The University Recommendation System for Higher Education

Aishwarya Nalawade, Bhavana Tiple

Abstract: ***Recommendation system has become a requirement in today's world. This recommendation system is spread over large sectors right from education, entertainment, health, business etc. The University Recommendation System is a system which recommend right university for the students based on their GRE, TOFEL score. Due to rapid increase in data and lack of learning in education filed, students often halt selecting wrong universities. Thus, there is a need of recommendation system which is trained to understand the user's requirements and suggests them that suitable university which they need. Typically, recommendation mechanisms are used based on user's historical data. It helps the user to discover information and settle on right choices where they do not have the required learning to judge a specific item. This paper explores the flow, types and uses of recommendation system in education.***

Keywords: ContentBased Filtering, Recommendation System, Collaborative Filtering, Artificial Intelligence.

I. INTRODUCTION

Following the completion of undergraduate level of study, a considerable number of students pursue graduate studies in countries other than their home countries. The process of obtaining full-funded opportunity to graduate studies is both very systematic and competitive [1]. Students begin the application process by applying to different institutions from around the world supported by their academic background and standardized test scores including but not limited to GRE, IELTS, TOFEL. Institution admits students on the basis of their academic prowess, standardized test results and job experience.

But the most important step in applying for graduate entry is the choosing of institutions throughout this process. The information gained from the effective applicant's database will help to provide answers to questions such as: What criteria decide the applicants funding potential to a specific grade school? Which student groups typically get full MS fund? What core criteria are required to attain funding in graduate studies after choosing the correct degree? Data mining methods are very useful to uncover hidden knowledge of this kind from both the basic and dynamic data types [3].

Among the South Asian countries, India holds a comparatively impressive employment record. Many Indian students choose to enhance the chances of employment via opting for graduate studies.

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The research study's main objective is to develop a recommendation system for graduate admission seekers that aims at exploring past data of already enrolled students in graduate programs and using the relevant information to assist the admission seekers in selecting the deemed fit university for them on the basis of their academic record, academic standing and standardized scores.

II. RECOMMENDATION SYSTEM IN EDUCATION

A recommendation system refers to a technique that can forecast a user's potential choice for a collection of products, and suggests the top items. Recommendation systems are commonly used in several fields to recommend appropriate products for its users for their performance. Recommendation programs are usually used to recommend videos, music, news articles and other content on the basis of historical data and specifications of consumers [11]. Recommendation system can be used in various sector of education. Recommendations systems will help the education sector since the choice of subjects, programs, and courses will be dilemmatic for students.

The key reason we need a recommendation system in education is because of the proliferation of the Internet, students have too many opportunities to use from. Recommendation systems aim to predict the needs of students and recommend goods of the Universities that are likely to be of interest to them.

A. Need of Recommendation System in Education

Recommendation system helps in reducing information overload by estimating relevance of the product. Usually reviews speed up results to allow users to easily procure resources that interest them. The user is beginning to feel known and understood, which increases the chances of user purchasing additional products or increase in chances of content consumption. The business achieves competitive advantage by understanding what a user wants, and the threat of losing a customer to a rival reduces. Providing the added value is important to consumers by integrating feedback into programs and goods.

III. RELATED WORK

There have been various studies concerning the method of entry, but very few of them utilize Machine Learning domain for assisting the process of making decisions on university admissions. A need has been established to produce a recommendation system that caters to helping student's select graduate school best fitting their academic and career profile.

Data mining system have been successfully tried and tested for recommendation systems. Popular pre-processing approaches such as sampling, classification algorithm, dimensionality reduction, Bayesian networks as well as k-means clustering algorithm have been scrutinized and a survey of their use in Recommendation System has been performed successfully [2]. Such styles of systems as mutual filtering dependent on k-nearest neighboring ones are very powerful on the network. For this particular reason, a groundbreaking analysis of various recommendation generation algorithms based on items was performed on the basis of item-item similarities computation and different strategies for utilizing them to extract recommendation outperformed user-based algorithms [4]. There is a significant study which demonstrates the deep-rooted concepts of collective filtering, i.e assessing things by taking other people's opinion into account [7]. As well as the implementation and assessment of interactive filtering algorithms, the analysis highlights basic implications of flexible web users. Once again [15], useful research has been analyzed explaining the use of a content-based model to optimize existing performed demonstrating the various kinds of methods utilizing collaborative filtering and assessing recommendation mechanisms through prediction accuracy, offline evaluation structure, datasets, accuracy over time, ranking accuracy, online evaluations, decision support metrics etc. Along with these, suggestion framework for technology-enhanced learning has been implemented effectively [12]. Some recent work on Referral Systems in education sector inspires to carry out research on recommendation system for graduate schools that will of great help to students wishing to obtain admission in reputed institutions around the world [23].

