

# DESIGN AND DEVELOPMENT OF A RECOMMENDER SYSTEM FOR E-LEARNING MODULES

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## ABSTRACT

Extensive literature review revealed that, different recommender systems for E-learning were developed. A preliminary version of the development was undertaken and evaluated in an experiment during an introduction psychology course in an open university. The activities were integrated in to a model which operates on a network. No curriculum structure was assigned and the users were allowed to undergo learning activities in any order they wanted. Though voluminous work was reported on establishing bench marks for learning process on a wide range basis, there are only discrete references on developing a system comprising of a web-based typical learning environment which includes many aspects of learning such as course content delivery tools, synchronous and asynchronous conferencing systems, quiz models, grade reporting systems, creation of virtual class rooms. An attempt is made in this study to design and develop a Recommender System (RS), in the form of a software agent giving recommendations based on the previous observations. The developed RS suggests the applications of web mining techniques resulting in, on-line learning activities and improving the course material navigation. The proposed RS combines a top down ontology based recommendation techniques clubbed with bottom-up techniques. Both techniques were combined in the RS, which decided, which of the techniques is more suitable for the current situation in which a learner works. Finally the present work provides for recommendation strategies for a personal RS in E-learning models for life long learners. The major contribution of the present work lies, in designing and developing a RS in the form of a software agent, incorporating web mining techniques resulting in, on-line learning activities, such as course content delivery tools, conferencing systems, creation of virtual class rooms.

**Keywords:** Recommender Systems, Web Mining, Life Long Learners, E-Learning, Curriculum Structure

## 1. INTRODUCTION

A RS in E-learning environment, is a software agent that tries to provide the learner all informations associated with the learning process. These activities can be through on line using web enabled services. Often E-learning is understood as E-training where, a given course material is delivered through pre announced websites, more or less serving as E-libraries delivery abstract from popular text books or the complete text books from preface to index. E-learning goes much beyond above service and comprises of education, information, communication, training, knowledge

management, performance management making information and knowledge available to those who need it. Those activities are mainly internet or computer based to reach the distant learners. E-learning is not a replacement for traditional classroom learning but it is an enhancer. A typical E-learning is a web based learning environment with multicourse delivery tools. When a course is delivered on line by instructors, they relay compile interactive course notes, simulations, demos, forums, chats. Often this sequence may not be optional. It is often very difficult to assess the online learning activities in a web-based system. Hence the need arises for non intrusive automatic feed back from users in order

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to better understand the learning process and to evaluate the effectiveness of the on-line course structure. From the learners point of view, the RS will be very useful if it can guide the learner intelligently recommending on-line activities which improve the efficiency of the learning process. To effectively achieve above objective the experiences of successful learners and their navigation patterns are studied for developing the RS. Hence in this study an attempt is made for developing such an automatic RS for web based learning environments that take into account the profiles of online learners, their learning history, their navigation patterns, simple data mining techniques, Learning Networks (LN).

### 1.1. Literature Review

The latest trend is focus on learner than supporting learning tools. The web based learning systems no doubt takes care of above aspects, the main draw back is that, they are closed learning environments. Costanzo and Faro (2012) reported his work on a novel method of mobile recommender system and compared its performance with conventional recommender systems. Amini *et al.* (2011) made a comparative study of various recommender systems and developed a method to identify optimal RS. Bobadilla *et al.* (2010) published his findings on collaborative filtering matrices that improve the behavior of RS. McSherry and Mironov (2009) worked on private RS and made a comparative study with existing recommender systems. Takacs (2009) made pioneering work on collaborative filtering approaches for large Ghauth and Abdullah (2009) reported their results on building E-learning RS using vector space models. Santohms and Boticario (2009) published his work on knowledge based E-learning RS for inclusive E-learning scenarios. Ghauth and Abdullah (2010) presented their results on measuring learners performance in E-learning RS.

## 2. MATERIALS AND METHODS

To start with, a brief review of the existing RS is made. The various steps namely analyzing user data, identifying user requirement are considered. The various algorithms such as random prediction algorithms, collaborative filtering algorithms, content based algorithms that are used are analysed. The various RS in use namely, collaborative or social filtering type, content based type, knowledge based type, personal logic based type are studied. All above mentioned recommender systems have their own inherent merits and demerits.

Some systems collect more rating from users and there is a risk namely some one in the system will be a better match compared to newly introduced users. A collaborative filtering RS must be initialized with a large amount of data other wise it is unlikely to be sensitive to the number of rated items that can be associated with the system.

An attempt is made in this study to propose a RS addressing above issues. The present work consists of (i) use of web mining techniques for smart E-learning modules (ii) Analysis of associated recommendation system (iii) Developing a smart RS, (iv) Analysing strategies and their benefits for E-learning and (v) proposing an algorithms that addresses above issues. The above aspects are detailed as shown below.

