On Web Personalized e-Learning Recommendation System

Fayaz Dafedar
Assistant Professor, CSE , SNIST

M.Kiran Kumar
Assistant Professor, CSE , SNIST

Dr Kamalesh V.N
Professor & Dean, CSE , SNIST

Abstract:*-e-learning framework provides learners a numerous amount of content with its ease of access. Since with the availability of enormous content, it is difficult for the learner to opt the most needful information from the available content. Recommendation system are the engines that filter the data depending on various parameters and produces most appropriate information as the result. In the context of e-learning recommendation system, recommender system is a engine that attempts to" intelligently" recommend activities to a learner based on the actions of previous learners. This recommendation could be an on-line activity such as doing an exercise, reading posted messages on a conferencing system, or running an on-line simulation, or could be simply a web resource. Most of the recommendation systems have been implemented in e-commerce platform to improve the sales of goods to improve the revenue generation for to compete in the market, but haven't been implemented in e-learning. This paper proposes a recommender system that uses web mining techniques to recommend on-line learning activities or shortcuts in a course web site based on learners' access history to improve course material navigation as well as assist the online learning process. Which helps the learner to learn very quickly and easily as the recommendation engine is assisting continuously throughout the learning process.*

Keywords*-E-learning, Recommender Systems, Collaborative Filtering, Content-based filtering.*

1. INTRODUCTION

E-learning is the most revolutionary approach that provide education throughout the life time, when comparing with the outmoded face-to-face elegance teaching and learning. In the modern days as the world is moving into digital world most of the people have benefited by using numerous e-learning programs. However, high diversity of the learners on the Internet poses new challenges to the traditional "one-size-fit-all" learning model, where only one set of learning resource is supplied to all online learners. In reality, the learners could have various expertise levels as the interests of various learners may vary according to their interests. In the light of the above learners should be treated in different ways relating to their expertise, and they cannot be treated in a uniform way. Hence it is most advisable to facilitate a personalized recommendation system which can automatically adapt to the interests and levels of learners.

Recommender Systems are employed in e-commerce and many more websites to predict the user behaviour based on his previous preferences[1][2]. The major duties of recommendation systems are analysing or understanding user data and take out advantageous information in order to make future predictions. A recommender system is an information filtering software which assists users to identify the most interesting and relevant products among the available number of products. Recommender systems might be developed based on the many factors such as collaborative filtering (by taking user ratings on the content or item or product), content-based filtering (by making use of keywords), and hybrid filtering (by both collaborative and content-based filtering).[1] As shown in the below figure1.1

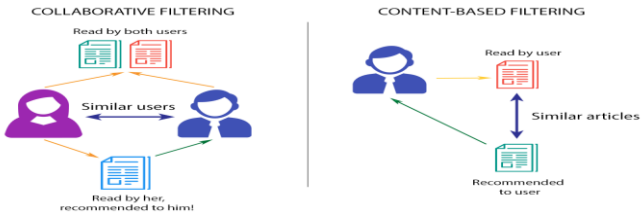

Fig-1.1. Recommendation systems based on Collaborative filtering and Content based filtering

The following figure is a general model of recommendation which summarizes the recommendation process by identifying the communication among its components.

Fig.1.2. Recommendation system

The one who needs any sort of suggestions or recommendations is taken as the user of the system. The user may request for a recommendation, or the recommender system may generate recommendations without the user's demand.

The user of the system may in touch with preference provider and represent information about their interests or preferences. Otherwise, the recommender of the system requests interests and preferences from the user explicitly in order to generate recommendations. Depending upon the identified preferences of the seeker or user and those of other people, the recommendation system recommends items to the seeker probably will like. The recommendation produced may be useful for the users to select items from the set of available alternatives or to communicate with like-minded other users as the recommender also identifies people with similar interests[1][7].

