Chapter 15

Artificial Intelligence Methods in E-Learning

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ABSTRACT

Gathering and extracting knowledge from the large amount of data available today is becoming more and more important in our information society, and similarly, learning is an essential important part of our everyday lives. The new requirements of the competing world and the development of more advanced technologies have also changed traditional educational systems, which now employ better and more effective teaching and learning methods. In this regard, the integration of artificial intelligence (AI) technologies in the field of education offers both great challenges and opportunities in building e-learning systems. E-learning systems allow learners to access the educational materials ubiquitously from anywhere at any time. Therefore, these systems have to become adaptive to the needs and preferences of each individual learner. This chapter presents a review of the important concepts and background for research to include introduction and examination of e-learning systems and intelligent tutoring systems (ITSs), available today.

INTRODUCTION

Internet plays an increasingly important role in improving communication, collaboration, sharing of resources, and delivery of education in distance learning mode. Web-based educational systems facilitate distance learning and offer easy access to any knowledge domain and learning process at any time for learners from different backgrounds with different needs, preferences, and characteristics (Chrysafidi

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& Virvou, 2015). Therefore, Web-based educational systems have to be dynamically adaptable for every learner. An Intelligent Tutoring System (ITS) uses AI techniques to automatically adapt the teaching content to fit to the learners’ needs and goals. Personalized and adaptive e-learning environments can be established by using AI techniques, which are mainly applied in knowledge representation, managing a learning strategy and monitoring students’ status. AI is a branch of computer science rendering computers to behave like human beings. Its rich resources of tools, technologies and paradigms of computing includes Fuzzy logic, Bayesian Networks, Neural Networks, Genetic algorithms, etc., has proved to be extremely useful in solving challenging problems in different fields as well as educational environments involving incomplete and/or an uncertain knowledge. In the context of educational environments, in addition to learners, instructors in higher education need to improve their teaching ability and skill in order to enhance the learning process and help students in acquiring the perfect knowledge. Therefore, faculty development has become an essential issue and a major focus of various educational institutions that want to keep pace with development (Beach, Sorcinelli, Austin, & Rivard, 2016; Meyer, 2014; Schmidt, Tschida, & Hodge, 2016). With this in mind, providing appropriate development opportunities for the faculty teachers has become crucial.

This chapter will present the issue of AI techniques and how they can be applied in e-learning systems. In particular, an overview of various AI techniques such as Fuzzy logic, Bayesian Networks, Neural Networks, and Genetic algorithms are discussed. A brief overview of the role of e-learning and AI technology for faculty development is presented, followed by the conclusion and future research.

E-LEARNING

E-Learning has been seen by many as a major shift from the teacher-centered model in the traditional learning system to a learner-centered one, where students learn actively and can decide what, how, where, and when to do it (Brown, 2003). Furthermore, Rosenberg (2001) defines the term e-learning as, “the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance.” Longmire (2001) states that “e-Learning covers a wide set of applications and processes such as computer-based learning systems, Web-based learning systems, virtual classrooms, and digital collaborative learning GroupWare packages.” E-Learning content is for the most part conveyed by means of Internet, satellite communication, TV, DVD and CD-ROM.

Both computers and software have evolved with the development of Internet, so that online learning has become widespread worldwide. Such learning also removes the distance barriers to education, thereby helping students and other learners access web-based material anytime from anywhere in the world by being connected to Internet. Figure 1 shows the advantages of E-learning systems.

Through the evolution of Internet and the growth of Web technology, distancelearning environments have been created to support learning processes such as Massive Open Online Courses (MOOCs), which first emerged from the Open Educational Resources (OER) in 2008. MOOCs allow learners around the world to access courses offered by different educational institutions via Internet (Sinclair, Boyatt, Rocks, & Joy, 2015). There are many commercial and non-profit providers of MOOCs such as Coursera1 and FutureLearn2.

Many applications including Virtual Learning Environments (VLE) and Learning Management Systems (LMS) have been developed to make online learning much easier. These software systems or platforms are widely used by several universities to help instructors in creating online courses that are