IV. RECOMMENDATION PROCESS PHASES

A. Information Collection Phase

It gathers specific user information to create a user profile or model for predictive activities, including the feature of the system, attitudes, or nature of the user's access service. The suggestion system cannot work properly unless the user profile is designed well and good. The program needs to know the customer as much as possible, to give fair advice right from the start.

Recommendation system relies on different data types including most useful high-quality explicit feedback, which involves specific input from consumers on their value in the item, or tactic feedback by implicitly calculating and judging the user preferences from analyzing the behavior of user. Feedback of hybrid nature can also be received by incorporating both explicit and implicit feedback. The profile of a user on E-learning platform is a list of personal belonging to that particular individual. This information comprises of executive competencies, mental competencies, behavioral patterns, motivation, interests and machine engagement. The profile of the user is usually used to collect the details needed to construct a user model. Hence, it represents a model of the user that is easy. The performance of any recommendation system is majorly dependent upon its skills to represent the user's current interest. Reliable models are important to get accurate, relevant and informative feedback from any predictive techniques.

- **Explicit Feedback:**

The program usually asks the consumer to provide feedback for objects through the framework interface in order to build and develop his layout. The consistency of the feedback depends on the amount of reviewers that the customer receives. The only shortcomings of this approach are that it needs users to try, and sufficient information is not always provided by the user. The argument being based on the premises that clear input needs more initiative from the consumer, yet it is understood as offering data that is more reliable, as it does not entail collecting expectations from behavior. It also ensures clarity in the phases of recommendation resulting in a higher consistency and confidence in the recommendation.

- **Implicit Feedback:**

The system calculates and estimates the user preferences automatically by tracking the user's various actions including purchase history, browsing history and the time spent on a particular web pages, user-followed links, funneled links, email information and clicks. Implicit user decreases the pressure on consumers by inferring expectations of a user with the program from their actions. However, the system does not require user initiative, which renders it less effective. A point that was argued stated that implicit preferential data might actually be of objective in nature, since there is no bias resulting from the responses of the user in a socially desirable manner, and the issues of self-image or maintaining an image are absent.

- **Hybrid Feedback:**

In a hybrid system, the benefits of both implicit and explicit input can be balanced to mitigate their drawbacks to achieve the best output level, which can be accomplished by using implied data as a clear rating test or by encouraging users to give specific input only when they choose to show their express interest.

B. Learning Phase

The phase involves applying a learning algorithm to filter and exploit the features of the user that were collected from the feedback during the phase of information gathering.

C. Recommendation Phase or Prediction Phase

This suggests or forecasts the sort of products that the customer would choose. This can be achieved either simply on the basis of the data collected during the process of information in collection, which may be focused on experience or pattern, or through the user's perceived device activities. The recommendation phase is highlighted by Fig 1.

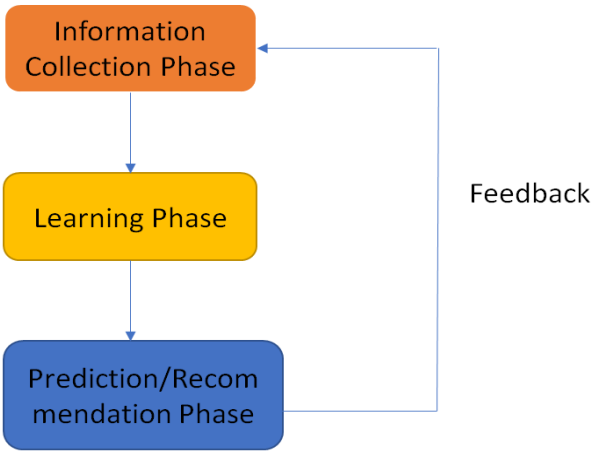

Fig. 1. Recommendation Process Phases

V. TYPES OF RECOMMENDATION SYSTEM

A. Content Based Filtering

Content based methodology is a domain dependent method, such that the area of emphasis is on evaluating object attributes to produce predictions. The most effective screening method is when records including web pages, journals, and news have to be recommended. In content-based filtering methods, decisions are created using user profiles and attributes derived from the nature of objects reviewed by the user in the past. The customer is offered items that are mostly connected to the favorably reviewed things.