1.1 Recommendation Systems for E-Learning

A "recommendation system for an e-learning framework" is a recommendation engine that generates suggestions of a learning activity to a learner using the activities which he has already done previously and their successes, and depending on the activities the likeness of the learners could be determined using user profiles, or would be depending on common previous access patterns done by other "similar" learners. [9][1]

The similarity of the learners could be determined using user profiles, or could be based on common previous access patterns. Hypothetically, the design of such an agent consists of two parts : first is the module which reads the user previous history and access patterns called a "learning" module and infers an individual or common access pattern; and the next is the "recommending" module which uses the "learned model" at specified times to recommend activities. This can be implemented in many ways, such as data clustering, association rule mining, or collaborative filtering[1] [11] etc.

Recommendation systems have been widely used in many areas such as online e-commerce websites to generate product or item recommendation so that the similar products will be recommended to the user by which the sales of related products may increase hence the revenue if going to be increased, also these are used in many areas such as movie databases etc., However, in the purview of our knowledge there is such no distance educating system up to the date that offers such automated facilities to automatically recommend learning activities or resources[12][13][16]. However, In the field of electronic commerce, considering the lucrative prospects into account, a significant research struggle has been done to develop extravagant approaches to take lead of purchasers' accesses and purchase behaviours with the intention of boost the purchasing experience and customer satisfaction by user profiling and smart recommendations, and consequently upsurge the sales to get higher profit. By using the suggestions sales can be boosted by exposing items or services a consumer is likely to be interested in. Amazon.com is one of the leading e-commerce platform that recommends products to purchase related to a recent purchase based on preference information and similar customer purchases. The methods applied here are, however, so simple and not always accurate or even effective. Mostly, the recommendation engine program equates the set of products bought by the current buyer with the set of products bought by other similar buyers, selects the customers with the higher product overlay with the current customer's product set, at the last it élites nearly products not yet purchased by the current buyer but present in the purchased list of buyers with high overlap and boons them as a recommendation list to the current buyer. Most of the techniques in recommendation system uses "ratings of products" which are given by users and picks products for recommendation from buyers those who rate items in the same way or level as the current buyer. The same methodology also applied in information retrieval for retrieving text documents that are similar is called collaborative filtering [11]. moviefinder.com is a popular website that provides movies and music and uses recommender system to generate suggestions using collaborative filtering by forecasting a person's preferences as a linear weighted combination of other people's preferences. As the ratings for course material will not be available with us, collaborative filtering cannot be applicable for devising an accurate recommendation engine for e-learning activities. Furthermore, we are attentive in endorsing helpful learning actions to improve on-line learning, as well as recommending shortcuts or jumps to some resources to support users in order to easier the navigation process through the course materials. Which guides the user to understand about his expertise level and from which he will be guided accordingly in order to improve his expertise level up to the maximum.[3][6][7]

1.1.1 What Makes Recommendations Different in E-learning from Other Domains

An e-learning recommender system includes:

- Items liked by students probably won't be pedagogically appropriate for them. For instance, a student without basic foundation on the systems of web mining may just be keen on knowing the cutting edge of web mining procedures in web based business. At that point, it ought to be prescribed that he/she read some survey papers. For instance, a publication article by two of the main researches in this area [5], in spite of the fact that there are numerous superb specialized papers identified with his/her advantage. Then again, for the student originating from industry with some earlier information who needs to know how web mining can be used to take care of online business issues, ought to be suggested, in light of the fact that the paper is the KDD-Cup 20001 coordinators' give an account of how web mining can bolster business basic leadership for a genuine web based business merchant, and calls attention to challenges, and in addition exercises gained from the opposition, which can profit the two analysts and industry experts. By differentiate in different spaces, proposals are made construct absolutely with respect to clients' interests.

