RESTAURANT RECOMMENDATION SYSTEM USING SUPPORT VECTOR MACHINE AND NAIVE BAYES CLASSIFIER MACHINE LEARNING ALGORITHMS

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Abstract

Recommendation System is the system that contains huge amount of information about the interests of different users and preferences for a particular product. This system can suggest the restaurant to the customer based on the previous purchases, ratings, feedback and some other Components. Machine learning plays a significant role in restaurant recommendation system, which filters the customer based on their previous actions. Here, restaurant recommendation can be performed by feedbacks, ratings, reviews and restaurant reputation, tastes, which is given by the other customers. This paper proposes a hybrid based filtering technique for classifying the users by using the machine learning algorithms such as naive Bayes and Support Vector Machine(SVM). This system increases the food sales, reduces the workload and provides customer satisfaction.

Keywords: support vector machine, naïve bayes, restaurant recommendation, classification, hybrid techniques.

1 INTRODUCTION

Recommendation system is defined as system that can be used for recommending the products to the users based on their interest, preferences and various factors. Many companies like Myntra, Flipkart, Netflix are using this type of software tools for recommending products and movies to the users based on their previous activities. This system is considered as a software tool for giving the suggestion of products for the user by using the machine learning techniques.

Machine learning techniques is used for finding the similarities and possibilities of recommending the items for the users. It identify the similarities between the user and the product and recommend the products according to their interests. Machine learning algorithms such as support vector machine, naive Bayes, KNN , decision tree, random forest, etc.. For example, recommendation system can be used to recommends books, article, products, restaurants, tourist places, movies, jobs, etc. In this paper, recommendation system can be applied to restaurants by using the hybrid based filtering technique. Here, SVM and naive Bayes algorithms are used for classifying the users based on certain factors and recommend the needed information to the users.

2 LITERATURE SURVEY

1) **Mining customer product ratings for personalized marketing**

   In customer rating paper they applied the two machine learning methods for recommender system. The filtering techniques are used for support vector machine that is content based recommendation. The performances for superior comparison for the traditional content based techniques for equivalent time avoids the matter for feature selection. In collaborative technique

extend the class models to recommend that product for trained the set of data. The model based approach is effectively solve the problems.

2) **The Use of Machine Learning Algorithms in Recommender Systems**

Machine learning algorithm is recommender the system and identifies the research opportunities for the software engineering research analysis. Recommendation system is widely used algorithm Bayesian and decision tree. The phase of recommender system that are study the further research.

3) **Product recommendations using data mining and machine learning algorithms**

Food product recommender system to the user that supported the purchase, the dataset for the recommendation system like food items. Data mining techniques is used to recommend the product by using K-nutrient algorithm to understand the advice system. Implementation process using machine learning algorithm like support vector machine and random forest. The comparison between support vector machine and random forest, support vector machine perform effective recommender system and it gives more efficiency and time complexity.

4) **An Intelligent Data Analysis for Recommendation Systems Using Machine Learning**

The hotel recommendation system that deals with textual hotel having numerical ranks and number of video proposes the system. An intelligent technique approaches the large size heterogeneous data to fulfill our potential customers. The collaborative filtering is a popular techniques used in product recommendation system. Opinion based sentiment analysis to achieve hotel feature identification of the collaborative recommendation. The features for understand the sentiment towards the guest type family or couple by using different analysis like lexical, syntax, semantic. The proposed system recommender hotel based features and guest type recommendation system. We can develop the e platform using big data hadoop for the feature management and guest recommendation system.

5) **The Use of Machine Learning Algorithms in Recommender Systems**

Recommender system provide a use of machine learning algorithm for user can recently take research field of artificial intelligence based machine learning process. The proposed work for analysis the algorithm to help the product recommender with the research fields. The final study of the use of machine learning algorithm is Bayesian and decision tree algorithm are widely used for recommender system.