### 2.1. Use of web mining for Developing Smart E-Learning Modules

Access to web site is tracked by the web server using URL. A log entry is automatically made each time when a request is made to the web server. The entries are not in a format that is usable by mining applications and require to be reformatted for path completion. Data mining provides for the overall processing of Knowledge Discovery from Data (KDD). This process includes, data structuring, preprocessing, data information, data selection and conclusions. Useful patterns are obtained.

### 2.2. Analysis of Associated Recommender Systems

The usual practice is that, the RS recommends a learning task to a learner based on the tasks already performed by the learner and based on the task performed by other similar learners. To make the RS effective, data clustering, association rule mining are recommended in this study.

### 2.3. Developing a Smart RS

The web performs mining of the data collected and stored in the web and provides learners navigated and the associated activities. A cleaning and transformation phase of the mining provides for the processed data for using in data mining algorithms. The association rules are used by us for datamining algorithms.

### 2.4. Analysing Recommendation Strategies and their Benefits for E-Learning

Since most of RS are domain dependent, it is not possible to apply one RS of a particular domain to another domain. We propose an algorithm that considers above issue and provide for an RS which, to a large extent is domain independent.

## 2.5. Algorithm for the Proposed RS

- Step 0: Identifying and entering the vast data base connected with E-learning.
- Step 1: Storing data under different headings for the reach of the user at the click of mouse.
- Step 2: Listing the methodology for analyzing the contents, structure and synthesis of the stored data.
- Step 3: Retrieving the data as and when required.
- Step 4: Guiding the users in the areas of history of previous users, both on-line and off-line.
- Step 5: Summing up the process for selecting topic content, listing the available structured data, methodology of using the data.
- Step 6: Providing for possible suggestions for the best use of the RS.

A suitable programme is written and the RS is designed.

## 3. RESULTS

- Literature review revealed that, the tools required for developing RS for E-learning models are based on users and no systematic generalized tools are available
- The proposed method as reported in this study, provides for developing a generalized design of tools for effectively addressing above issues
- The proposed algorithm for the RS provides for a system based web enabled typical learning environment, which included content delivery tools, grade reporting systems

## 4. DISCUSSION

- The proposed RS is essentially a software agent giving recommendations, based on previous learners experience.
- Liberalised use of web mining techniques makes the proposed RS more effective
- The proposed RS provides for recommendation strategies for a personal RS in E-learning models for life long learners
- The proposed RS address many issues relating to existing systems through scientific data mining techniques
- The proposed RS is domain independent and can be used in different domains.
- The major contribution of the present work lies, in designing and developing a RS in the form of a

software agent, incorporating web mining techniques, resulting in, online learning activities such as course content delivery tools, conferencing systems, creating virtual class rooms.

## 5. REFERENCES

- Amini, B., R. Ibrahim and M.S. Othman, 2011. Discovering the impact of knowledge in recommender systems: A comparative study. *Int. J. Comput. Sci. Eng. Survey*, 2: 1-4. DOI: 10.5121/ijcses.2011.2301
- Bobadilla, A., F. Serradilla and J. Bernal, 2010. A new collaborative filtering metric that improves the behavior of recommender systems. *Knowl.-Based Syst.*, 23: 520-528. DOI: 10.1016/j.knosys.2010.03.009
- Costanzo, A. and A. Faro, 2012. A fuzzy mobile recommender system: JQMobile Vs FlashBuilder implementations. *Proceedings of the IEEE 3rd International Conference on Software Engineering and Service Science (ICSESS)*, Jun. 22-24, IEEE Xplore Press, Beijing, pp: 513-518. DOI: 10.1109/ICSESS.2012.6269517
- Ghauth, K.I. and N.A. Abdullah, 2010. Measuring learner's performance in e-learning recommender systems. *Aus. J. Educ. Technol.*, 26: 764-774.
- Ghauth, K.I.B. and N.A. Abdullah, 2009. Building an E-learning recommender system using vector space model and good learners average rating. *Proceedings of the 9th IEEE International Conference on Advanced Learning Technologies*, Jul. 15-17, IEEE Xplore Press, Riga, pp: 194-196. DOI: 10.1109/ICALT.2009.161
- McSherry, F. and I. Mironov, 2009. Differentially private recommender systems: Building privacy into the net. *Proceedings of the 15th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, (DM '09)*, ACM New York, NY, USA, pp: 150-161. DOI: 10.1145/1557019.1557090
- Santohms, O.C. and J.G. Boticario, 2009. Building a knowledge-based recommender for inclusive eLearning scenarios. *Proceedings of the Conference on Artificial Intelligence in Education: Building Learning Systems that Care: From Knowledge Representation to Affective Modelling, (AM '09)*, ACM Press, Amsterdam, pp: 689-691.
- Takacs, G., I. Pillaszy, B. Nemeth and D. Tikk, 2009. Scalable collaborative filtering approaches for large recommender systems. *J. Mach. Learn. Res.*, 10: 623-656.