- Customization ought not exclusively be settled on about the decision of learning things, yet in addition about their conveyance. For instance, a few educators will prescribe students to peruse an intriguing magazine article, for example, a related article in Communications of ACM, before a specialized paper, since they trust it will enable students to

comprehend the specialized paper and make them less scared. In any case, this isn't the situation in internet business suggestions, where webpage directors want to leave the rundown of prescribed things unordered to abstain from leaving a feeling that a particular proposal is the best decision.

1.1.2 Recommender System Approaches

Recommender system can be built with many approaches. Below are some of them:

- Random prediction algorithm is a method that haphazardly picks items from the arrangement of accessible things and prescribes them to the client. Since the thing's selection is done arbitrarily, the exactness of the calculation depends on luckiness; the more prominent the quantity of things is the possibility of good determination brings down. Irregular forecast has an incredible likelihood of disappointment. Along these lines, it has never been considered important by any scientist or merchant and just fills in as reference point1, contrasting the nature of the outcomes acquired by the use of a more advanced algorithm [15].

- Frequent sequences can help to fabricate recommender frameworks. For instance, if a client as often as possible rates things we can utilize the successive example or frequent patterns to suggest different things to him. The main issue is that this strategy may be effective after the client makes least buys.

- Collaborative filtering algorithms (CF) are algorithms that require the recommendation seekers to express their inclinations by rating things. In this calculation, the jobs of user (a client) and inclination supplier are combined; the more clients rate things (or classes), the more precise the suggestion moves toward becoming. In most CF approaches, there is a cluster of clients U = u1,u2,,,, um and a cluster of items I = i1,i2,,,,,in. Every client ui has a cluter of items Iui on which he has communicated his feeling [16].

- Content based algorithms are algorithms that endeavour to recommend things that are like things the client preferred previously. They regard the proposal's concern as a scan for related items. Data about everything is put away and utilized for the proposals. Things chose for suggestion are things that substance associates the most with the client's inclinations [17]. For instance, at whatever point a client appraised a thing, the calculation builds a hunt question to and other well-known things by a similar creator, craftsman, or chief, or with comparative catchphrases or subjects [14]. Content based calculations examine thing depictions to recognize things that are quite compelling to the client.

2. LITERATURE SURVEY

Recommender framework in an e-learning context is a recommendation generator that attempts to "wisely" recommend activities to a student in view of the activities of past students. This suggestion could be an on-line action, for example, completing an activity, perusing posted messages on a conferencing framework, or running an on-line reenactment, or could be basically a web asset. These suggestion frameworks have been attempted in web-based business to lure buying of products, yet haven't been attempted in e-learning. This paper proposes the utilization of web mining systems to manufacture such a specialist, to the point that could prescribe on-line learning exercises or easy routes in a course site in light of students' entrance history to enhance course material route and additionally help the web-based learning process. These systems are viewed as coordinated web mining rather than disconnected web mining utilized by master clients to find on-line get to designs. [1]

The focus in eLearning has been moved from the supporting tools towards the learning individual. It has turned out that the learning achievement can altogether be enhanced if the learning content is particularly adjusted to individual students' inclinations, learning advancement and necessities. Personalization has advanced as a promising idea to mull over individual needs. Because of the dynamic idea of eLearning, this paper centers around static as well as especially on powerful parts of personalization. A customized e-learning framework which can consequently adjust to the premiums and levels of students is the framework which is planned in view of the IEEE Learning Technology Systems Architecture (IEEE LTSA) to accomplish high versatility and reusability. An input extractor with combination ability is proposed to join various criticism measures to gather client inclinations. Client profile, which stores client inclinations and levels of ability, is gathered by client profiler to convey customized data utilizing the community oriented separating calculation. [3]

The majority of current e-learning frameworks are closed learning platforms where courses and learning materials are settled and the main powerful perspective is the association of the material that can be adjusted to permit a generally individualized learning condition. In this paper, we propose a developing electronic learning framework which can adjust not exclusively to its clients, yet in addition to the open Web. All the more particularly, the oddity as for the framework lies in its capacity to discover important substance on the web, and its capacity to customize and adjust this substance in view of the framework's perception of its students and the collected appraisals given by the students. Henceforth, in spite of the fact that students don't have coordinate connection with the open Web, the framework can recover significant data identified with them and their arranged learning qualities. [4]

