



An Introduction to Artificial Intelligence and Machine Learning for Online Education

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1 Editorial

From Jan 2019, COVID-19 has been rushing the world, forcing many offline life and work to turn online. Education industry is also heavily impacted from universities to primary schools, and most traditional offline education and learning have to become online all over the world. The virus closed the door for the real world; however, it opens another window of the online world.

Online education and learning is the most popular way for both students and teachers, and has occupied a dominant position today [1, 2]. Therefore, the study of everything in online education method has become an urgent problem to be solved because it was never been so important. In past two years, many scholars have studied in the area. Meantime, artificial intelligence (AI) and machine learning (ML) methods in online education have been one of the most important research domains because this kind of method is very suitable to process the generated big education data online every day [3, 4].

Hence, how to provide AI and ML solutions for online education, what directions to aim, what kind of data to use, such problems are all current urgent required solving. In this way, this issue “Artificial Intelligence and Machine Learning for Online Education” is presented to provide an opportunity for educators and scholars to publish both theoretical and technological studies of emerging theory within AI and ML for online education, and their novel engineering applications within this domain.

This issue received 54 submissions and accepted 12 out of them with at least 2 rounds of strict reviews, with acceptance ratio 22.22%. This editorial is divided into two sections, which aims to the machine learning algorithms for online education in the first section, as well as intelligent educational applications in the second section.

2 Machine Learning Algorithms for Online Education

The first section of this issue includes six articles, which focuses on the machine learning algorithms for online education, including decision-making, privacy protection, assistance system, pattern recognition, online resource search, and engineering education [5–10].

In order to improve the quality of online distance education and students' online learning, an intelligent online distance education decision-making method based on cloud computing is proposed in the first article, “A decision-making method of intelligent distance online education based on cloud computing”, authored by Gautam Srivastava from the Brandon University, Canada, as well as China Medical University, Taiwan. The proposed method provides a cloud computing based decision-making resources for online education. It provides human–computer interaction windows to view the decision-making scheme at the application layer, and complete the optimal decision-making for online education by providing the management function of cloud computing services. Experimental results show that this method can effectively obtain the decision-making scheme of network education. After the application of this method, the students' learning ability and academic performance have been significantly improved [5].

Long distance education occupies more important part under the COVID-19 age. An intelligent privacy protection with higher effect for the end users is an urgent problem in long distance education. In view of the risk of privacy

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disclosure of location, social network and trajectory of end users in the education system, the second article, “Intelligent privacy protection of end user in long distance education”, authored by Weina Fu from the Hunan Normal University, China, proposes a method to protect the privacy of end user by deleting the location information from the location set and providing the anonymous set to location. Experiments show that the proposed algorithm is superior to SOTA algorithms. In addition, when the privacy protection intensity is 8, the trajectory loss rate of the proposed method tends to be stable with good clustering effect. By using the proposed method, the proportion of insecure anonymous sets is smaller, the trajectory privacy protection effect is better, and the location, social network and trajectory privacy of distance education end users are more effectively protected [6].

In order to improve the quality of distance education and solve slow data processing of the online teaching system, an intelligent distance education assistance system is developed in the third article “Design of distance assistance system for intelligent education by web-based applications”, authored by Jerry Chun-Wei Lin from the Western Norway University of Applied Sciences, Norway. In the proposed system, the huge transmitted information by students, teachers and administrators is merged using the Bayesian model for integrating educational resources in the digital cloud to create a distance education database that supports the system with data. Experimental results show that the designed system can realize the remote auxiliary function of intelligent education and effectively improve the quality of teaching. By comparing with other recent methods, the data processing efficiency of the proposed system is higher, also, the proposed system has high stability and accuracy of data collection [7].

Personalized adaptive learning is a very important research domain in online education. In order to effectively identify the pattern of personalized adaptive learning and improve the recommendation satisfaction of resources in online education platform, the forth article “A pattern recognition method of personalized adaptive learning in online education”, authored by Peng Peng from the Hunan University of Arts and Science, China, studies the pattern recognition method of personalized adaptive learning in online education. The learning behavior pattern data in the online education platform are mined and analyzed, and the obtained data are used to construct the learner's learning characteristics model. The experimental results show that the proposed method can effectively identify the personalized adaptive learning patterns of learners, including interactive behavior and online social patterns. The personalized learning resources recommended by the proposed online platform according to the identification results have obtained the learners' satisfaction score at 93.27%, which is higher than other methods [8].

In order to realize the best matching search of mobile intelligent education system resources, a resource search method of mobile intelligent education system based on distributed hash table is proposed in the fifth article “Resource search method of mobile intelligent education system based on distributed hash table”, authored by Thippa Reddy Gadekallu from the Vellore Institute of Technology, India. The proposed method combines the chord system based on distributed hash table and vector space model to form a resource discovery mechanism, and solve the similarity between query and location resource vectors by establishing the vector relationship between them. Then, according to the resource similarity solution results, the resources with the greatest relevance to the search content are obtained. The experimental results show that comparing with other methods, the value of search request blocking rate is far lower, the search performance is better, and the matching degree of resource search results is higher [9].

