Balancing the Role of Machine Learning and Teacher in Adaptive Learning Guidance System (ALGS)

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Abstract— One of the features in adaptive learning systems, that correspond to learners’ needs, is building a user model which in turn requires data gathering and user modeling. Since learning happens everywhere, privacy concerns would make measuring, and monitoring an invasive process that may concern the stakeholders involved in the learning process. While adaptive systems can have many flavors, Adaptive Learning Guidance System (ALGS) leans toward fostering the role of the teacher in the adaptive process. In ALGS, the teacher has input at all stages while deploying technology and integrating both the machine learning system and the human element together. In this sense, having a mentor may achieve some balance between the strengths of AI and the assurance of human guidance.

Index Terms— Adaptive learning, machine learning, artificial intelligence, deep learning.

I. INTRODUCTION

Adaptive learning environments can have different flavors; some are intelligent tutoring systems, and some others are learning analytics [1][2]. As these various types of adaptive environments have been implemented, some concerns have emerged due to relying solely on deep learning. These concerns include motivation, procrastination, engagement and others. The novelty that ALGS is proposing is balancing the machine learning and the human factor in an attempt to reduce this gap. In ALGS, the mentor has input in all stages as well as in making adaptive decisions with the help of technology. The system may detect any alarming deviation in a particular learner’s behavior from peer groups. Upon detecting such alarming actions, the system immediately triggers the teacher to intervene and act appropriately.

A. The Two Main Pillars That ALGS Rests Upon

ALGS is based on two main pillars which are the teacher and the computer-supported collaborative learning (CSCL). In order to address the issues with motivation, engagement, and others that are accompanied with machine learning systems, a need for other tools/facilities along with technology has emerged. These tools are human guidance on one hand, and computer supported collaborative learning on the other. Both are suggested to work along side by side with AI.

AI can perform tasks beyond human capabilities, which may result in complexity, hence, makes it hard to observe or control the whole learning and the adaptation processes, especially for the teacher. As a consequence, the system would generate suggestions to adapt to the learner’s model that the teacher may not be able to interpret [3][4]. For example, an AI learning system generates recommendations for the learners based on their current progress. In order for the system to perform such a task, it needs to generate as well as evaluate all possibilities and alternatives. Such search techniques are applied to automate the decision-making process [5]. In an attempt to make the system-suggested recommendations interpretable by the mentor, ALGS proposes allowing the mentor to have input at all stages. Figure 1 shows the two pillars that ALGS rests upon.

Figure 1. ALGS is based on 2 pillars: the teacher and the computer supported collaborative learning

In the literature, motivation [6], procrastination [7], engagement [8][9], and keeping cohesive learning environments online [10] are noted as issues that can be better enhanced by personal relationships. According to Holmberg’s (2007) [11] theory, personal relationships help motivate students, boost engagement, and mentor procrastinators. [6]. Based on these facts, ALGS deploys the mentor’s physical existence with technology to maintain a healthy learning environment that corresponds to individual learners’ needs.

On the other side, in CSCL contexts, the system facilitates the group interaction among learners via machine learning environments [12]. ALGS supports on-line chatting facility among learners during the different stages of learning. This enables learners to exchange ideas and help each other to understand the topics and answer the test questions in a collaborative way.

B. The Role of the Machine Learning System in ALGS

ALGS collects data about students’ actions and behavior patterns, and then analyzes these large datasets. When processing and analyzing data, ALGS detects any deviation in the behavior of each learner from peer groups. The system then produces triggers and alarms the human teacher to intervene accordingly.

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ALGS adaptation engine creates automated mechanisms to generate recommendations to students of the content they should study next based on analyzing students’ learning patterns and behaviors. Such processes are time-consuming and beyond human capabilities [4]. However, it is crucial that the teacher comprehends the system-generated recommendations which can be difficult due to the complexity of data processing [3][4]. As a result, in ALGS, the teacher has the chance to have input at all stages.

The key to tailor recommendations that correspond to learners’ needs is the “student model” [13][14]. ALGS crucial role in the adaptation procedure is building a reliable user model that enhances adaptation functionality [15].

C. The Role of The Teacher In ALGS

The teacher corresponds to the system-generated alarms when there is a deviation in a learner’s behavior from other similar users. Upon receiving the system alarm, the teacher can track the history of a particular student to interpret the rationale behind such deviation or failure to cope with the peers. The teacher’s role then is to intervene and take the proper action whether in the form of an input recommendation to the system or to appear to the student, or in face-to-face interaction with the student.

Another major role for the teacher in ALGS is creating the database upon which the system filtering function is based. At the very early stages in ALGS, the teacher sets the conceptual and pedagogical structures of the courses to be taught, and associates content with the concepts. The teacher’s input in this case suggests an initial path since there are no usage data stored yet in the system to adapt to.

Furthermore, the teacher in ALGS reviews and refines the system-generated recommendations. As the system generate tailored recommendations to users’ needs, the teacher may omit or add further recommendations. The teacher then provides guidance of what the learner should do next and makes the adaptation decision, which again can be an input to the system, that appears to the student during the online classroom time, or a face-to-face guidance. Figure 2 demonstrates the roles of both the teacher and the machine learning in ALGS.

Figure 2. The roles of the teacher and the machine learning in ALGS.

REFERENCES


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