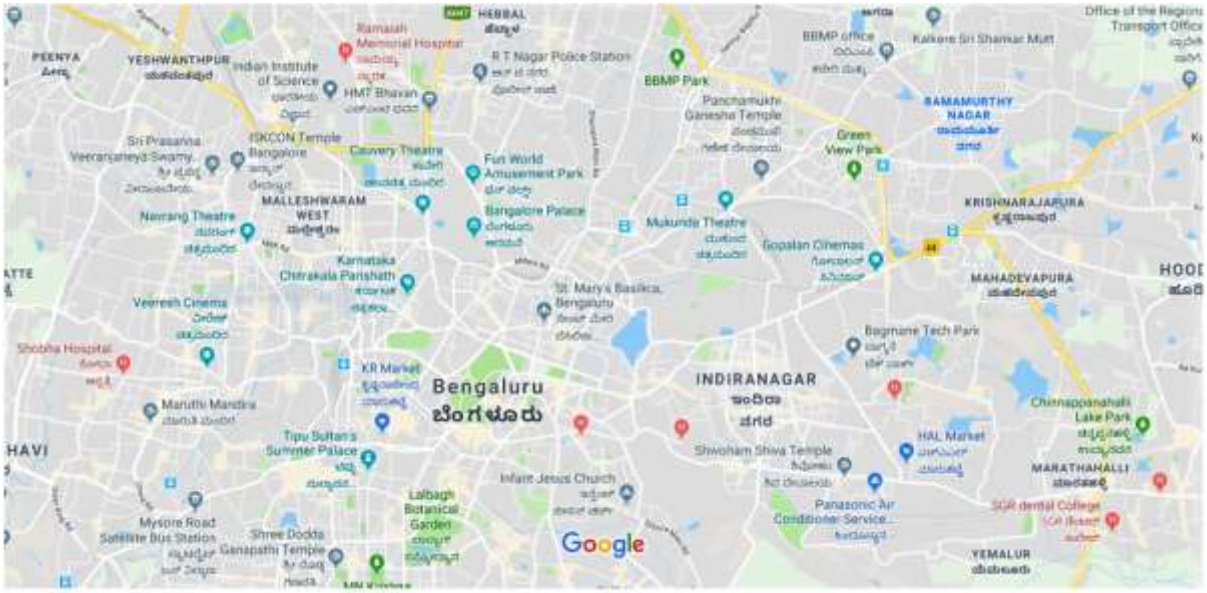
RECOMMENDER SYSTEM
FOR
RESTAURANTS IN BENGALURU



INTRODUCTION

INITIAL SETUP

Problem background:

Bangalore, officially known as Bengaluru, is the capital city of the Indian state Karnataka. It is also known as Silicon Valley of India. As per the 2018 statistics, the population of Bengaluru is about 124.476 lakhs and the geographical area is 709 sq.km.

A variety of cuisine is available in Bengaluru; this reflects the social and economic diversity of the city. Roadside vendors, tea stalls, South Indian, North Indian, Muslim food, Chinese and Western fast food are all very popular in the city. Udupi restaurants are very popular and serve predominantly vegetarian cuisine. The Chinese food and the Thai food served in many of the restaurants can be customized to cater to the tastes of the Indian population. Bengaluru can also be called a 'Foodie's Paradise' because of its vast variety of foods and edibles with a touch of its uniqueness and tradition.

Problem Description:

People go around the city of Bengaluru, either as a part of their work or for enjoying the vacation. They would like to know the type of food available in a particular area (neighborhood) they visit. In such a scenario, they can make use of the Recommender System, which should address the following points:

1. Nearest restaurant with a good rating
2. Type of food available in that restaurant
3. Similar restaurants located nearby
4. Comparison between them

Target Audience:

People could simply decide to look for a similar restaurant all the time because they are addicted to a specific category of food. People who rarely use restaurants would prefer to have the most rated restaurants nearby them and all this information could be easily provided by this system. So, the target audience for this project is basically everyone who is exploring different places and various types of food they would like to taste.

Success Rate:

With more and more restaurants evolving, new food categories emerge, and hybrid food starts to be more popular, people need a system that could help them access numerous varieties of

food. It is impossible for a person to get this information manually. In such a situation, the Recommender System can be used as a personal assistant and success rate would certainly increase with time.

Data Requirements:

In order to build the Recommender System, we need the following data:

1. To locate a restaurant in a certain place, we need the latitude and longitude of that place.
2. To determine the quality of the restaurant, we need the data regarding the population of the neighborhood and the proportion of people who visit that restaurant. More the number of people visiting a restaurant, better will be the quality rating of the restaurant.
3. To determine the income group of people who visit the restaurant, we need the income data of the people in the neighborhood.

