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Mood Based Food Recommendation System

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***Abstract* - The constantly expanding volume of online information is a strategic approach to managing the excessive amount of data. The importance of recommender systems cannot be emphasized, considering their ubiquitous use in many online applications and their ability to alleviate many problems associated with over-choice. All potential parts of enterprise are the rising usage of technology that demands usage of IT. The hotel and restaurant industry nowadays are one of the most expanding businesses and has greatly contributed to the economy of the nation. Existing restaurant recommendation does not consider user's current point of view or is not personalized. The proposed system is completely personalized for users, this system recommends food and available restaurants based on user's current mood. The dataset from Zomato is taken to locate the restaurants based on location of user. A website is designed where the user must enter their basic personal details for developing their personalized system, and then select their current mood out of the options provided. Based on given inputs the application recommends user with food items and restaurant. Multiple options are provided to the user along with restaurant rating to give better experience. Total 9 restaurants are recommended to a customer out of which top-3 are the best recommendations and 6 are other recommendations. This model is developed using PyCharm, the restaurants are grouped by location using KNN algorithm. Flask is used to create website which is user friendly. This application can be used when a customer doesn't understand what to eat when they are in the moods.**

Key Words: K-Means Algorithm, PyCharm, Flask, Content and Collaborative based methods, Recommendation.

I. INTRODUCTION

With the enormous and ongoing expansion of the information accessible and the progress of the technology, it is more difficult for individuals to identify and locate those high-quality, popular, and trustworthy services. In addition, thoughts, and sentiments from colleagues regarding a service affect the decisions and beliefs of the user substantially. Recommendation system since not only time and money may be saved but also things that best fits users' needs. Because the web's accessible data is exploding, more than countless items, films or restaurants are welcomed by consumers [1].

Personalization is therefore a vital method to facilitate the experience of a user. In total, in different Information Access Systems, Recommendation Systems have played an integral and crucial part in boosting business and decision-making and are prevalent in many web domains such as e-commerce and/or media sites.

Recommendation models are mainly categorized into collaborative filtering, content-based recommender system and hybrid recommender system based on the types of input data. Historically recommendation systems have been developed in several disciplines for different machine learning applications. An example of this is social networking sites like Facebook, where recommendation systems are being used to suggest user connections. The same machine and recommendation logic is used for music and media services like iTunes and Spotify to propose different tracks to consumers based on their past selections and tastes [2]. Keeping this general idea, this project is one step ahead of current recommendation web applications in such a way that the proposed system recommends food and restaurants based on user's mood.

The aim of this system is to suggest food based on user's mood from top-rated restaurants for best quality. An application is created where user must select their current mood, based on which food and best restaurants that are having the suggested food are also suggested. The restaurants are suggested based on user's location, which are grouped using K-Means Algorithm and this model is connected to the web application that is developed using Flask. The application uses content-based filtering and collaborative based filtering methods while recommending the food and restaurants.

Currently, a website that can provide food and restaurants recommendations based on mood of a person is not available. The existing systems are based on either rating or location or nutrition etc. but, not with both the options. In proposed work, a website is developed with registration and login for customers, along with recommendations of food and restaurants based of customer's mood, location, rating by providing avg. cost for two persons. Sentimental Analysis and

Opinion mining is done while building the model for recommendations of food and restaurants.

The developed model is loaded into a python code through pickle and this python code is executed using PyCharm which generates a link for accessing the developed model and HTML pages.

II. LITERATURE SURVEY

Recommender systems are identified as any system that produces individualized recommendations as output or has the effect of guiding the user in a personalized way to interesting or useful objects in a large space of possible options [1]. Propose systems evaluate user preference for objects and recommend objects that consumers could proactively enjoy them. Models of Recommendations mainly come under three categories: collaborative filtration, contents-based and hybrid system of recommendation. Collaborative / collaboration recommends by learning by prior user interactions, be it explicit (e.g., prior user ratings) or implicit feedback (e.g., browsing history). The content suggestion is mostly based on comparisons between the auxiliary information of goods and users. A variety of additional information might be interpreted, such as text, pictures, and videos. Many systems are proposed in literature and some of them are discussed as follows:

