74.839219	Hotel annaapoorna	Indian Restaurant	12.885206	74.838214
4	D C Office	Government Building	12.861403	74.836295	Cardamom	Indian Restaurant	12.861908	74.835169
5	D C Office	Government Building	12.861403	74.836295	Hotel Swagath	Udupi Restaurant	12.861357	74.836930
6	Tara Hospital	Hospital	12.869495	74.840137	Punjab Da Pind	Punjabi Restaurant	12.870084	74.841372
7	Tara Hospital	Hospital	12.869495	74.840137	Hotel Maya Darshini	South Indian Restaurant	12.868126	74.840420
8	Tara Hospital	Hospital	12.869495	74.840137	Fish bowl	Seafood Restaurant	12.870882	74.841335
9	Wenlock Government Hospital	Hospital	12.867602	74.843103	Taj Mahal Veg Restaurant	Vegetarian / Vegan Restaurant	12.868113	74.842896
10	Wenlock Government Hospital	Hospital	12.867602	74.843103	Diet N Protein Meals	Restaurant	12.869382	74.843450
11	Wenlock Government Hospital	Hospital	12.867602	74.843103	Hotel Salwa	Restaurant	12.869074	74.842652
12	KMC Ambedkar Hospital	Hospital	12.872169	74.848706	Sana-di-ge	South Indian Restaurant	12.874285	74.849011
13	KMC Ambedkar Hospital	Hospital	12.872169	74.848706	Kudla Veg. Restaurant	Vegetarian / Vegan Restaurant	12.872689	74.849506
14	KMC Hospital Life's On	Hospital	12.872002	74.848127	Hotel Kudla	Indian Restaurant	12.872732	74.849481
15	KMC Hospital Life's On	Hospital	12.872002	74.848127	Kudla Veg. Restaurant	Vegetarian / Vegan Restaurant	12.872689	74.849506
16	St Aloysius PU College	College	12.873166	74.844708	spice of Andhra	Indian Restaurant	12.871033	74.845399
17	St Aloysius PU College	College	12.873166	74.844708	five star chicken	Asian Restaurant	12.872201	74.844856
18	St Aloysius PU College	College	12.873166	74.844708	Goodies Arabian Taste	Middle Eastern Restaurant	12.871059	74.844308
19	SDM Law College, Mangalore	College	12.878730	74.841349	Aroma Restaurant	Indian Restaurant	12.878075	74.842066
20	Canara College	College	12.879053	74.842549	Aroma Restaurant	Indian Restaurant	12.878075	74.842066

Lets plot all the nearby restaurants on the map which was already rendered to display the top spots

1. Top locations are displayed in Orange circle
2. Nearby restaurants are displayed in Blue color



Lets group the location name with the existing dataframe. This grouping provides the count of nearby restaurants for each location. New data provides clear details on the nearby restaurants for the given location.

```
restaurants_combined.reset_index(drop=True)
```

	location	count
0	Canara College	1
1	St. Aloysius High School	1
2	Sovereign Tile Works	1
3	Sarasija Foods (NARAN'S)	1
4	SDM Law College, Mangalore	1
5	RTO	1
6	shakthi creations	1
7	Milagres School	2
8	Nalanda School	2
9	KMC Ambedkar Hospital	2
10	Government High School	2
11	D C Office	2
12	Canara Girls High School	2
13	KMC Hospital Life's On	2
14	Mangalore City Corporation	3
15	Wenlock Government Hospital	3
16	St Aloysius PU College	3
17	Tara Hospital	3
18	Rudra Industries	4
19	University College Mangalore	5

From the above result its clear that within 200m of walkable distance:

1. **One location does not have** any nearby restaurants(which is not present in the table because we didn't find any restaurant)
2. There are **7 locations** which has **One nearby restaurant**
3. There are **7 locations** which has **Two nearby restaurant**
4. There are **4 locations** which has **Three nearby restaurant**
5. There is **1 location** which has **Four nearby restaurant**
6. There is **1 location** which has **Five nearby restaurant**

5. Result and Discussion

Our overall data analysis shows that Mangalore has many restaurants near crowded places. To identify the optimal location, we first identified the locations for Colleges, Hospitals, Factories, Schools and Government Building category within the 5 KM range from Mangalore center point. We wanted to get the optimal location within 5KM city radius. Then filtered these data to get top 5 locations for each category.

We could have opted for 10 locations for each category. But with 10 locations for each category, we may be moving away from the city center point. To be near the city center point, I preferred to select the top 5 locations.

Once we got top 5 locations for each category, we got the nearby existing restaurants for each of these locations using the Foursquare API, which are within 200m of distance from location.

The reason for considering 200m as the radius limit is, we wanted to look for a restaurant within walkable distance. We could have gone with 500m, but many don't prefer 500m as the walkable distance. For 500m, they prefer either two wheeler or four wheeler. Hence 200meter is a decent walkable distance.

Finally merged all the data and plotted these info on the map, with Orange color for category locations and Blue color for Restaurants.

Then prepared a table to list out the location name and nearby restaurants. We got one location without any nearby restaurant and 7 locations each with one and two nearby restaurants.

Recommendations: Based on the obtained result, i would recommend following locations:

1. For **Mahesh P.U. College** location, we didn't find any nearby restaurants within 200m. This location is my first recommendation.
2. There are **7 such locations**, for which we have only **1 nearby** restaurants. They are: **Canara College, St. Aloysius High School, Sovereign Tile Works, Sarasija Foods (NARAN'S), SDM Law College, Mangalore and RTO, Shakthi creations.**. Interested stakeholders can look into any of these locations.

6. Conclusion

Purpose of this project is to identify the optimal location for opening a new restaurant within 5KM range of Mangalore city. This would help the stakeholders in narrowing

down the search for location. Initially, I identified the top 5 locations for different categories. These categories normally attract crowds. Hence scope for opening a restaurant near such location is more. Then we identified the nearby restaurants for such locations.

My finding and recommendations are already discussed in the *Result and Discussion* section. Please check the recommendations. Selecting the optimal location is left to the stakeholder based on the other dependent factor such as rent, water availability, parking slots, connectivity etc. It is upto the stakeholder who has to pick one of the recommended locations.