

A Survey on Applications of Recommendation System

Navya K.

Dept. of Information Science of Engineering
Sai Vidya Institute of Technology
Bangalore. India

Roopashree G

Dept. of Information Science of Engineering
Sai Vidya Institute of Technology
Bangalore. India

Asst Prof. Deepak Raj.S

Dept. of Information Science of Engineering
Sai Vidya Institute of Technology
Bangalore. India

Abstract—Recommendation system is a successful application area in various fields. This paper is concerned with its application in four main fields. One of the main problems faced by users in various fields is "decision making" Hence recommendation system acts as a gateway for users to be suggested as to what decision would be right and predicts the future post decision. This paper gives the overview of its application in four areas along with the data mining techniques used together with the algorithms.

I. INTRODUCTION

The main idea behind recommender system is to get meaningful recommendations and use this recommendation to help users in finding the products, objects or the things which they are really interested in. The recommendation systems are developed based on various things like which domain the recommender system is related to, what kind of data recommender system will recommend, and particular characteristics of the data or attributes of data. Recommendation systems are built based on the results of analysis of interactions of users and products. Recommendations systems mainly depend on data analysis, which is the most basic and important thing used in recommending the users. Web applications are used to achieve the same.

The 3 main divisions of recommendation systems are:

1) *Content based recommendation system*: It is in one of common recommendation system that is used. In this recommendation system the recommendation is done based on content of the product, attributes of the product, description of the product etc. In content based recommendation system attributes of the product describe them. In this system an analysis is done on the likes and dislikes of the user, the result of this analysis is used for recommendation. [9]The key activities involved in this recommendation system are Information retrieval and Information filtering. Information retrieval is a method by which relevant information is obtained with the help of indexing and metadata. Information filtering is a method in which all unwanted, irrelevant and duplicated data are removed to improve the efficiency of the process. The various algorithms that are used are cluster analysis

algorithms, decision tree algorithms, Bayesian classifiers, artificial neural networks.

2) *Collabrative based recommendation systems*: In collabrative based recommendation system the recommendations are concluded by taking into consideration the behaviours of users, preferences of the user. The system can recommend complex items also accurately without giving much importance to the attributes and content of the item. In some cases this recommendation system has proved well when compared with content based recommendation system.[6] The key techniques involved in this are implicit data collection and explicit data collection. Implicit data collection includes analyzing user's likes and dislikes towards the object, analyzing how many times a user would have searched for a particular object, observing his/her interest in the object and to what extent the interest is. Explicit data collection includes querying the user about the object and asking them to rate the object, making a note of the objects he has already taken etc.[7]The various algorithm used in here are k-nearest neighbour, correlation algorithms, factorization algorithms and approximation algorithms.

3) *Hybrid recommendation systems*: This system is combination of content based recommendation system and collabrative based recommendation system. In this recommendation system the recommendation are done based on the results of comparisons achieved by constantly monitoring searching and watching habits of same kind of users. In some cases it proves more efficient than content based recommendation systems and collabrative based recommendation systems. This system involves Demographic recommender and Knowledge based recommender. Demographic recommender uses demographic niches and various ratings of users to recommend an object or product. Knowledge based recommender recommends the object based on the inferences of users preferences, likes and dislikes. The hybridization techniques used in this system are:

a) *Weighted*: The score of different recommendation components are combined numerically.

- b) *Switching*: The system chooses among recommendation components and applies the selected one.
- c) *Mixed*: Recommendations from different recommenders are presented together.
- d) *Feature Combination*: Features derived from different knowledge sources are combined together and given to a single recommendation algorithm.
- e) *Feature Augmentation*: One recommendation technique is used to compute a feature or set of features, which is then part of the input to the next technique.
- f) *Cascade*: Recommenders are given strict priority, with the lower priority ones breaking ties in the scoring of the higher ones.
- g) *Meta-level*: One recommendation technique is applied and produces some sort of model, which is then the input used by the next technique

II. VARIOUS RECOMMENDATION SYSTEMS

In this part of the paper we list the popular and efficient recommendation system that are used in daily life for the fulfillment of various needs of people.

