Restaurant Recommendation System

PROJECT SYNOPSIS

Machine Intelligence

BACHELOR OF TECHNOLOGY- V Sem CSE

Department of Computer Science & Engineering

SUBMITTED BY

Batch No:- 20

Student name 1:   Anish Cherekar   SRN: PES2UG20CS052

Student name 2:   Amey Mittal   SRN: PES2UG20CS037

Student name 3:   Abhishek S Kutre   SRN: PES2UG20CS012

PES UNIVERSITY

(**Established under Karnataka Act No. 16 of 2013**)

100 Feet Ring Road, BSK III Stage, Bengaluru-560085

➤ *Abstract and Scope*

Recommendation systems are a type of information filtering systems because they improve the quality of search results and provide elements that are more relevant to the search item or that are related to the search history of the user.

In this project, we present the recommendation system for restaurants based on food rating distribution, service rating distribution by calculating the matrix density. With addition to that we build the popularity based recommender model for recommending restaurants to the customers. Ranking scheme can be employed based on scores. The output of the model may be recommending most popular restaurants and most popular food items served by the appropriate restaurant.

For betterment of the model we accompany collaborative filtering with singular value decomposition. Evaluation of the model can be completed with Root Mean Square method(RMSE). This experiment is executed on the Kaggle data set and we build a web based application using python's Flask web frame work.

➤ *Feasibility Study*

- The Recommendation system is the *unavoidable* thing for whatever we buy or go to the new place.

- Restaurants also need recommendation systems in terms of attracting more customers in the management side and tasting favorite, famous food in the restaurant in customer's side.

- In reality, finding the favorite food and famous food especially in new area is a challenging task.

- Recommendation systems have recently become most popular because of its use in various domains. A recommendation system is a set of algorithms that learns from the input and after processing it can recommend the needed to the customers.

- In general, it is tool that would recommend products to customers based on various factors like search history, similarities of users, similar patterns, based on ratings.

- Real time popular examples are YouTube, amazon, Facebook, etc. Their working mechanisms are mainly based on historical data. Based on the data available items are ranked and most relevant are given to the customers.

➤ *Design Approach/ Methodology/ Planning of work*

- In this project, we are using python for machine learning algorithm. Because python has many machine learning supporting packages. It used for representing the results in different ways by chart view, graph view and table view.

- For front end we are using python framework "FLASK" with HTML, CSS and JavaScript.

- For database we are using SQLite, for creating tables for each customer's to maintain the customers logs, ratings, feedback, reviews and browse history

The proposed Recommendation system has used the statistical methods and exploratory data analysis for answering the following questions. To find out number of unique users and restaurants. Find out ratings including food, service and quality.

For the betterment of the model we found how many times user rated, totally how many times the restaurant been rated and find out the rating distribution of food, service and quality separately.

Fig 1. Find out unique values of the entity.

```
Unique users:  138
Unique restaurant:  130
Total no.of ratings given:  1161
Total no.of food ratings given:  1161
Total no.of service ratings given:  1161
```

Fig 2. Find Number of times user rated.

```
U1061       18
U1106       18
U1134       16
U1024       15
U1022       14
```
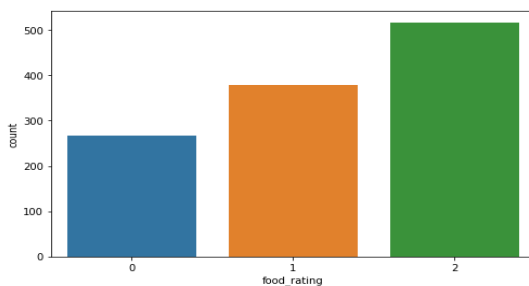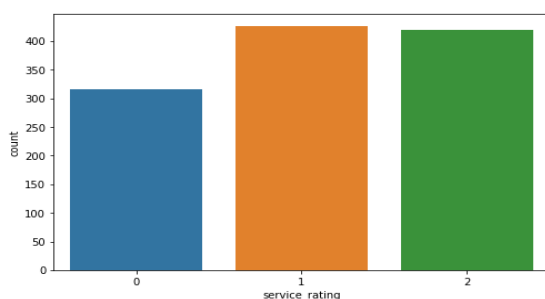
Fig 3. Food Rating

Fig 4. Service Rating.