Sumedh and Gina Pai [3] proposed a Yelp Food Recommendation System based on customer's restaurant rating. Using Yelp dataset, they extracted both collaborative and content-based features to identify the profiles of customers and restaurants. They used K-nearest neighbor clustering for building the model that recommend restaurants, based on preferred ratings and location of the customers. Mara-Renata and Sergiu-George [4] constructed a model that can recommend restaurant based on positive and negative reviews of it using sentimental analysis. They combined the outputs of sentimental analysis and recommendation system to build a model that can recommend effectively and efficiently, while performing sentimental analysis by taking the positive and negative reviews of customers and giving this output to recommendation system, whose results are used to recommend restaurants to other customer through collaborative filtering method. Rui Maia and Joao et al. [5] performed a study for recommending restaurants and food based on ratings of previous customers. Used context-aware method i.e., it identifies the restaurants that are nearby to a customer and performs collaborative filtering on food items to predict which items are most popular based on collaborative ratings on food item, this recommends a new customer about the food and restaurant when they pass through nearby place. R. Year at al. [6] presented a food recommending system based on nutrition and calories. The only goal of the research was nutrition, not taste, not famous cuisine in a restaurant, it only concentrated on the diet of the customers. The restaurant recommendation system proposed by Li Chen et al. [7] was based on reviews of the visited customers. In this research, a review-based restaurant recommendation model was built based on content-based, collaborative filtering and preference-based product rating techniques. Text analysis is done on the reviews of the customers and then the rating is calculated, when customers give a preferred a rating then all restaurants with that rating are displayed. But this cannot sort restaurants based on location and rating at the same time. In work presented by Khan et al. [8] restaurant recommendation system based on opinion mining on unstructured reviews by the customers like emojis, gifs etc. is proposed. The results of this research were extraordinary, which deduced every unstructured opinion into some useful data which is further used to rate the restaurants.

Much research is carried out and many models were built for recommending food and restaurants based on different type of factors like past orders (content-based filtering), ratings (collaborative filtering), location, nutrition etc. but, none of the research built a model for recommending food based on customer's mood. A customer's mood plays a vital role while taking-in food, because mood decides a lot of our actions and food selection is one of them. In our proposed system, a user-friendly website is created where customers must enter their basic personal details for creating an account. After creating an account, customer must select their mood based on which they will be recommended with food and restaurants. Flask is used for creating the website and K-Means clustering model to use to sort restaurants based on user's location.

III. PROPOSED SYTEM

The proposed system aims to overcome the demerits of the existing systems by giving food recommendations based on moods and providing interactive interface and personalized recommendations. The restaurants recommended in this model are based on collaborative filtering i.e., through rating, which are grouped by the location of the customer.

In this system, a website is created which is user-friendly for users where they must register, and login first and then must select their mood. After selecting mood, the user is suggested with food and top-rated restaurants where that food is famous. While suggesting, the best and top 3 are suggested first and then there are some other suggest where customer can select and order the food from their favorite restaurants. Total nine best restaurants suggested with some quality food to try. Famous food of the top-rated restaurants is displayed below i.e., immediately after the restaurant's name and average cost for two people is also displayed for customers convenience.

This website not only concentrated on moods and ratings, but also on locations of the customer to sort out restaurants in a particular region. The food suggestions provided in this are also based on nutrition, party, cost, delivery of food items etc. are taken while suggesting a food or restaurant for a customer. The rating of a restaurant is done using opinion mining on unstructured data, because the dataset has reviews of customers instead of direct rating of restaurants.

A. Dataset

In this study, datasets are taken from Kaggle for building the model and for mood-based recommendations for a customer. It includes two datasets, “Zomato” and “food-choices” for recommending through rating and mood, respectively. The official Zomato dataset consists of 9552 samples with attributes like rating, address, cuisines, average cost, delivery available etc... From this dataset, the data is selected through customer’s location i.e., through latitude, longitude and the top-rated restaurants of those regions are displayed which are having the recommended food.

The other dataset “food-choices” is a dataset that consists of the food choices of customers when they are in that mood. This dataset includes 126 samples with attributes like cuisines, mood, nutrition, gender etc... From these two datasets, attribute selection is done before building the model and creating a recommendation system.