To create useful suggestions, Content based Filtering use different employ different types of models to pick up similarities between documents. Vector Space Framework can be utilized such as Term Frequency Inverse Document Frequency (TF/IDF) or Probabilistic Models including Naive Bayes Classifier, Decision Trees or Neural Networks to framework the relationship within a corpus of various documents. Some techniques generated recommendations by understanding the model underneath using statistical analysis or techniques in machine learning. Content-based filtering methodology doesn't require other user's profile as they have no effect on suggestion. However, if some improvement is reported in user profile, the CBF methodology retains the ability to modify the suggestions in a short span of time. The major drawback of the approach is the requirement to have a thorough knowledge of the products and its feature.

1. Advantages and Disadvantages of Content-Based Filtering Method:

Content Based filtering strategies manage to solve CF problems. A potential exists for suggesting new items inspite of consumers not disclosing the scores. Hence, even if the database is void of user preferences, it does not impact the quality of the suggestions. It also comprises of the ability to adjust the suggestions in a short duration of time if the consumer's expectations shift. This particular use case will handle cases when the same object is not shared by different users, but only for items that are similar on the basis of their intrinsic characteristics. Without sharing their profile, users can get recommendations which ensures in maintaining privacy. CBF methodology also provides users with the descriptions on how suggestions are being produced.

Nevertheless, as discussed in the literature, the methods suffer from a variety of problems. Content-based filtering techniques rely on metadata of the objects. That is to say, they need a detailed overview of the products and a carefully articulated user profiles before users can be provided with suggestions. This particular system is called the Review of limited content. Therefore, CBF's effectiveness relies on the quality of concise data. Additional grave problem with the CBF approach is material being over specialized. Users are restricted to providing suggestions which stand similar to those identified in the user profile.

2. Example of Content Based Filtering:

LIBRA is a book review program based on content that uses information obtained from the Internet about the novel. To acquire a user profile, it applies a, Naive Bayes classifier on the knowledge collected from the site to generate a rated and documented list articulating titles based on training examples provided by a specific individual user. The system can explain an y possible recommendation made to users via listing down the features contributing to the ratings that are highest and thus allowing users to have complete confidence in the system's recommendation made to the users.

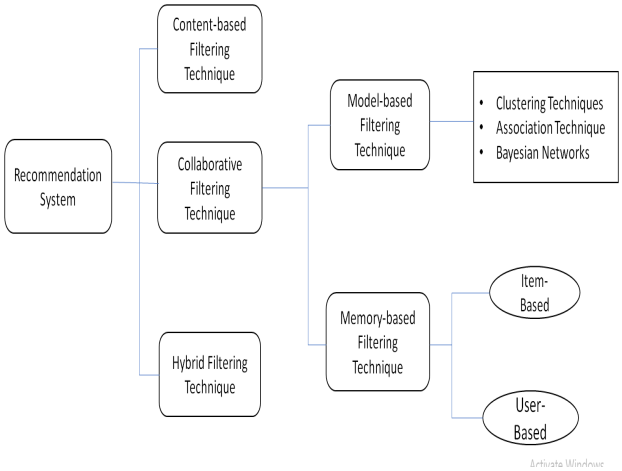

Fig. 2. Types of Recommendation System

B. Collaborative Filtering

Collaborative Filtering is a domain-independent classification strategy for information on the metadata involving movies or music, cannot readily and accurately classify. The Collaborative Filtering strategy works by creating a matrix of user-item (database) of user preferences for objects. Subsequently, it pairs users sharing interest and make recommendations by comparing correlations in their profiles. Those users create a community named party.

A user receives reviews for the things that he/she has not reviewed before-hand but that people in his/her area have already scored favorably. Recommendations made by CF can be classified as descriptive or explanatory. Prediction is essentially a numeric value, R_{ij}, which expresses the user i's predicted score of items denoted by j while recommendation denotes a list of top N having a high probability to be liked by the user, as show in Fig 2. The interactive filtering methods are broken down into: memory-based and model-based.

- ***Memory Based Collaborative Filtering:*** A relevant role is played by items that have been rated by the user already, in pursuit of a neighbor that shares his/her appreciation. Once a user's neighbor is located, numerous algorithms can be utilized to blend neighbor's expectations to create recommendations.
- ***Model Based Collaborative Filtering:*** Each method uses previous scores to use a template to enhance the performance of the Method of Collaborative Filtering. Machine Learning or techniques of data mining can be used to build the model. Such techniques will easily suggest a range of products for using pre-computed models and have shown effects of recommendations close to neighborhood-based recommendation techniques.

1. Pros and Cons of Collaborative Filtering Techniques:

Collaborative filtering holds advantage over CBF in particular that it can work in environments where not much information is available correlated with objects and where material is hard to interpret for a particular computer system including views and ideals. CF methodology also holds potential to provide accurate and precise suggestions, meaning that it can suggest things that are deemed to be important for the consumer even in absence of user's profile information. The question of data sparsity is one of issues in existence because of lack of sufficient knowledge, triggered when only a few of the total number of database accessible items are classified by the users.