6) **Recommendation and Classification Systems: A Systematic Mapping Study**

Recommendation system is widely used in multiple sectors to increases the goal profits for more specialized services to the customers. The classification algorithm is difficult for detect people. The existing classification of the recommender machine learning system is helping the researchers. The combination of two algorithms that classified the recommender product to detect the business and analysis.

3 ALGORITHMS USED

3.1 SUPPORT VECTOR MACHINE

Support vector machine is considered as the powerful machine learning algorithm, which can be used for regression and classification techniques. SVM is mainly based on classifying the data points by using the hyperplane. Hyperplane is nothing but the decision boundary in a n- dimensional space. The hyperplane can be identified by plotting the classes as datapoints in a n-dimensional space, where the hyperplane can be predicted by finding the distance between the datapoints.

The main aim of SVM is to divide the datasets into classes, so that the new upcoming data can be plotted based on the hyperplane. This algorithm will give an better accuracy for classifying the datapoints based on certain factors.

SVM is consists of two types such as linear SVM and non-linear SVM. Linear SVM means it is based on straight line for classifying dataset into two classes, whereas non-linear SVM means it doesn't contain any straight line for classifing dataset into two classes.

3.2 NAIVE BAYES CLASSIFIER ALGORITHM

Naive Bayes algorithms is one of the effective supervised machine learning algorithm, which can be used for solving classification problems. This algorithm is mainly based on Bayes theorem. Bayes theorem works on the concept of conditional probalities with the prior experience. It is mainly used for text classification based on probalities of results. It will predict the results quickly by using the concept of conditional probability. Conditional probability finds the results by the prior knowledge and predicts the final results based on maximum probability. Bayes' theorem can be written as:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

4 TECHNIQUES USED

4.1 Content-Based Recommendation System
This system is one of the type of recommendation system, which is based on the concept of comparing the existing data. For example, if a person is hearing the melody songs means the system will check the other songs related to the melody songs. By this way, the system can identify the user's interest and recommends the needed data.
It can also monitor the user's action like website surfing, product viewing, frequent viewing of pages, categories of items, spending time for a particular product, etc. After deciding the results, it make a profile for each customer and recommend products according to their need and interest.

4.2 Collaborative Filtering
Collaborative filtering can be considered as a intelligent filtering technique, that works on the relationship between the users and the products in the online websites. This system recommends the products to the user based on their tastes and their purchasing behaviour. This technique will give an effective recommendation if the data about the user is higher.
This approach includes gathering and analysing of data about the user based on their interests, preferences and opinion. For example if a user X likes tandoori, Chinese and Indian food items and user Y likes Italian, tandoori and Chinese food items means the food recommendation recommends Italian foods to user X and Indian foods to user Y, by this the system can understand the similar taste of different users and recommends products according. The decision can be predicted by majority of similarities between the users. The KNN algorithm and Latent correlational analysis algorithm are the mostly used algorithms in this approach.
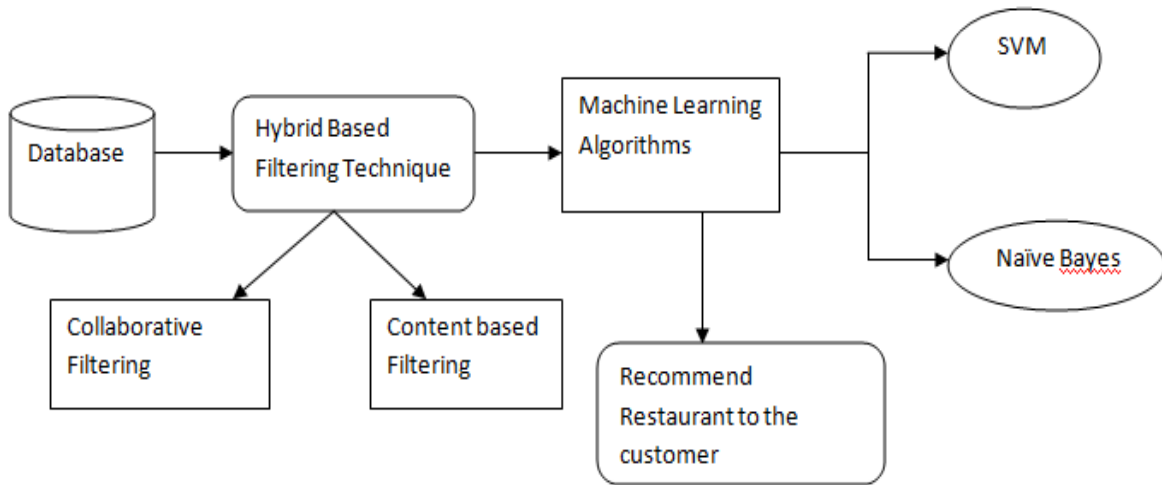
4.3 Hybrid recommendation systems