Recommendation process in distributed information systems extracts similarities and differences between recommendations in stores and the recommendations applied to an e-learning environment. It also explains the phenomena of self-organization and cooperative emergence in complex systems coupled with bio-inspired algorithms to improve knowledge discovery and association rules. Finally, the present recommendation is applied to e-learning by proposing recommendation by emergence in Multi-Agent System architecture [5].

Recommended learning resources are computed based on the current learner’s recent navigation history, as well as exploiting similarities and dissimilarities among learners’ preferences and educational content. The proposed framework

for building automatic recommendations in e-learning platforms is composed of two modules: an off-line module which pre-processes data to build learner and content models, and an online module which uses these models on-the-fly to recognize the students' needs and goals, and predict a recommendation list. Recommended learning objects are obtained by using a range of recommendation strategies based mainly on content based filtering and collaborative filtering approaches, each applied separately or in combination. [6]

Suggested learning resources are figured in view of the present student's ongoing route history, and in addition abusing likenesses and dissimilarities among students' inclinations and instructive substance. The proposed structure for building programmed suggestions in e-learning stages is made out of two modules: a disconnected module which pre-forms information to manufacture student and substance models, and an online module which utilizes these models on-the-travel to perceive the understudies' needs and objectives, and anticipate a suggestion list. Prescribed learning objects are gotten by utilizing a scope of suggestion systems construct basically with respect to content based sifting and collective separating approaches, each connected independently or in blend. [6]

When fabricating a knowledge-based recommender along the eLearning life cycle, the accompanying issues must be viewed as: a) the UI outline of the devices required, b) the procedure to configuration/produce the suggestions, c) the procedure to choose the proper proposals, and d) the administration of the clients' collaborations. We are characterizing a client focused assessment approach that adapts to those issues and drives the recommender building process in three back to back advances: 1) elicitation of instructively stable proposals approved by clients with a collective survey, 2) securing and approval of the client highlights to choose the proper suggestions for the present setting, and 3) investigation of the proposals gave and assessment of their effect on the us. [8]

Recommender frameworks have been a helpful tool to recommend things in numerous online frameworks, including e-learning. Be that as it may, very little research has been done to gauge the learning results of the students when they utilize e-learning with recommender framework. Rather, a large portion of the scientists were concentrating on the exactness of the recommender framework in foreseeing the proposal as opposed to the information gain by the students. This exploration intends to think about the learning results of the students when they utilize a few sorts of e-learning recommender frameworks. In view of the correlation made, we propose another e-learning recommender framework system that utilizations content-based sifting and great students' evaluations to prescribe learning materials, and thusly can expand the understudy's execution. The outcomes demonstrate that understudies who utilized the proposed e-learning recommender framework created an altogether better outcome in the post-test. The outcomes additionally demonstrate that the proposed e-learning recommender framework has the most noteworthy level of score gain from pre-test to post-test. [9]

3. CONCLUSION

A recommender framework is a engine that observers what a client is doing and attempts to suggest game-plans it supposes would be useful to the client. This is the thought behind a few frameworks utilized in electronic business locales to prescribe items to clients they may wish to buy in light of their past buying history and also the obtaining history of the individuals who purchased comparable products. To date, this hasn't been proposed for on-line learning conditions and no known e-learning framework uses such a product specialist to upgrade the on-line learning knowledge as portrayed in this paper.

In this paper we can conclude that a useful recommender system can be developed for the e-Learning framework that uses data mining and machine learning techniques in order to build a model that represents on-line user behaviours, and uses the developed model to recommend activities or shortcuts. These recommendations can help learners in a better manner to navigate in the on-line materials very easily and quickly by identifying related resources faster using the recommended shortcuts and support the learner to select appropriate learning activities that could advance their performance depending on the on-line behaviour of successful learners.

