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Elective Subject Recommendation System

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Abstract— Giving students a chance to select a subject of their choice is becoming popular day by day. Elective subjects provide this chance and are increasingly a key part of the progress of a student in their academics. Various universities offer different subjects which belong to various areas of studies. Opting for the best field of study definitely plays a driving role in every student's career. The proposed system titled "Elective Subject Recommendation System" is a web application for suggesting the best elective subject, among all their academic elective subjects, in which that particular student could have a scope of scoring more. It mainly focuses on the tests that will be taken to analyze the student's basic knowledge in the respective field. Then the elective subject is recommended using the random forest algorithm. The objective of the project is to let every student opt the elective subjects based on their capability and knowledge but not by the choice of their fellow students.

Keywords— Randomforest, collaborative filtering

I. INTRODUCTION

Recommender systems are algorithms used to suggest relevant items to users. Recommender systems apply knowledge discovery techniques to make personalized recommendations for information, products or services. The main approaches for building recommendation systems are: Collaborative based and Content based.

Collaborative methods for recommender systems use past interactions recorded between users and items in order to provide new recommendations. These interactions are stored in the "user-item interactions matrix". Collaborative filtering methods are classified as user-based and item-based. User-based collaborative filtering finds users similar to the current user and recommends items based on the weighted average of items rated by those users. Item based collaborative filtering looks for the items that are similar to the once rate by the current user and recommends most similar items. Content-based recommendation systems analyze item descriptions to find items that are of similar interest to the user. The main advantage of collaborative approaches is that they require no information about users or items hence they can be used in many situations. As more and more users interact with items the new recommendations become accurate as for a fixed set of users and items, new interactions recorded over time bring new information and make the system more and more effective. The marks obtained in the test given by the student will be analyzed and a suitable elective subject is recommended by random forest algorithm.

Section I contains the introduction of this work, Section II contains the related work, Section III contains the brief explanation of the methodology of the system, Section IV contains the results of this recommendation system, and Section V concludes the work.

II. RELATED WORK

In the Elective Subject Selection Recommender System [1] the elective subjects are recommended to the students based on student's expertise in all those subjects which constitute the elective subject. The faculties are recommended elective subjects based on their assessment and their work in the field related to the subject. Subject percent score and their respective weight of each subject that constitute the elective are calculated. They are multiplied and the sum is found.

RARE [2] a course Recommender system based on Association Rules that are reviewed in [3] combines association rules together with user preference data to recommend relevant courses. The association rules are generated using the Apriori algorithm. This algorithm has two parameters, the support and confidence, which influence the discovered rules. The rules are extracted from a database which consists of records and each record representing a collection of items.

A Recommender System for On-line Course Enrolment: An Initial Study [4] system proposes item-based collaborative filtering algorithm. Here two matrices record the core and elective modules that are selected by students, respectively. The pair wise vector similarity between the columns of matrices is computed, resulting in similarity matrix S. Si,j, gives the similarity between (core) subject code i and (elective) subject code j.

Learning materials recommendation using good learners' ratings and content-based filtering[5,6] can be divided into 2 phases: (i) development of the modeling which involves retrieving the document's keywords, calculation for the item's similarity, retrieving the good learners' ratings, and calculation for the good learners' average and prediction ratings, and (ii) development of the recommendation which involves the process of selecting the top-N recommended items that exceed the item's similarity threshold, and recommending good learners' rating for a particular learning material.

Another recommender system uses Bayesian Recommendation Model [7]. System mainly analyzes two aspects of information sources: one is the students have chosen course information. Another is the optional course

information databases with course (for example to elective here). Then build related Bayesian reasoning nets and on this Bayesian network based on the combination of the corresponding design recommendation algorithm, finally gives recommended engine with students' interest personalized recommendation results. The item-based[8] approach in Item-Based Collaborative Filtering Recommendation Algorithms [9] looks into the set of items the target user has rated and computes how similar they are to the target item i and then selects k most similar items {i1; i2;::: ;ik}. At the same time their corresponding similarities {si1; si2;::: ;sik} are also computed. Developing an Intelligent Recommendation System for Course Selection by Students for Graduate Courses [10] framework uses these techniques: Clustering Technology, Feed-forward back propagation probabilistic neural network and Classification using Fuzzy Logic and Rough Set. It is categorized into three phases: Data Preparation, Data Analysis and Predictive Modelling. Clustering Techniques such as K-Means Clustering Algorithm [11] is applied for classification of the required student's data and the acts performed are aligned into the meaningful division of groups based on previous data. The set of data items from the clustering process is then trained and tested by optimizing the error. Association rule is then used to inspect the association linking the subgroups [12]. This process is then applied to find out the student characteristics that align the individual characteristics. They [13] proposed an approach that provides student an accurate prediction of the grade they may get if they choose a particular course, which will be helpful when they decide to selecting an elective subject. The Candidate Job Recommendation System [14] classifies students' profiles using Naïve bayes classification algorithm based on their skills matching with the company requirements. Other recommendation system uses item based recommendation [15]. The data used are combined and formed into a matrix and then the system uses similar value decomposition algorithm to factorize the matrix to predict ratings.