B. Flow Chart

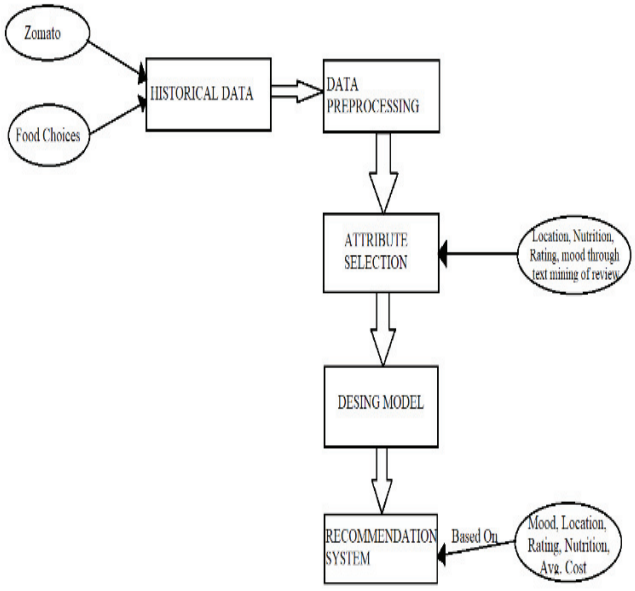

Fig. 1. Flow Chart of Proposed System

1) Historical data**:** For this project, we used the data from Kaggle. We took data of Zomato and food_choices for attributes like cuisines, location, address etc.

2) Data preprocessing**:** Preparing raw data and evaluating it to check if it fits.

3) Attribute selection: Select relevant features like characters, variables which are used to construct mode such as mood, rating.

4) Design model: Here, we construct the model in front end and recommender system to get our desired output.

5) Recommendation: Finally, we get recommendations as per the given model.

B. Classifier

A classifier is an algorithm that automatically categorizes or sorts of data into one or more "classes." The algorithm – the rules used by the machines to categorize data is a classifier. The final product of the machine learning of your classifier, however, is a classification model. The classifier is used for the model and the model is ultimately used for the results classification. In proposed recommendation system K means clustering classifier is used. By using this techniques, we give data to the design and able to obtain an accurate model.

K-Means Clustering is a lazy learning technique that saves all occurrences in n-dimensional space that matches training data points. When unknown discrete data is received, the nearest k number of examples (close neighbors) is analyzed, and the usual class is predicted, and the average of the k closest neighbor is returned for real-life data.

K-means Clustering is one of the simplest and popular unsupervised machine learning algorithms. This method originally originates from signal processing, which is intended as a prototype of the cluster to divide n observations into k clusters in which each observation is a cluster of the closest mean (cluster centroid). This causes the data space to be partitioned into Voronoi cells as shown in Fig. 2 [9].

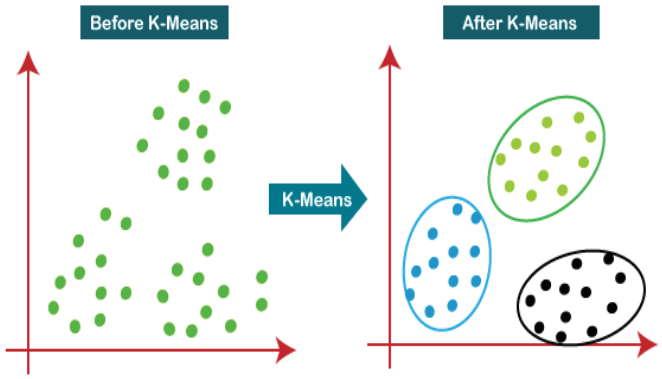

Fig. 2. K- Means Clustering

C. Recommendation System

A subclass of an information filter system to predict a user's "rating" and "preference" for a particular item is the system that recommends or recommends (occasionally substituting a synonym such as a platform or engine for a synonym) [10]. Recommendation systems normally utilize collaborative and content-based filtering (also known as a personality approach), or other methods such as knowledge-based systems. Collaborative filters construct a pattern from a prior behavior of a user (things previously purchased or picked and/or numerical ratings provided to such goods), and other users make similar selections. In this model, things (or evaluations for things) which the user is interested in are predicted [10]. Content-based filtering techniques use a set of discrete and pre-tagged features for a thing to advise more things which have like features.