In the sixth article “Bridging the gap between university engineering education and enterprise requirements”, authored by Hao Shen from the Beijing Institute of Technology, China, the consistency between engineering education in universities and corporate needs for such education is investigated. The article analyzes the problems in current engineering education such as low-level participation by enterprises, decoupling of teaching and industry demands, and difficulties for enterprises to participate in teaching reforms. In response to these problems, this article proposes a practical ability training platform, which features “university-enterprises co-construction”. The platform adopts the method of “credit bidding” to improve the curriculum system that is combined with the enterprise teaching mechanism. Moreover, the university-enterprises collaborative teaching management and operation guarantee mechanism is established. By the proposed engineering education method, the practical ability of students and the satisfaction of enterprises to graduates are greatly improved [10].

3 Intelligent Educational Applications

The second section of this issue includes six articles, which focuses on the intelligent assistant system, evaluation model for classes, and communication platform in distance learning [11–16].

Aiming at the problems of low coverage of teaching resource recommendation results, long running time of the platform and low accuracy of resource recommendation in traditional methods, the seventh article “Intelligent real-time news communication platform in education”, authored by Jin Li from the University of Chinese Academy of Social Sciences, China, as well as the State Taxation Administration, China, designs an intelligent real-time news communication

platform and applies it to educational domain. The standard three-tier cloud architecture IaaS + PaaS + SaaS is adopted to design the overall architecture, and the new is tracked and clustered through the content acquisition. TF-IDF algorithm is used for news data feature selection, and the feature correlation degree is calculated. The experimental results show that the resource recommendation accuracy of the proposed method is high up to 90%, the running time of the platform is always about 1.0 s, and the resources can cover more fields up to 100% [11].

In order to improve the training accuracy of online sport teaching and training scientifically and standardized, a correcting assistant system based on NET platform is designed in the eighth article “Design of action correction assistant system in physical education teaching and training based on NET platform”, authored by Dawid Połap from the Silesian University of Technology, Poland. Based on the NET platform, a three-tier architecture is constructed, in which the data access layer is used to realize the exchange of database information, and provide services for the business logic layer. Dynamic time planning algorithm is used to match the corresponding frames, calculate the training score, and reproduce the action correction. The experimental results show that the proposed system can collect training actions and mark joint points, accurately match the corresponding frames, which means that it get higher training action scores and user satisfaction than current algorithms [12].

The scientific quantitative decision-making of political ideology integrated teaching in college is important in China. The ninth article “Evaluation model of physical education integrated ideology and politics based on principal component analysis”, authored by Jianbo Yu from the Hunan Educational Technology Center, China, proposes a teaching effect evaluation model of physical education integrated political ideology based on principal component analysis. By using clear indices such as teaching contents, activities planning and organization, sports teams, initial evaluation is established. Experiments show that the mean of linear and rank correlation coefficient of the proposed method are 97.3% and 96.7%, respectively, which are higher than current methods. From the actual physical teaching experiment of various professionals, accuracy of the evaluation results with the proposed model is higher, which can effectively improve the sport teaching integrated political ideology [13].

The current video key frame extraction algorithm is affected by the lens conversion, and the accuracy is poor. In the tenth article “Accurate key frame extraction algorithm of video action for Aerobics online teaching”, authored by Marcin Woźniak from the Silesian University of Technology, Poland, a precise extraction algorithm of video action key frames for online aerobics teaching is studied. In order to ensure that the color distance is suitable for human vision, a non-uniform quantized HSV space method is adopted, and

a one-dimensional feature vector is introduced to realize the segmentation of video shots and reduce the impact of shot conversion. Sequence search constructs the processing dynamic frame, extracts the feature vector of the video sequence, and uses the multi-layer core aggregation algorithm to extract the key frame of the video action according to the extracted feature vector. Experimental results show that the proposed algorithm can effectively extract the key frames with the fidelity higher than 0.9, and the precision and recall both higher than 99% [14].

In order to improve the accuracy and performance of classroom teaching effect evaluation, an intelligent teaching mode classroom teaching effect evaluation method is proposed in the eleventh article “Evaluation method of classroom teaching effect under intelligent teaching mode”, authored by Hui Lu from Inner Mongolia University, China. Based on the characteristics of intelligent teaching mode, an effect evaluation index system including five indexes of basic quality, teaching attitude, teaching method, teaching ability and teaching effect is constructed. After obtaining the scores of each index by expert scoring, the final score of teaching effect evaluation is obtained by inputting the data into cuckoo search algorithm extreme learning machine evaluation model and solving with objective function. The experimental results show that the proposed method can effectively improve the evaluation accuracy of classroom teaching under intelligent teaching mode [15].

Due to the low recognition accuracy and slow convergence speed of the traditional basketball shooting trajectory recognition methods, the twelfth article “A recognition method of basketball’s shooting trajectory based on transfer learning”, authored by Fan-long Meng from Zhengzhou University of Industrial Technology, China, proposes a basketball shooting trajectory recognition method based on transfer learning to accurately analyze the behavior pattern of shooting trajectory in the monitoring scene. Combined with transfer learning, the speed of improving network optimization is accelerated, the missing information is made up, and the recognition of basketball shooting trajectory is realized. Experimental results show that the proposed method can accurately identify the basketball shooting trajectory with the minimum coordinate error, effectively improve the accuracy and time of network training, and also improve the convergence speed and recognition accuracy [16].

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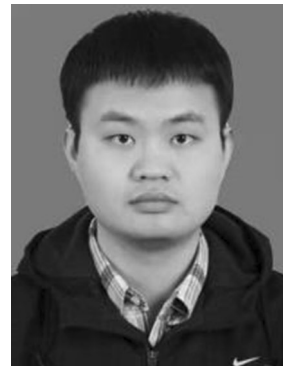
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