An E-Learning based Recommendation System for Semantic Web: A Survey

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Abstract: The recommender systems are the technique of processing and evaluation of user behavioral data in order to suggest the resources according to user needs. In e-learning system, it is actually used to suggest resources and relevant contents to learners. Thus e-Learning recommender system is a technique to identify requirements of learner to provide relevant learning content. In this paper current state-of-art for the e-learning recommendation system is reviewed. In addition of that recent research work in the direction of enhancing the user's experience in online learning is also reported.

Keywords: E-learning, Semantic Web, Personalization, User Behavior, Recommendation System

I. INTRODUCTION

In recent years, the academics and their learning techniques are rapidly changed due to, the introduction and innovation of new technologies in education domain. Among them E-learning is a need of new generation education industry. To provide education, with respect to traditional face-to-face style teaching and learning. E-learning provide free to learn anytime and anywhere. Therefore more and more new learners are connecting with different e-learning programs. Be that as it may, high assorted variety of the students on the Internet presents new difficulties. In which a solitary arrangement of the learning asset isn't adequate and reasonable to all students. The students could have similar interests, behavior and may have different levels of expertise. Hence they cannot be treated in a uniform manner. Therefore it is important to provide a personalized system that can automatically adapt the interests and levels of learners [1].

E-learning systems are becoming increasingly popular in education due to the development of web-based information and new communication technologies. The rapid growth of e-learning systems has been changed due to the traditional learning behavior which presents a new situation to students, i.e. learners which greatly supports and enhances learning practices online. It's difficult for learners to find their activity according to their criteria due to numerous kind of activities [2]. Due to these types of problems, an e-learning recommendation as to develop personalized e-learning systems.

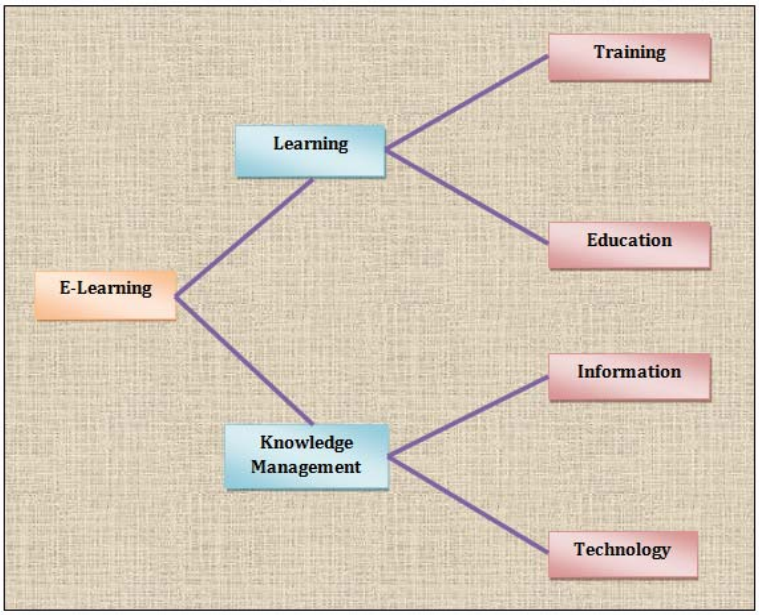

Figure 1: Unity of E-learning

In general, E-Learning is a term used to refer to a form of learning in which the instructor and student are separated by space or time, where the gap between the two is bridged through the use of online technologies. Customary e-learning frameworks are normally intended for conventional students regardless of individual prerequisites. The emergence of World Wide Web in 1991 revolutionized almost everything; the impact is almost on every aspects of life, including education resulting on the term 'e-learning'. It is important to note that e-learning intersects numerous fields to thought and practice and cannot be trivialized into simple formula. The above illustration shows that how fields of study merge as unity in e-learning [3] [4].

Hence, actualizing learning idea with regards to ordinary learning is very troublesome because of different inclinations, earlier information, and knowledge of the students. This issue can be settled in the E-learning framework setting in which every understudy can be orchestrated to get a showing system which is all the more tweaked to his/her learning style.

Why we use E-learning

These days, innovations and the quick development of the Internet have made access to data more agreeable for all sort of individuals, raising new difficulties for the train when utilizing the Internet as a medium. Outstanding amongst other precedents is the means by which to control understudies in their learning forms. Hence e-learning is part of learner daily life for ease of use for study. There are many advantage of e-learning system that learner use to this: some of are listed below [5] [6]:

Personalized Training Experience: The hardest aspect concerning up close and personal guidance is that you need to adjust your course for students originating from an assortment of foundations. With e-learning, students can progress at their very own space. Besides, you can incorporate diverse learning ways with your course, giving students a more customized involvement.