1) Collaborative Filtering: It would be a co-operative filtering to assume that people who agreed in the past agree on

this in the future and enjoy things of the same sort they liked in the past. The technology only produces suggestions for different individuals or things with rating profiles [11]. When pairs of individuals / things with equal rating histories are found, suggestions are generated from this area. Collaborative filtering methods are classed memorialized and based on models. The collaborative filtering strategy has one of the key advantages of not relying on material to be examined from the computer and may thus propose complicated components such as films until the object itself is understood [11].

2) Content based filtering: Content-based filtering algorithms are based on a product description and a profile of consumer preferences. These solutions are most suited when the known data is provided on a single item (name, locale, description, etc.) and are not exposed to the user. Content based recommenders regard recommendations as a user-specific challenge in terms of categorization and learn the preference and categorization of discourse of a user based on the elements. Keywords are employed for the description of things in this system and a user profile is constructed to identify what sort of thing this user wants. In other words, these algorithms attempt to propose goods that are comparable to or are currently examined by a user in the past. This typically transient profile is not generated via a user sign-in procedure. In specifically, different candidate products are compared with user-rated things, and we propose them for the best matching goods.

A fundamental problem with content-based filtering is whether the system can learn user preferences from the actions by users about one source of material and utilize them in other types of material. When the system is confined to proposing the same sort of content used by the user, its value is substantially less than that used by other sorts of material on other services. Most content-based advisor systems are currently using a hybrid strategy for overcoming this [11]. Content-based advisory systems may also incorporate recommendation systems based on opinion. Users can give text checks or comment on the products in some situations. These user-generated texts are implicit system data as they can provide a rich resource for the element's features/aspects and users' assessment/sense of the item. Features collected from user-generated evaluations are better meta data since they are also reflective of elements of the item such as meta-data.

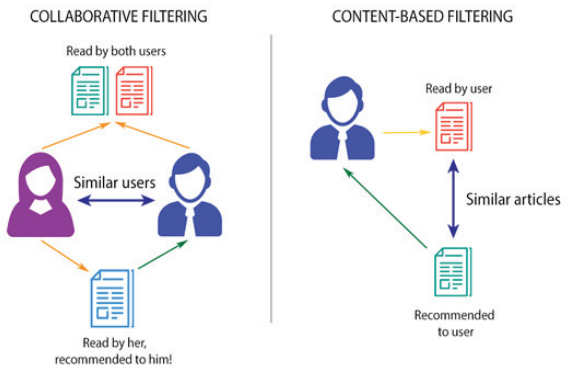

Fig. 3. Collaborative and Content-Based Filtering

D. PyCharm

PyCharm is an IDE devoted to Python that provides a variety of necessary tools for Python developers to build an environment which is well suited for Python's productive development, web, and data science. To allow you to rapidly enter code to enable debugging, PyCharm is an integrative development environment. 3, in plain language: Python is an Interpreter, a PyCharm to construct a custom IDE for the Python language (Integrated Development Environment). You may decide the interpreter you wish to use to pick for your code, each setting includes environmental variables, Python interpreter and working directory options.

PyCharm provides with several interpreters. You may modify how your application is run by PyCharm with this option. The main advantages of this IDE are – It is straightforward to operate and install PyCharm. Syntax and error maintenance, even prior to compiling your code, may decrease overheads in the analysis of syntax error. Language injection enables you to build a template string that may be injected into an HTML tag for subsequent application to utilize the resulting output of a function, value for variables or any object. Import support might allow imports from another area of the project of missing libraries. It uses more space than other text editors to impair the functionality of code to the major downside of using PyCharm.

IV. IMPLEMENTATION AND RESULTS

A. Implementation Process

The step by step procedure followed for implementing the proposed model is explained as follows:

Step-1: First, all the packages are imported into jupyter notebook where the model is going to be created, like pandas, numpy, stopwords, nltk, matplotlib.pyplot, wordcloud, from nltk.stem import WordNetLemmatizer, Collection and Counter.