A. TRAVEL AND TOURISM RECOMMENDATION SYSTEM

Touring and sightseeing forms one of the main fields of business to consumer e-commerce. This industry yields for about 50% of the total production of B2C. Research says that due to the information provided through the internet it makes travellers easy to choose their journey. Problem identified is that collaborative filtering technique cannot be used as there cannot be frequent personal travelling activities. As there is no discrete travel activities at a personal level it's complicated to build user profiles at personalized level. Comment or review based recommendation has already been established successfully in travel sites. Another important problem concerned with this is the recommendation of bunch of people together cannot be considered as it will be the generalized decision, hence it's necessary to build a personalized level travel settings.[1]

Mobile recommender system plays an important role in tourism and travelling domain. It can be called as a mobile guide for respective travellers based on their interest as the main feature it has is the "points of interest (POI)" with an interactive map. But a minor drawback of this is that it is used only at small scale so efficient use of this application is not always possible. And it should possess all the features such as global positioning system but due to wide range of smart phone usage it is easily available.

B. EDUCATION RECOMMENDATION SYSTEM

Main difficulty faced by a university student is making a right decision concerned with the academic course. Recommendation system builds a model to support every student on which course to enroll on based on their academic past patterns as well as students who chose a particular course

and possess same academic history. The enrollment is done online through web system. So collaborative recommendation approach is used based on the assumption that students with same history of academics would prefer to choose the same course in particular.[2] Data included is number of courses which could be chosen, and average grades of students previously chosen and an algorithm C4.5 is used which displays a set of rules for a student such as predicting if the student will be successful post choosing the course. Evaluation of these rules using the above algorithm has shown 80% correct results in predicting the future of the student post choosing a particular course. To achieve proper results in an organized way data is arranged in a table where each row includes student and a course. If a student has chosen n courses then the data of this student includes n no. of records. Initially recommender system uses these data to come up with rules and these rules are obtained using pattern discovery module. So this approach tells that using data mining techniques it is possible to develop a model to represent the behaviour of students and predicting their career probabilities for a proper vision.

C. BOOK RECOMMENDATION SYSTEM

Book recommendation system a common scenario which we can see consists of set users and books. Books are rated by various who have read it previously and also these users give review about the book. These reviews can help to predict what genre people may like the book. The opinion whether the book is good or bad also matters a lot. A machine learning techniques like automated machine learning techniques is used for building opinions. There are various sites like Amazon, Goodreads, Google books, Flipkart etc. provide ratings and reviews on various books. Comments given by various readers can also be used to depict the polarity of a book. In book recommendation system various opinion mining techniques are used. There are various approaches used in book recommendation system like collaborative filtering, content based filtering etc. The process consists of data collection in which information regarding book like abstract of the book, review and comment are noted, then based on this information complete analysis is done and then is evaluated. In book recommendation system the books are recommended based on their interest also, the books can be fiction, non-fiction etc. After recommending books the book recommendation system also take feedback from users or readers to improvise the recommendation system.[3] The well-known book recommendation system LIBRA (Learning Intelligent Book Recommending Agent) uses content based filtering with text categorization.

D. MOVIE RECOMMENDATION SYSTEM

In movie recommendation system a common scenario which we can see consists set of users and set of movies. A set of users at initial stage would have rated for example on the rate of 1 to 5 for some movies which they have already seen. These ratings which are given by the set of users is taken as input to movie recommendation system. The movie recommendation system uses these ratings given by user to predict the ratings of other movies that each user would give. In some cases user's ratings will not be available in such cases the movie recommendation system will not predict the ratings instead will predict the probability that user would choose to watch a movie or the likelihood of the user. Movie recommendation systems like MovieGEN recommends the movies to user based on their personal information and asking them to answer some movie related questions. There are online movie recommendation

systems like MovieLens in which user has to login to their website, the user is supposed to rate the movie which he has already seen and these are used to recommend them the movies. This system also uses collaborative filtering and are used to create personalized recommendations. K means algorithm can be used in cluster analysis tool of movie recommendation system. An efficient machine learning tool called Support vector machine is used in this to establish correlation analysis between the information provided by the user and preference towards movies and this information is used to recommend movies from a dataset. Ranking of movies based on user's preference is done. The process involved goes on like this 1. Generate questions, 2. Change rank based on answer, 3. Recluster and repeat. Each movie can be seen as a vector of attributes; Name, Genre, Starring, Director, Year, Age Group, Gender, Rank. More meaningful results can be obtained if data set is large [4].

III. CONCLUSION

Recommendation system has successful applications in various fields. Therefore it can be concluded that it has many roots such as retrieving the information, consumer choice and service as well as in management. Two main approaches used are collaborative filtering and content based filtering. This paper provides an overview of four major applications of recommender systems that is travel and tourism which in turn uses mobile recommender system, Education recommender system which supports the decision making capabilities of every student at university level, book recommendation system which suggests the users based on the reviews given by previous users, Movie recommendation system deals with users and group of movies at personalized level of interest, this also makes use of K-means clustering algorithm

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