Hybrid recommendation system can be considered as a combination of collaborative filtering and content based filtering technique. Hybrid technique can be done by many like finding predictions for content based filtering and collaborative filtering and merging them, by including content based features to collaborative approach or combining the two models into one approach.

5 SYSTEM DESIGN
This restaurant recommendation system is mainly based on recommending restaurant and food items to the customer based on previous purchases made by other customers. The customer's previous actions can be stored in a database. The database contains restaurant name, address, list of food items, feedback, ratings, reviews, frequently bought food items, etc. The restaurant and food items can be filtered by the technique called Hybrid filtering technique. Hybrid filtering technique is a combination of collaborative

filtering and content based filtering. It collects the customer's by tracking the customer action, behavior of the customer, preferences given by the customer to the specific food item and the similarities between the customers.
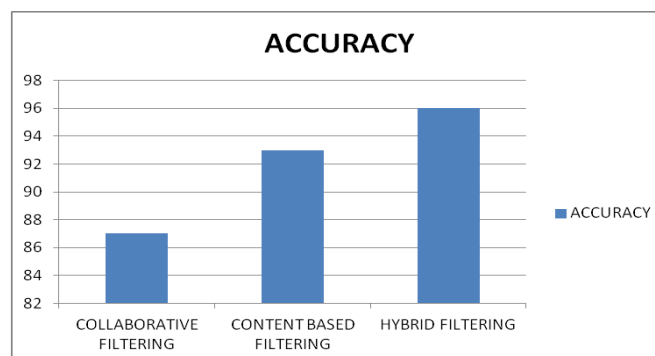
Machine learning technique such as classification is used for classifying the customer based on certain features. For classifing the customers, the two machine learning algorithms such as SVM and Naive Bayes are used in this approach. After classifying the customer, this System recommends the restaurant and food items to the customer according to their need. This system plays an prominent role for increasing the restaurant sales, reduces workload and provides satisfaction for both customers and restaurant owners.

Fig 1: Architecture diagram

6 RESULTS

In fig 2, the X axis represents the different types of filtering techniques that was applied to find the better accuracy. The different filtering techniques used in this paper are content based , collaborative and hybrid filtering. Here, the y axis represents the range of accuracy. From the three different filtering techniques, collaborative filtering gives 87% accuracy, content based filtering gives 93% accuracy and hybrid filtering gives 96% accuracy. Hence hybrid filtering technique is considered as a best technique for predicting accuracy, when comparing with other two filtering techniques.

FIG 2 . Comparison of Filtering Techniques

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7 CONCLUSIONS

This paper proposes the Restaurant Recommendation system that helps the customer to identify the best Restaurant in the city and increases sales to the restaurant. The two machine learning algorithms are considered for classifying the customer, based on their interests and other factors. These two algorithms give the best accuracy results for classification technique than other machine learning algorithms. Hybrid based filtering technique is used for filtering the needed information about the restaurant and the customer from the database.In future, Deep learning and neutral networks will be used together for finding the non-linear patterns and association between the inputs and the outputs for giving the better results.

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