

Chapter 1

Review of Data Mining Techniques and Parameters for Recommendation of Effective Adaptive E-Learning System

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ABSTRACT

This chapter revolves around the synthesis of three research areas- data mining, personalization, recommendation systems and adaptive e-Learning systems. It also introduces a comprehensive list of parameters, extricated by reviewing the existing research intensity during the period of 2000 to October 2014, for understanding what should be essential parameters for adapting an e-learning. In general, we can consider and answer few questions to answer this body of literature ‘what’ can be adapted? What can we adapt to? How do we adapt? This review tries to answer on ‘what’ can be adapted. Thus, it advances earlier personalization studies. The gaps in the previous studies in building adaptive e-learning systems were also reviewed. It can help in designing new models for adaptation and formulating novel recommender system techniques. This will provide a foundation to industry experts and scientists for future research in adaptive e-learning.

INTRODUCTION: DATA MINING, RECOMMENDATION SYSTEMS AND PERSONALIZED ADAPTIVE E-LEARNING SYSTEMS

In the recent years, e-learning has become very important in various educational settings. This is because the number of participants is not limited to the number of available seats and physical infrastructure. Moreover, the learners can use the internet for information retrieval and communication with teachers as well as peer group from any remote location, suiting their convenience. Thus, the application of e-learning has traversed the boundaries of school, corporate training, college education and the internet-based coaching for examinations, to permeate the entire learning spectrum.

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Various schools, universities and corporate trainers have realized and exploited the benefits of e-learning as an important supplement to the traditional learning scenarios. The worldwide sector for e-learning has anticipated reaching \$51.5 billion by 2016. This offers tremendous opportunity to both local and global players to nurture online learning market and make further advances. India is one of the biggest education frameworks in the entire world, with a spread of 18,000 higher education institutions and more than one million schools. With National Skill Development Corporation (NSDC), planning to train 12 million people by 2022 to impart the skills required by a growing economy, the potential of growth is exponential. The Government of India has been effectively backing the e-learning initiative to fortify accessibility. Specific schemes namely National Program on Technology Enhanced Learning (NPTEL) and National Mission on Education through Information and Communication Technology (NMEICT) are advanced to integrate the capability of Information and Communication Technology (ICT) in web-based course content. Moreover, with the recent launch of 'Digital India', there's seemingly great potential to digitally educate the masses, especially in the remote and rural parts of India. Hence, there's a need for better quality of learning content and support in e-learning environment, which will not happen with few unrelated changes here and there. Given the differences in the learning capabilities of learners, web-based learning programs should abstain from forcing a "same content fits all" approach. Hence, we need to supplement the traditional e-learning system with flexible technology to offer quality education to large sets of learners per their requirements.

A personalized system recommends items to its users. People use recommender systems to retrieve information on books, movies, news, smart phones, vacation trips, practically every product or service. For this, recommender systems should be able to forecast the needs of customers and afterwards, give them with suggestions of items, which they are liable to acknowledge, in light of the previous interactions with the customers. The personalization task is basically a prediction problem i.e. the system should be able to predict the area of interest of the users, specific content and then their ranking (Brusilovsky & Millán, 2007).

In personalized adaptive e-learning systems, 'adaptability' is the ability to modify existing course materials on the basis of different learner parameters. The main idea behind adaptive e-learning systems is that, based on the learner characteristics, an appropriate adaptation method should be used, to adapt the presentation of the course content to the individual learner.

Lately, data mining has become an important tool for extracting data by establishing patterns. These patterns are analyzed to generate useful information required for decision-making. In any sector, for example marketing, banking and finance, telecom, retail, sales, population study, human migration, health sector, production, science or education, there are many ways available to store the data being generated. But they do not have the right tools and insight to use the patterns obtained from this data to track the future uncertainties. The business environment is prone to change very frequently due to a fierce competition from rivals. Therefore, it is pertinent to keep the customer consistently satisfied. This will reduce the risk of losing customers to its rivals and to lure potential customers thereby reducing customer churn (Mahajan et al, 2015). This gigantic growth of data and the pressing needs of customer relationship management (CRM) together with customer churn management have spawned new set of tools and techniques that can automatically and wisely transform data into a valuable and need based learning.

The first and foremost task for a researcher is the review of the previous work done so far in the related field. Hence a comprehensive review of the relevant literature is organized and reported in this chapter. The exploratory studies are divided into following sections.

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