Data Collection:

The required dataset consists of three .csv files, one for each of the requirements specified above. Sample of all these datasets are shown below:

	Borough	Neighborhoods	Latitude	Longitude
0	Central	Cantonment area	12.972442	77.580643
1	Central	Domlur	12.960992	77.638726
2	Central	Indiranagar	12.971891	77.641151
3	Central	Jeevanbheemanagar	12.962900	77.659500
4	Central	Malleswaram	13.003100	77.564300
5	Central	Pete area	12.962700	77.575800
6	Central	Rajajinagar	12.990100	77.552500
7	Central	Sadashivanagar	13.006800	77.581300
8	Central	Seshadripuram	12.993500	77.578700
9	Central	Shivajinagar	12.985700	77.605700

	Borough	Neighborhoods	Population
0	Central	Cantonment area	866377
1	Central	Domlur	743186
2	Central	Indiranagar	474289
3	Central	Jeevanbheemanagar	527874
4	Central	Malleswaram	893629
5	Central	Pete area	730999
6	Central	Rajajinagar	981362
7	Central	Sadashivanagar	662625
8	Central	Seshadripuram	396862
9	Central	Shivajinagar	77836

	Borough	Neighborhoods	AverageIncome
0	Central	Cantonment area	18944.099792
1	Central	Domlur	56837.022198
2	Central	Indiranagar	41991.817435
3	Central	Jeevanbheemanagar	6667.447632
4	Central	Malleswaram	53270.063892
5	Central	Pete area	50712.430215
6	Central	Rajajinagar	60967.535874
7	Central	Sadashivanagar	59943.541564
8	Central	Seshadripuram	58407.090338
9	Central	Shivajinagar	55850.962099

In addition to these datasets, we need FourSquare API to obtain nearest venue locations, so that we can form clusters of neighboring locations.

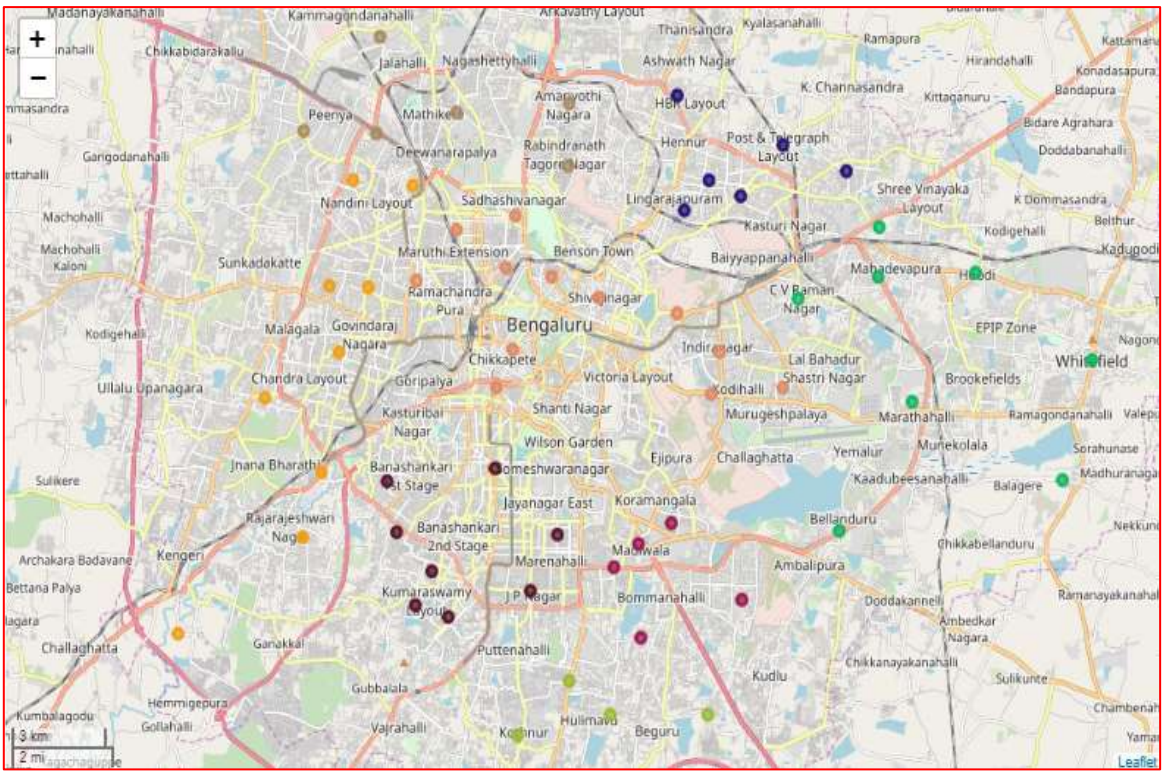
METHODOLOGY

Get mean latitude and longitude, unique Boroughs in Bengaluru and create their map:

Latitude and Longitude of Bengaluru : 12.962339620312497 77.60175294687502

Unique Boroughs: 'Central', 'Eastern', 'NorthEastern', 'Northern', 'SouthEastern', 'Southern', 'SouthernSuburbs', 'Western'

Map of the Boroughs:



Explore the neighbors using FourSquare API:

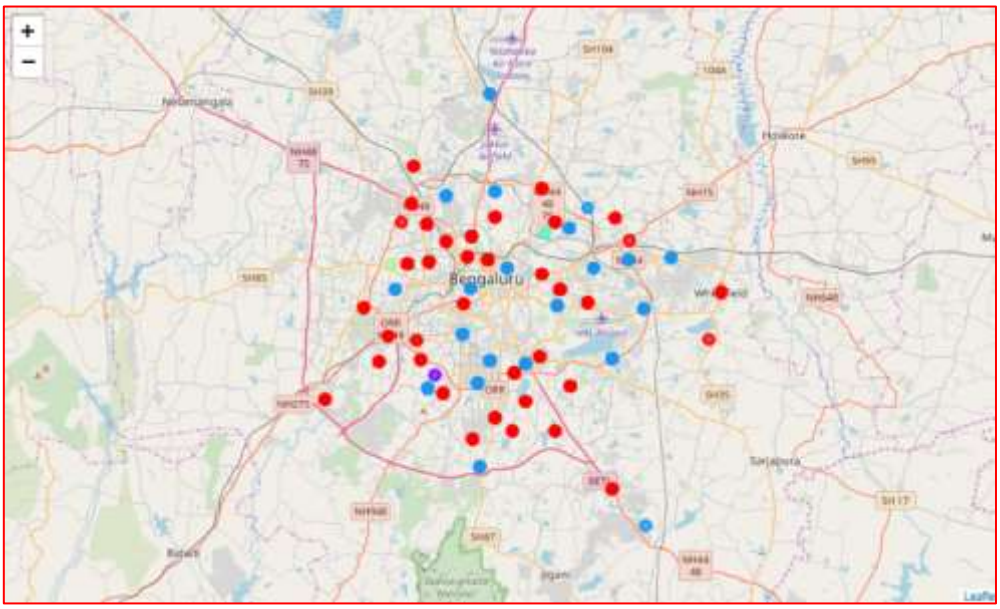
The sample result of this analysis is as follows:

	Neighborhood	Borough	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Cantonment area	Central	12.972442	77.580643	Hotel Fishland	12.975569	77.578592	Seafood Restaurant
1	Cantonment area	Central	12.972442	77.580643	Vasudev Adigas	12.973707	77.579257	Indian Restaurant
2	Cantonment area	Central	12.972442	77.580643	Adigas Hotel	12.973554	77.579161	Restaurant
3	Cantonment area	Central	12.972442	77.580643	Sapna Book House	12.976355	77.578461	Bookstore
4	Cantonment area	Central	12.972442	77.580643	Kamat Yatrinivas	12.975985	77.578125	Indian Restaurant
5	Domlur	Central	12.960992	77.638726	Lavonne	12.963909	77.638579	Café
6	Domlur	Central	12.960992	77.638726	Barbeque Nation	12.962684	77.641599	BBQ Joint
7	Domlur	Central	12.960992	77.638726	Mainland China	12.962458	77.641727	Chinese Restaurant
8	Domlur	Central	12.960992	77.638726	Domino's Pizza	12.961000	77.639000	Pizza Place
9	Domlur	Central	12.960992	77.638726	Srinidhi Sagar	12.959348	77.638387	Indian Restaurant

As a sample study, we explored ‘Malleswaram’ venues:

	Neighborhood	Borough	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
86	Malleswaram	Central	13.0031	77.5643	Raghavendra Stores	13.000799	77.563924	Breakfast Spot
87	Malleswaram	Central	13.0031	77.5643	Sai Ram Chats	13.006615	77.564158	Indian Restaurant
88	Malleswaram	Central	13.0031	77.5643	Naturals Ice Cream	13.006587	77.564354	Ice Cream Shop
89	Malleswaram	Central	13.0031	77.5643	Bun World	13.007511	77.563738	Bakery
90	Malleswaram	Central	13.0031	77.5643	Amrith Ice creams	13.001860	77.567340	Ice Cream Shop
91	Malleswaram	Central	13.0031	77.5643	baskin robbins	13.007388	77.563982	Ice Cream Shop

Clusters obtained performing the cluster analysis:



I constructed a target neighborhood for ‘Malleswaram’ and then created their ranking by combining population and income factors.

Result:

Finally, top three recommended neighborhoods Malleswaram in terms of food are determined**.**

	Neighborhoods	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	Ranking
0	Arekere	Venue Category_Indian Restaurant	Venue Category_Sporting Goods Shop	Venue Category_Mughlai Restaurant	[0.32959888840700646]
1	BTM Layout	Venue Category_Indian Restaurant	Venue Category_Chinese Restaurant	Venue Category_Ice Cream Shop	[0.6918117751640322]
2	Banashankari	Venue Category_Indian Restaurant	Venue Category_Café	Venue Category_Breakfast Spot	[0.8234029969357849]

Discussion:

In the project, I performed a methodical study and analysis to design a recommender system for Bengaluru. As an example, I explored the neighborhoods of Malleswaram and obtained best recommendations in terms food.

Conclusion:

The recommender system is a system that considers factors such as population, income and makes use of Foursquare API to determine nearby venues. It is a powerful data driven model whose efficiency may decrease with increase in the size of the data set but accuracy will increase. It will help users to select the best among the various possibilities.