III. METHODOLOGY

In pre-processing of data the Nan values were converted to 0. Then data was encoded using the label encoding method. Label Encoding converts the labels into numeric form so that it can be converted into the machine-readable form. Machine learning algorithms can then decide in a better way on how those labels must be operated. The data was split into features and labels. The features matrix contains marks scored by students whereas the labels contain the subject. The dataset is then split into training and test sets. Random Forest Classifier algorithm is used to train the model. Random forest, like its name implies, consists of a large number of individual decision trees that operate together. A decision tree is the main unit, building block of a random forest. A decision tree asks a series of yes or no questions about our data that eventually lead to a predicted class. This is an interpretable model because it makes classifications much like we do: ask a sequence of queries about the available data we have until we arrive at a decision. Here we have created a forest with 100 decision trees in it. To find out the accuracy the following formula is used:

Accuracy = (Total no. of right predictions) / (Total no. of predictions) (1)

Working of random forest algorithm:

Step 1 − First, start with the selection of random samples from a given dataset.

Step 2 − Next, the algorithm constructs a decision tree for every sample. Then it will get the prediction result from each decision tree.

Step 3 − In this step, voting will be performed for every predicted result.

Step 4 − Lastly, select the most voted prediction result as the final prediction result.

The following diagram describes the flow of the working of model:

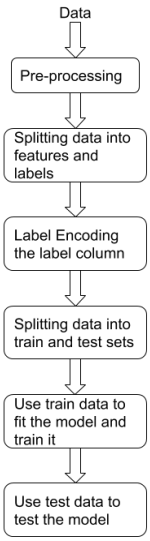

Figure 1. Flow diagram

IV. RESULTS AND DISCUSSION

Some of the questions in the test conducted and the subject recommended for the respective semester are shown below.

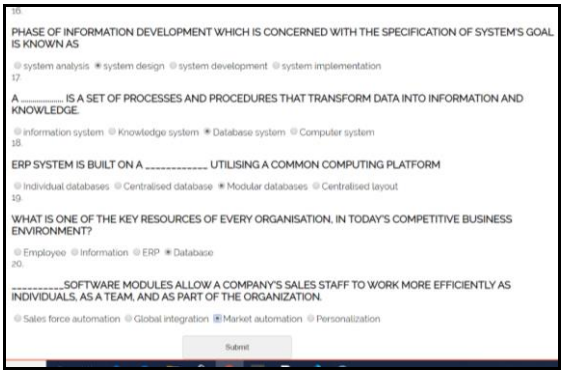

Figure 2. Questions in the test

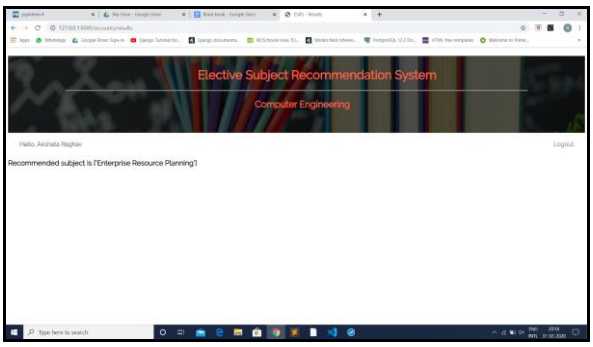

Figure 3. Results

V. CONCLUSION

This work uses test scores to recommend elective subject to the student. The student can select required semester for which he/she wants the elective subject to be recommended. After completion of test the system will recommend the elective subject to the active user. The system is user friendly, and has required options, which can be used by user to perform desired operations.

Our model correctly recommended the elective subjects with 90.37 % accuracy when training and test set labels were compared.

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