1. Dataset:

In this recommendation system, the main resources are the Kaggle dataset that we are going to use in this application for recommend the restaurant.

Totally it contains 9 csv files including ratings, cuisine, user payment etc. In that we analyze mainly rating file which contains 1161 instances and mainly 5 attributes. This dataset is integrated with our application so that the machine learning algorithm deploys the suitable results for the customer.

2. Popularity Based Recommendation:

This model is not focused on personalized approach but it simply recommends to the user the most popular thing in that region or on that occasion or the best thing in the appropriate restaurants. Hence the consumer may use the product or may not use the same on. It recommends the current trending or popular across the region.

This type of recommendation is very useful when we do not have any past historical data about the particular user. It works based on principle of popularity and in the current trend. Benefits of this technique are it does not affect the problem of cold start and there is no need of customer's historical data. Demerits of this system may its not personalized and the system may recommend same sort of products based on popularity to every customer.

Fig 5. Assign score to the most popular places.

	placeID	score
123	135085	36
31	132825	32
80	135032	28
98	135052	25
33	132834	25

Fig 6. Rank based on the scores

	placeID	score	Rank
123	135085	36	1.0
31	132825	32	2.0
80	135032	28	3.0
98	135052	25	4.0
33	132834	25	5.0

3. Collaborative Filtering (CF):

Collaborative filtering is a more recently used algorithm for recommendation system. This method uses inputs from multiple users with similar taste. It has user-based CF and item-based CF.

This methodology exploits the users underlying preferences through the analysis of latent features that define the input values. We have used singular value decomposition collaborative filtering model.

Fig 7. Pivot table.

placeID	132560	132561	132564	132572	132583	132584	132594	132608	132609
userID									
U1001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
U1002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
U1003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
U1004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
U1005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fig 8. Recommend places based on ratings and userID.

```
Below are the recommended places for user(user_id = 12):

                   user_ratings  user_predictions
Recommended Places
135046                      0.0          0.780975
135026                      0.0          0.465279
135058                      0.0          0.458938
135055                      0.0          0.455777
135045                      0.0          0.440416
```

Fig 9. Actual ratings and Predicted ratings.

	Avg_actual_ratings	Avg_predicted_ratings	place_index
placeID			
132560	0.015625	-1.171132e-18	0
132561	0.023438	3.334107e-18	1
132564	0.023438	-1.491341e-18	2
132572	0.117188	9.900262e-02	3
132583	0.031250	3.323385e-02	4

➤ *Conclusion*

- The main objective of the study is to develop the restaurant recommendation system using machine learning with the web interface that can act as an application for the customers.

- This application is used for the users to predict the suitable restaurant and find out which dish is famous in the region wise and in person. This application ensures the availability of ratings to the customers.

- The popularity based and collaborative based filtering makes the recommendation more efficient so that each user can use this application for their easy prediction of restaurant.

- This restaurant recommendation system web application will provide user a better experience in searching of restaurant with short amount of time and nearby location. This will decrease the user's effort and makes the time more precious.

➢ ***References***

1. Yifan gao, Wenzhe Yu, Pingfu Chao, Rong Zhang, "A Restuarant Recommendation System by Analyzing Ratings and Aspects in Reviews", 20th International Conference, DASFAA 2015, Hanoi, vietnam, 2015.

2. Anant Gupta, Kuldeep Singh, "Location Based Personalized Restaurant Recommendation System for Mobile Environments", International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2013.

3. Rui Jiang, "A Customized Real Time Restaurant Recommendation System", A Thesis in Computer Science and Engineering "10(2) special 2015.