4. REFERENCES

[1] Fayaz Dafedar ; K. F. Bharati "A fast Collaborative filtering approach for web personalized recommender systems" International Conference on Information Communication and Embedded Systems (ICICES), 2017

[2] Zaiane, O. R.,"Building a Recommender Agent for eLearning Systems",University of Alberta, Edmonton, Alberta, Canada, 2002.

[3] Armin, U., and Kandpal, D., and Tochtermann,K., "First Steps towards Personalization Concepts in eLearning" Know-Centre Graz, 2003.

[4] Li, X., and Chang, S. K., "A Personalized E-Learning System Based on User Profile Constructed Using Information Fusion" University of Pittsburgh, USA, 2006

[5] Tang, Y. T. ; and McCalla, G.," Smart Recommendation for an Evolving E-Learning System" Dept. of Computer Science, University of Saskatchewan, 2007

[6] Gil, A. B., and García-Peñalvo, F., J., "Learner Course Recommendation in E-Learning Based on Swarm Intelligence", Department of Computer Science, Sciences Faculty University of Salamanca, Salamanca, Spain, 2008.

[7] Khribi, M. K., Jemni, M., & Nasraoui, O. (2009). Automatic Recommendations for E-Learning Personalization Based on Web Usage Mining Techniques & Information Retrieval. Educational Technology & Society, 12 (4), 30–42.

[8] Ghauth , K., I., B., and Abdullah, N., A., " Building an E-Learning Recommender System using Vector Space Model and Good Learners Average Rating" Multimedia University , and University of Malaya, 2009 Ninth IEEE International Conference on Advanced Learning Technologies.

[9] Santos, O.C., and Boticario, J.G., " Building a knowledge-based recommender for inclusive eLearning scenarios" Artificial Intelligence Department, Spain, 2009

[10] Ghauth, K., I., and Abdullah, N., A., " Measuring learner's performance in e-learning recommender systems". Multimedia University, 2010

[11] R. Agrawal, T. Imielinski, and A. Swami. Mining association rules between sets of items in large databases. In Proc. 1993 ACM-SIGMOD Int. Conf. Management of Data, pages207–216, Washington, D.C., May 1993.

[12] S. Chee, J. Han, and K. Wang. Rectree: An efficient collaborative filtering method. In 3rd Int. Conf. On Data Warehousing and Knowledge Discovery (DAWAK 2001), LNCS 2114, pages 141–151, Munich, Germany, September 2001. Springer Verlag.

[13]O. R. Za¨ýane and J. Luo. Towards evaluating learners' behaviour in a web-based distance learning environment. In Proc. of IEEE International Conference on Advanced Learning Technologies (ICALT01), pages 357–360, Madison, WI, August 2001.

[14] O. R. Za¨ýane, M. Xin, and J. Han.Discovering web access patterns and trends by applying OLAP and data mining technology on web logs. In Proc. Advances in Digital Libraries ADL'98, pages 19–29, Santa Barbara, CA, USA, April 1998

[15] Linden, G., Smith, B., and York, J. Amazon.com recommendations: Item-to-item collaborative filtering. IEEE Internet Computing 7 (2003), 76-80.

[16] Papagelis, M., and Plexousakis, D. Qualitative analysis of user-based and item-based prediction algorithms for recommendation agents. Engineering Applications of Artificial Intelligence 18, 7 (2005), 781-789.

[17] Sarwar, B., Karypis, G., Konstan, J., and Reidl,J. Itembased collaborative filtering recommendation algorithms. In WWW '01: Proceedings of the 10th international conference on World Wide Web (NewYork, NY, USA, 2001), ACM, pp. 285-295.

[18] VAN Meteren, R., and van Someren, M. Using contentbased filtering for recommendation.