Finding optimum locations for new shopping mall

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1. Introduction

1.1 Background

Pune is the second largest city in the Indian state of Maharashtra. It is the ninth most populous city in the country .The city is considered to be the cultural capital of Maharashtra. It is also known as the "Oxford of the East" due to the presence of several well-known educational institutions. So very large migration of students, corporate, workers takes place in Pune every year. This is creating long queues in shopping malls. Shopping malls are highly preferred source of buying as they provide diverse shopping items at one place along with better discounts for their customers. Hence it becomes important to provide shopping malls nearby to the vicinities.

1.2 Problem

This project aims to find an optimum location for shopping malls in the vicinities that are not already crowded with shopping malls. We are also particularly interested in areas with no shopping malls in vicinity. We would also prefer locations as close to city center as possible. assuming that first two conditions are met.

1.3 Interest

This project will be useful for the businessman and property developers who are interested in opening a new shopping mall.

2. Data acquisition

Neighborhood data of Pune city is readily available in Wikipedia. From there we will be using suburb areas as ‘Neighborhoods’. Centers of the areas will be generated algorithm ically and approximate addresses of centers of those areas will be obtained using 'Geocoder function'.
Number of shopping malls and location in every neighborhood will be obtained using Foursquare API. Coordinate of Pune center will be obtained using foursquare API.

3. Data visualization

We got all neighborhoods' latitude and longitude using geocoder. We formed a dataframe containing all 82 Neighborhoods along with their geographical cocordinates. We used Folium library to get a map of Pune along with its neighborhood with obtained dataframe.

	Neighborhood	Latitude	Longitude
0	Ambegaon	19.004960	73.945830
1	Aundh	18.563450	73.812270
2	Baner	18.548200	73.773160
3	Bavdhan Khurd	18.511100	73.777730
4	Bavdhan Budruk	18.518270	73.765570
5	Balewadi	18.576020	73.779830
6	Bhamburde	18.733490	74.282880
7	Bibvewadi	18.471870	73.863360
8	Bhugaon	18.499220	73.753160

Fig 1- Dataframe containing neighborhoods and respective coordinates.

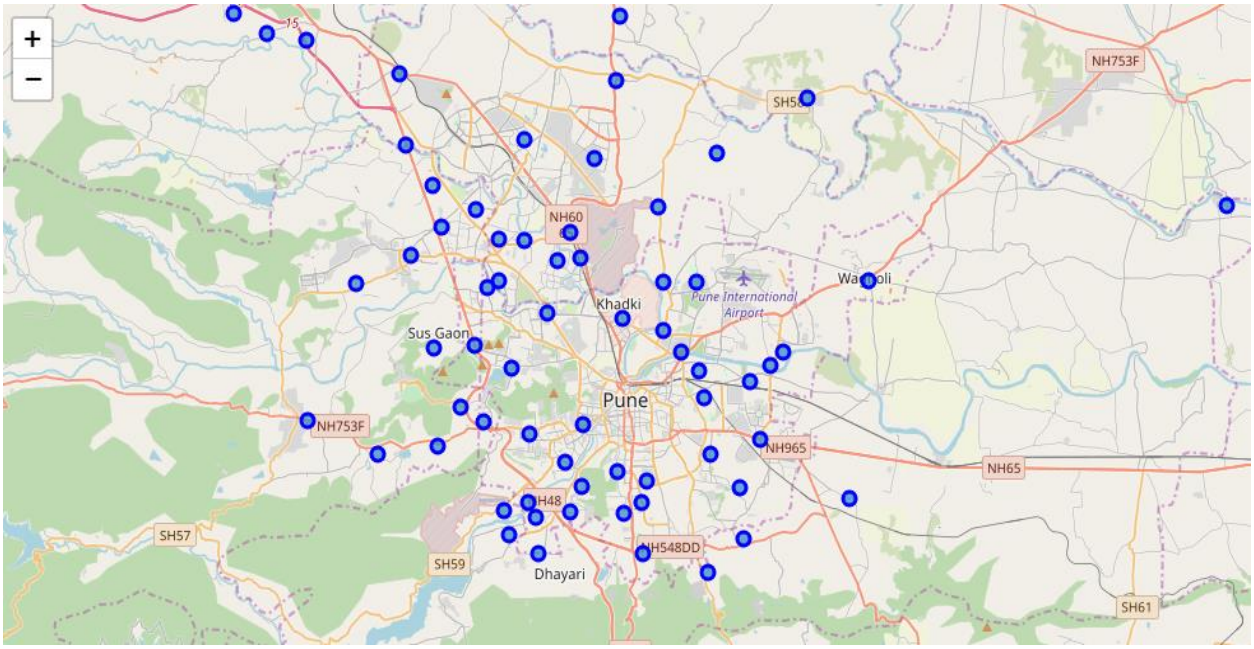

Fig 2- Map of Pune showing all of its vicinities

4. Data Analysis

Then using Foursquare API search query, we gathered all venues present in each vicinity. While searching it has been decides to use 'Pune' as centre and to search all locations which are within 5 km from Pune centre. It has been found that out of 82 vicinities only 78 were in new data frame due to filter applied while searching. We used K means clustering algorithm to form 4 clusters of all 78 vicinities.