2. Example of Collaborative Filtering:

Ringo is an example of user-based CF system that generates music album and artists recommendations. In Ringo, when a user is entered into the system, the user is given a list of 125 artists to be rated on the basis of their desire to listen to them. The list comprises of two separate sections. The first sections is made up of most commonly rated musicians, and this allows the participating participants the ability to rank artists that others have scored similarly, so there is a degree of overlap between the profiles of different users. The second section is created by selecting random items from the matrix of user-items, so that at any stage in the initial ranking processes all the artists and albums are finally scored.

C. Hybrid Filtering:

Hybrid filtering methodology incorporates multiple recommendation approaches to boost device performance in order to avoid such drawbacks and issues with mere recommendation systems. The theory backing the hybrid approaches is that a mixture of different algorithms has the potential to provide more reliable and efficient in comparison to a single algorithm, since the drawbacks of a one particular algorithm can be overcome by another. Use several suggestion strategies, in a blended model may eliminate the shortcomings of a particular technique. The integration methods can be achieved in one of the following ways: independent application of algorithms, integrating the effect, using a particular content-based filtering in collaborative method, using a particular collaborative filtering in content-based approach, providing a single recommendation system that encapsulates all the solutions in one.

VI. PROPOSED SYSTEM ARCHITECTURE

Most students who want to pursue higher studies apply their academic profile to different universities and standardized test scores such as GRE, IELTS, TOEFL and SAT.

Institutions are comprised of applicants who are qualified candidates on the grounds of an uniform academic profile. But the most important and exhausting phase in submitting to graduate studies is in that entire cycle of university searches. Some of them excel and are admitted in their preferred courses, but some do not participate because of the academic level of their schools. This problem of not getting admission because of applications, even though students have good academic profile can be resolved by building University recommendation model.

The proposed rating framework for university graduates suggests that universities are appealing to candidates. Student's data as well as University Data Collection is the basic step for building the University recommendation model. A set of features selection will be based on the collected information about graduate universities that applicants used to select universities in the past. Based on this set of data, different models will be trained and a list of 10 best universities will be recommended to increase a student's likelihood of being accepted from that list of universities. (See Figure 3 for the proposed recommendation system architecture.)

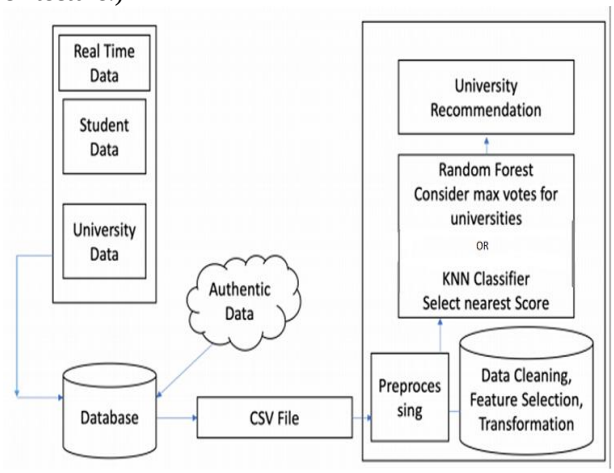

Fig. 3. Proposed System Architecture

In this research, we have proposed a graduate university recommendation system which will apply a Support Vector Machine to classify a graduate university that is likely appealing to an applicant and the K Nearest Neighbor algorithm to generate graduate university with similar requirements and qualification.

VII. RESULT

The best university is recommended to the students as per their requirement. This is an intelligent recommendation system which helps student to check his eligibility for a University based on University admission criteria. It also includes many parameters like GRE, TOFEL score, University rank, budget, weather, etc. for recommending right university. The accuracy of recommendation system is 69%.

VIII. CONCLUSION

A considerable number of students are presented with the opportunity to pursue higher education after the completion of their undergraduate studies in countries different than their home countries. The records of these students that have successfully gained admission can prove to be constructive and worthwhile for other students hoping to gain admission and help them in their decision making. Data Mining and Machine Learning are the paradigm that can explore and provide exemplary results. Hence the past records of successful graduate applicants hold utmost importance in selecting appropriate higher education institute for graduate applicants wishing to pursue higher studies. Conclusive of this research, we have proposed a graduate university recommendation system which will apply SVM to classify a graduate university that is likely appealing to an applicant and the KNN algorithm to generate university with similar requirements and qualification.

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