Step-2: Now, read the data which is in the csv form from the device and each country is given own id and are separated. The visualization of different combination of attributes, like cuisines with count and cuisines with fusion_num, is done by using bar plot.

Step-3: After data visualization is done for combination of attributes, the restaurants of a particular location are categorized and listed through rating of that restaurant.

Step-4: Then, K-Means clustering is used to cluster all the restaurant of a particular location in a list through latitude and longitude of that restaurant and customers location.

Step-5: Now, two functions are written called "search_comfort_food" and "find_my_comfort_food". The input of the customer is given into these functions for predicting the comfort food of the customer through collaborative and content-based filtering methods.

Step-6: At last, based on the customer's comfort food, top-rated restaurants which are providing those foods are displayed.

Step-7: A user-friendly website named main.py using flask, which when executed generates a link of the website created. When user creates an account and selects their current mood out of the provided options, the model loaded in main.py is executes and results are finally displayed.

B. Results Obtained

The results obtained from the website designed in proposed work for the mood based food recommendation system are displayed in Fig. 4 to Fig. 8. As customer enters the website he has to login and register himself, as show in Fig.4 and 5. Next, the customers had to select their current mood from various moods displayed on sccreen, as shown in Fig 6. Following this our designed system will provide the customer food and restaurants recommendations based on his current mood and location. Customers will be given various choices to choose from based on restaurant ratings and food availablity as displayed in Fig. 7 and Fig. 8.

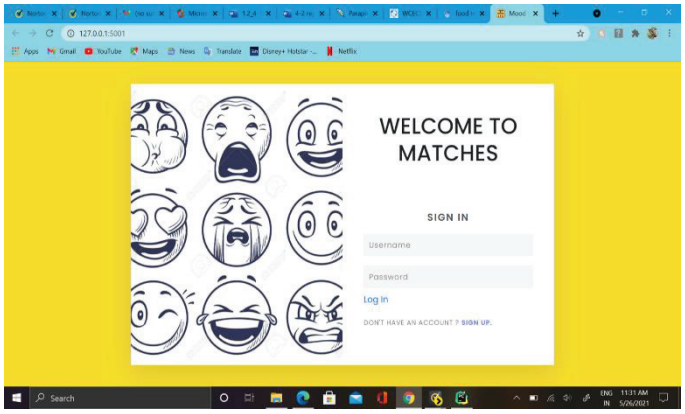

Fig. 4. Login Page

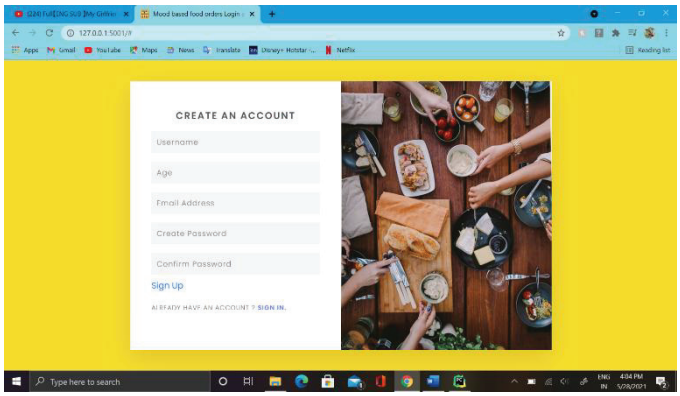

Fig. 5. Registration Page

Login Page is shown in Fig.4, this is the page where the user can login in order to order his food. The registration page shown in Fig. 5 helps user to register into the account so that he can enjoy the services. To register, user has to enter his/her name, age, email address and create a password for security.

After logging in, user get the above page (refer Fig.6) where user can select the mood. On selecting the type of mood, user can get foods and restaurants recommendation.