High Learning Retention – Mixed learning approaches result in a higher information degree of consistency. It likewise enables that coursework to can be revived and refreshed at whatever point required.

Scalable – E-learning empowers us to rapidly make and convey new approaches, preparing, thoughts, and ideas. Be it for amusement or formal training, e-learning is agile!

Increased Reach- The world is moving quicker than any time in recent memory. Workers need their preparation to be portable, just like they are. Thanks to mobile learning, they can access their training courses no matter where they are.

Faster Delivery- Sorting out instructional courses can be tedious and costly—particularly if your representatives are scattered around the nation or the world. With e-learning, representatives can get the preparation they require when they require it.

There are many more reason to use e-learning system because of wide variety of advantages. Here we highlighted top advantages of e-learning system.

I. BACKGROUND

As of late, human correspondence and cooperation have changed drastically. Cell phones have had an extensive influence in the changing correspondence examples of society. For a considerable length of time individuals assembled around flames or met at the junction to share data and news. Never again is there a need to physically meet to impart. Data is promptly accessible from everywhere throughout the world at the bit of a catch.

User Personalization

Personalization is more extensive than just individualization or separation in that it bears the student a level of decision about what is found out, when it is found out and how it is found out. Today, personalization is the component that happens independently inside every framework that backings some sort of clients' communications between the client and the framework. As a rule, term "Personalization" implies the way toward choosing what the most astounding estimation of an individual is if the client has an arrangement of conceivable options. These decisions can go from a modified landing page "look and feel" to item suggestions or from pennant ads to news content. The idea of "Personalization" can without much of a stretch be comprehended investigating a portion of the generally existing and utilizing computerized innovations that offer personalization and customization choices: program that wanders the Internet, email and informing frameworks, the advanced boxes that assistance to sit in front of the TV online [7] [8].

Two fundamental ways to deal with the personalization can be recognized: client profile based personalization and tenets based personalization. In the primary case, this is the way toward settling on choices dependent on put away client profile data or predefined amass enrollment. In the second case, this is the way toward settling on choices dependent on pre-characterized business runs as they apply to a division of clients.

The subject of personalization is entirely identified with the move from an educator focused viewpoint of instructing to a student-focused, competency-situated one. In as opposed to customary e-realizing which tends to regard students as a homogeneous element, customized e-learning perceives students as a heterogeneous blend of people. Radically customized e-learning offers to student's customization of an assortment of the components of the online training process:

- The learning condition—substance and its appearance to the student (like foundations, subjects, text dimensions, hues, et cetera).
- The learning content itself—sight and sound portrayals (like literary, graphical, sound, video, et cetera).
- The connection—incorporate facilitator, understudy and the learning content (e.g. mouse, console, tap/swipe; e.g. utilizing Quizzes, Online exchanges, "Gaming", Tutorials, Adaptive learning approaches).

These days it is the unavoidable interest that teachers need to reconsider e-learning courses and there is plenty of vital variables that decide it, similar to age, social foundation, the level of instruction, socioeconomics et cetera. Various vital viewpoints ought to be considered when choosing to customize an e-learning condition [9]:

- Personalize the earth—decide how online e-learning situations should resemble.
- Personalize the substance—join content from the students' close to home condition (mirror students' perusing propensities and inclinations).
- Personalize the media—as indicated by their learning styles and inclinations a few students get a kick out of the chance to watch a short video or read a printed PDF documents.
- Personalizing learning successions—nonlinear introduction of substance enables students to pick how they will learn.
- Personalize the jobs utilizing photos and pictures—utilize a photo of the teacher to make the substance more "individual."
- Personalize the discussion—utilize content or voice/video and change utilized sentences.
- Personalize the route—enable students to investigate different parts of the substance.
- Personalize the student—Make the course close to home to the student.
- Recognize singular competency—avoid known parts of instructing material and begin taking in the new subjects.
- Personalizing learning goals—empower students to accomplish better the learning targets.

Recommendation System

The new advancements, and especially with the quick development of the Internet, clients locate an incredible assortment of books, daily paper articles, pages or films, without the requirement for earlier exact learning of the substance of each one of them. Clients wind up overpowered by the over-burden of data and look for help to distinguish the items which might be additionally intriguing for them [10].