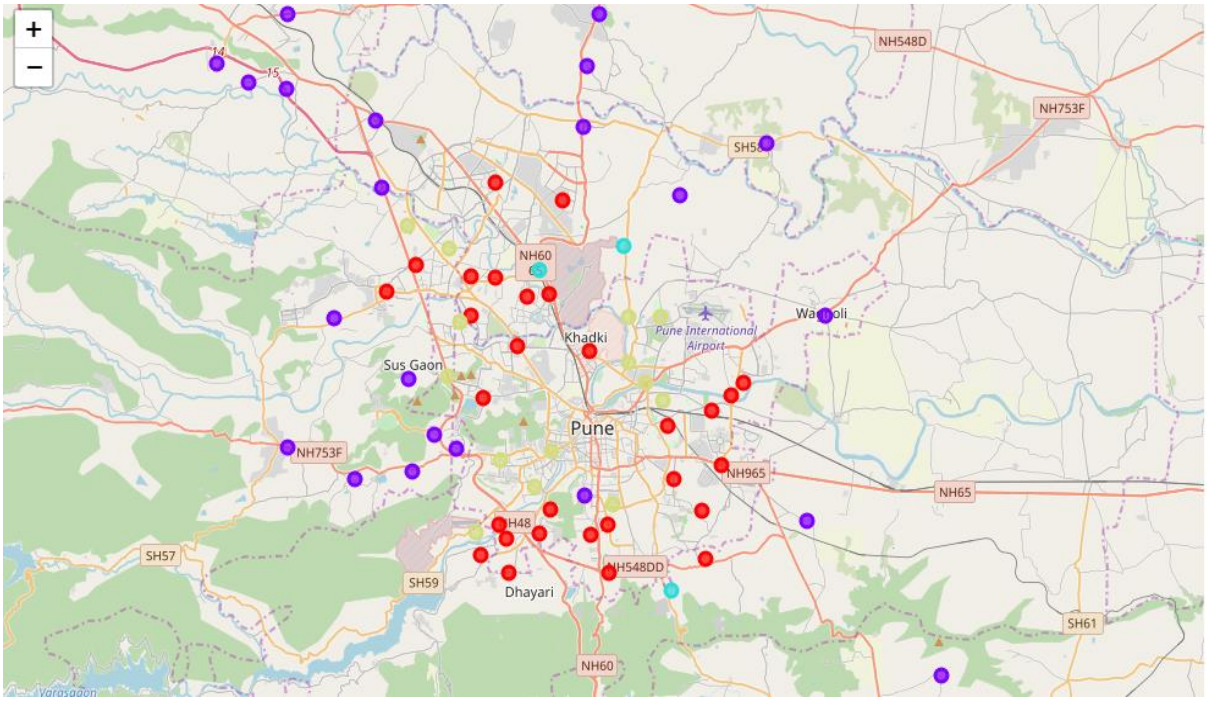

Fig 3- Map showing clusters formed from 78 vicinities

Then we continued further analysis of each cluster formed. To understand the shopping malls present in each vicinity, we performed 'one hot encoding'. With analysis we found number of vicinities in each cluster which contains one or more shopping malls in them. Below are the details we got from our analysis.

Cluster Sr. No.	Color used in map	Total vicinities with one or more malls	Vicinities without any mall in them
Cluster 1	Red	30	0
Cluster 2	Dark Blue	31	31
Cluster 3	Light Blue	3	0
Cluster 4	Green	14	0
	Total	**78**	**31**

Table 1: Table showing detailed summary obtained in analysis

5. Results and Discussion

Then Most of the shopping malls are concentrated in the central area of Pune city, with the highest number in cluster 1 and moderate number in cluster 3 and cluster 4. On the other hand, cluster 2 has lowest number to totally no shopping mall in the neighborhoods. This represents a great opportunity and high potential areas to open new shopping malls as there is very little to no competition from existing malls.

Meanwhile, shopping malls in cluster 1 are likely suffering from intense competition and high concentration of shopping malls. From another perspective, this also shows that the oversupply of shopping malls mostly happened in the central area of the city; with the suburb area still have very few shopping malls. Therefore, this project recommends property developers to capitalize on these findings to open new shopping malls in neighborhoods in cluster 2 with little to no competition. Property developers with unique selling propositions to stand out from the competition can also open new shopping malls in neighborhoods in cluster 3 with moderate competition. Lastly, property developers are advised to avoid neighborhoods in cluster 1 which already have high concentration of shopping malls and suffering from intense competition.

6. Conclusion

Purpose of this project was to identify Pune city areas close to center with low number of shopping malls in order to aid stakeholders in narrowing down the search for optimal location for a new shopping mall. By calculating shopping mall density distribution from Foursquare data we have first identified general vicinity that justify further analysis, and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby shopping malls. Clustering of those locations was then performed in order to create major zones of interest (containing greatest number of potential locations) and addresses of those zone centers were created to be used as starting points for final exploration by stakeholders.

Final decision on optimal shopping mall location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like population of each location, proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.