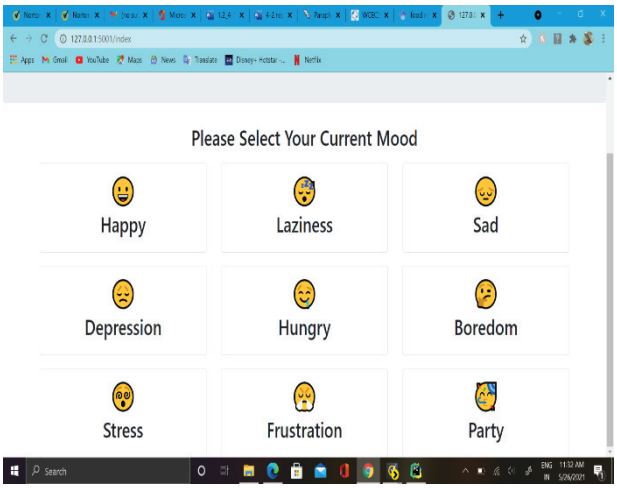

Fig. 6. Mood Selection Page

The pages illustrated in Fig. 7 ad Fig.8 shows the recommendations given to user by our designed website i.e. the food according to mood and restaurants which have highest rating for that particular food. First, the website recommends top three restaurants which have highest ratings (as shown in Fig.7) and then show other restaurants in the order of rating (as shown in Fig.8).

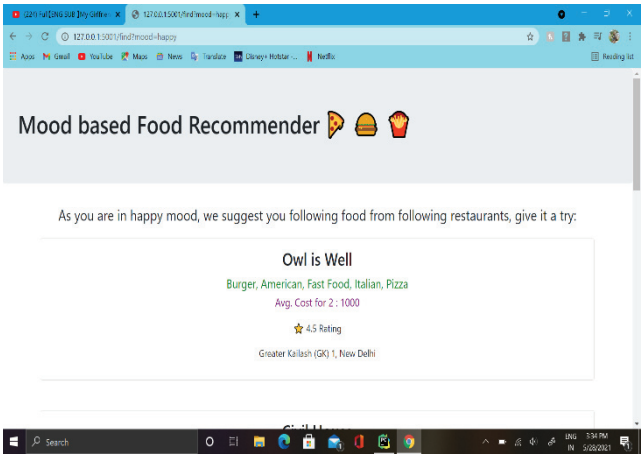

Fig. 7. Restaurant Recommendation

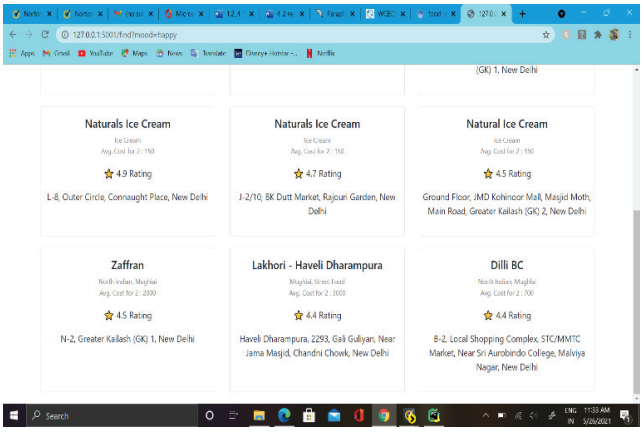

Fig. 8. Other Recommended Restaurants

The strengths of the proposed food recommendation is that user can select food according to their mood. Additionally, the page will be recommended with the top restaurants so that user can enjoy the taste and quality of food. User will not be confused in selection of food. The weakness of proposed model is that the mood has to be entered by user manually. In future work, we will be incorporating face identification model in the system for mood detection.

V. CONCLUSION AND FUTURE SCOPE

The proposed model of mood-based restaurant recommender system has successfully been designed using recommender system and k means clustering classifier. The data sets from Zomato and food choices are used to preprocess the model. A html page is created using HTML and JavaScript and with the help of PyCharm we have successfully achieved the working model. We finally got our desired output of recommending types of foods by entering user's mood or interest.

The data used in this project is based on web scrapping. When we implement this in real world, the data will be based in general tastes of average population. But it may not be same for every individual. So, we can develop it into a design in which it will learn the interests and favorites of individual account holder. It tries to learn all the interests of user and recommends according to the mood the user is in. Moreover, the model can be extended to recognize facial expressions and predicting mood of user and accordingly, recommend him food according to his interest.

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