A Recommendation System is an application equipped for showing a client a proposal for a protest, acquired from his past inclinations and the inclinations of a network which has likings and conclusions like his. Recommender framework in an e-learning setting is a product operator that attempts to "absolutely" prescribe activities to a student dependent on the activities of past students. This proposal could be an online movement, for example, completing an activity, perusing posted messages on a conferencing framework, or running an online reenactment, or could be only a web asset.

An e-learning Recommender framework is a bit of programming that has an intelligence nature of prescribing learning assets to a student by considering the activities of past students. An extensive variety of web mining systems have been utilized to fabricate a product operator equipped for suggesting learning exercises or easy routes in web based learning by finding on the web get to designs [11].

E-learning semantic web

The new age of the web, the Semantic Web, shows up as a promising innovation for executing E-learning. The principal modern firms and scholarly and explore establishments have begun to contemplate utilize and uses of Semantic Web innovation in which data in the machine-processable frame can exist together and supplement the present web with better-empowering PCs and individuals to work in co-task. The Semantic Web establishes a situation in which human and machine operators will convey on a semantic premise. Things can be effortlessly sorted out into redone learning courses (quick and without a moment to spare) and conveyed on interest to the client, as per her/his profile and business needs [12]. This paper centers on e-Learning, advantages, and necessities of e-Learning and potential employment of semantic web innovation in e-Learning.

The Semantic Web is a work of data connected up to be effectively processable by machines, on a worldwide scale. It is the new-age, Web that makes conceivable to express data in an exact, machine-interpretable shape, prepared for programming specialists to process, share, and reuse it, and also to comprehend what the terms

portraying the information mean [13]. The term "Semantic Web" includes endeavors to construct another WWW design that backings content with formal semantics. That implies content appropriate for computerized frameworks to expand, rather than substance proposed for human utilization. The Semantic Web offers new advances to the engineers of online applications going for giving more shrewd access and administration of the Web data and semantically more extravagant demonstrating of the applications and their clients. "Expressing meaning" is the essential undertaking of the Semantic Web [14]. To accomplish these few layers are required. The accompanying layers are the fundamental ones:

i. The XML layer, which speaks to information.
ii. The RDF layer, which speaks to the importance of information.
iii. The Ontology layer, which speaks to the formal general understanding about the importance of information.
iv. The Logic layer, which empowers insightful prevailing upon important information

II. LITERATURE SURVEY

The discovery of knowledge in any huge data source is a complicated task. In addition of that, to keep in track the user interest and required data from the web data source is a big issue in web information mining. In order to find the effective and accurate manner for improving the online learning experience of the web user the following intermediate objectives are established.

Thi Thanh Sang Nguyen [15] proposes a novel technique to productively give better Web-page recommendation through semantic-upgrade by coordinating the area and Web use learning of a site. Two new models are proposed to speak to the space learning. The primary model uses a philosophy to speak to space learning. The second model uses one normally made the semantic system to speak to space terms, Web-pages, also, the relations between them. Another new model, the connected desire illustrate, is proposed to normally make a semantic arrangement of the Semantic Web use information, or, in other words of spatial learning and Web utilization learning. Various compelling inquiries have been produced to question about these information bases. In light of these questions, an arrangement of suggestion systems has been proposed to deliver Web-page contenders. The proposal results have been differentiated and the results gained from an advanced existing Web Usage Mining (WUM) system. The preliminary outcomes demonstrate that the proposed methodology makes a profoundly higher execution than the WUM system.

Hiren M. Patel et al [16] centers around the advancement and assessment of an online motion picture suggestion framework Recently, it has turned out to be increasingly troublesome for the current electronic frameworks to find or recover any sort of relevant data, because of the quick development of the World Wide Web regarding the data space and the measure of the clients in that space. Be that as it may, in this day and age, numerous frameworks and methodologies make it workable for the clients to be guided by the proposals that they give about new things, for example, articles, news, books, music, and motion pictures. In any case, a considerable measure of conventional recommender frameworks comes up short when the information to be utilized all through the suggested procedure is meagre.

Xi Chen et al [17] proposed a novel collaborative filtering based Web service recommender the framework to enable clients to choose administrations with ideal Quality-of-Service (QoS) execution. The recommender framework utilizes the area data and QoS esteems to group clients and administrations and makes customized benefit proposal for clients dependent on the bunching results. Contrasted and existing administration proposal strategies, approach accomplish impressive change on the suggestion precision. Far-reaching tests are led including more than 1.5 million QoS records of certifiable Web administrations to show the viability of this methodology.

Xi Chen et al [18] proposed a novel communitarian sifting calculation intended for colossal scale Web benefit suggestion. Not quite the same as past work, approach utilizes the normal for QoS and accomplishes significant change on the suggestion exactness. To help benefit clients better comprehend the basis of the suggestion and expel a portion of the riddle, creators utilize a proposal representation method to demonstrate how a proposal is assembled with different decisions. Extensive investigations are led utilizing more than 1.5 million QoS records of certifiable Web benefit summons. The trial results demonstrate the productivity and adequacy of the given methodology.

Lina Yao et al [19] proposed a novel methodology that brings together shared sifting and substance based proposals. Specifically, a given methodology thinks about at the same time both rating information (e.g., QoS) and semantic substance information (e.g., functionalities) of Web administrations utilizing a probabilistic generative model. In the model, inconspicuous client inclinations are spoken to by presenting an arrangement of inert factors, which can be factually assessed. To confirm the proposed approach, they lead tests utilizing 3,693 correct Web administrations. The trial results demonstrate that this methodology beats the cutting edge techniques for proposal execution.

According to ***M. S. N. Murthy et al [20],*** numerous web clients are data purchasers as well as data suppliers. There are bunches of data in the Web and the vast majority can discover what they need by looking through the Web. One issue of countless in the Web is that we regularly invest a significant portion of our energy to locate a right outcome from indexed lists. A proposal is frequently founded on Bees Algorithm it is a populace based inquiry calculation. The Bees Algorithm is an improvement calculation roused by the usual scrounging (gathering the sustenance) conduct of bumble bees to locate the ideal arrangement (suggestion).

Jinal S. Chauhan et al [21] have reported that the recommender frameworks are utilized by an expanding number of web-based business sites to assist the clients with finding appropriate items from a broad database. The mind-boggling measure of information requires systems for productive data sifting. Proposal frameworks (RS) serve the correct thing to the client in a computerized form to fulfill the long haul objective. The essential errand of the recommender framework is to display suggestions to clients. Mixture suggestion utilizes various strategies together.

Ramkumari Tyagi et al [22] analyzes the influence of e-commerce on markets where situated businesses face competitors from web-established entrants with targeted choices. In specific, author study the retail sector where the development of online procedures and the provision of more than a few resources. They have developed a recommender procedure to analyze the have an effect on of competitors on the objects. The discounted items are supplied to the users in an effort to expand the client's curiosity.

Tobias Schnabel et al [23] examine waitlists as an interface part for recommender frameworks with the double objective of supporting the client's choice procedure, and besides enhancing understood input elicitation for expanded proposal quality. A waitlist is a brief rundown of competitors that the client is as of now considering, e.g., a rundown of a couple of motion pictures the client is at present considering for review. From a psychological point of view, waitlists fill in as computerized here and now the memory, where clients can offload the things, under-thought – in this manner diminishing their intellectual load. From a machine learning point of view, adding things to the waitlist creates another understood criticism motion as a side-effect of investigation and essential leadership which can enhance proposal quality. Short-listing gives extra information to preparing proposal frameworks without the increments in psychological load that asking for express input would acquire. Creators play out a client think about with a motion picture suggestion setup to contrast interfaces that offer waitlist bolster and those that don't.

Ning Wang et al [24] proposed a novel E-Commerce suggestion framework display dependent on example acknowledgment and client conduct inclination examination. With the advancement of the Internet and the age of the huge measures of information, data over-burden issue is progressively extreme, client suffocates in a sea of information, it is hard to viably end up keen on the general data. Proposal framework innovation was advanced and is broadly utilized for this situation; the suggestion framework investigation of the client's past conduct records, while utilizing the prescribed calculation consequently prescribe clients may be occupied with the data to the general client. The standard utility of the log document organize put away physical data about the customer association in the event that it tends to be a portion of the records put away in the mining investigation as can see the client's conduct. From this beginning stage, creators propose the new suggestion framework design with the joining of example acknowledgment calculation that is imaginative.

III. LITERATURE REVIEW

This section provides the review of the work done by various researchers in the field of recommender system is discussed in Table 1.

Table 1 Review on Recommender System

Paper title	Publication and year	Remark
Web-page recommendation based on web usage and domain knowledge	IEEE 2014	This paper proposes a method to efficiently provide better Web-page recommendation by integrating the domain and Web usage knowledge. Two models are proposed first model uses ontology and the second model uses automatically generated semantic network. Another model, is conceptual prediction model, it is proposed to generate a semantic network of the semantic Web usage knowledge, which is the integration of domain knowledge and Web usage knowledge. The results have been compared with the results obtained from an advanced Web Usage Mining (WUM) method. The results demonstrate that the proposed method produces significantly higher performance than the WUM.
	IJAERD 2015	It has become more difficult for existing web based systems to retrieve any kind of information, due to growth of World Wide Web in terms of information space and amount of users. However, traditional recommender systems result in failure when the data to be used throughout the recommendation process is sparse. This Paper focuses on the development and evaluation of a web based movie recommendation system.
Web service recommendation via exploiting location and QoS information	IEEE 2014	Web services have been employed for service-oriented applications development. Available large amount of web services makes it hard for a user to select a proper Web service. An inappropriate service selection may cause many problems. In this paper, a novel collaborative filtering based Web service recommender system is proposed to help users to select services with optimal Quality-of-Service (QoS). Compared with existing service recommendation methods, the approach achieves considerable improvement on recommendation accuracy.
Unified collaborative and content-based web service recommendation	IEEE 2015	Most existing Web service recommendation methods focus on UDDI registries or keyword based Web service search engines that possess many limitations. Recent research efforts on Web service recommendation center on two prominent approaches: collaborative filtering and content-based recommendation. Unluckily both methods have some drawbacks. In this paper, a novel approach is proposed that unifies collaborative filtering and content-based recommendations. Particularly, this approach considers both rating data and semantic content of Web services. The experimental results show that approach outperforms the state-of-the-art methods on performance.
Enhanced Bee Colony Optimization Mechanism In Content Recommendation System	IRJET 2016	Many internet users are not only information consumers but also providers. There is lots of information in the Web and most people can find what they want by searching the Web. One problem of large quantity of data in Web is that we spend most of our time to find a correct result. A recommendation is based on Bees Algorithm can help for finding appropriate information.

Survey on Hybrid Recommendation System	IJAERD 2016	Recommender systems are used by e-commerce websites to help the customers to find suitable products. It is the technique to deal with large amount of data for efficient data filtering. RS serve right item to user in an automated fashion to satisfy objective. Major task of the recommender system is to present recommendations to users.
An advanced recommendation system for E-commerce users	IEEE 2016	Over 200 million customers usages online electronic for trade. The internet business model, provides accessibility to suppliers and new stages of efficiency. The development in e-commerce has result in a substantially multiplied demand for understanding and communications. This paper analyzes the influence of e-commerce on markets. In specific, study the retail sector where the development of online procedures and the provision of more than a few resources. Authors have developed a recommender system to analyze effect on competitors. The discounted items are supplied to the users in an effort to expand the client's interest.

IV. SUGGESTED RECOMMENDATION SYSTEM

The key aim of the proposed study is to investigate about the e-learning recommendation system and improve the traditional concept for optimizing the performance of recommendation approaches. In order to perform this task the following task are included.

- **A Model for Web Browsing Behaviour Analysis and Design of Recommendation System:** In this phase the web usage mining and their techniques are explored. Additionally using the obtained outcomes from first phase, a new recommendation engine is needed to be design. That helps to understand the user behavioural attributes in specific domain knowledge and the web usage behaviour.
- **To optimizing the Recommendation by Involving the User Context and Desire Contents:** The core intention of the proposed technique to improve the user learning experience therefore an information retrieval system is proposed for final implementation and design. That personalizes the user behaviour of web navigation, interest of domain, probability of user behaviour fluctuation, probability of content availability for recommending the most appropriate contents to the user. Those technique usages the web usages based recommendation model in optimized manner for user context understanding, and their performance improvements.
- **Performance Analysis of the Proposed Designed Model:** after implementation of the required technique the performance of the designed system is need to be measure. Therefore, in this phase, the proposed technique is compared with the traditional recommendation model in terms of their performance factors.

V. CONCLUSION

Over the e-learning Recommendation systems resources are computed on the basis of learner's recent navigation history, as well as similarities and dissimilarities among other learners' preferences and content. In this paper, we have outlined the objectives and aim to be accomplished based on explored survey. Additionally basic principles of available approaches to achieve personalization in e-learning platforms are investigated. Basically a recommender system relying on web mining techniques and search engine technology to take care of one of the crucial steps in personalization which occurs in the "online" phase to compute the recommendations against a possibly massive repository of educational resources in "real time".

VI. FUTURE WORK

In near future, the author will explore different recommendation system development strategies and frequently used algorithm. In addition to that the strategies make use of user personal data and available items for making accurate prediction mode. Finally, a new approach of recommendation design needs to be proposed and implemented.

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