Exploration and Application of Integration of Machine Learning and Intelligence Education in the Perspective of Artificial Intelligence

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Abstract: With the rise of large data in education, how to analyze a large number of data to support accurate prediction is a new topic in the era of artificial intelligence. Machine learning, as an important branch of artificial intelligence, can meet the needs of large data analysis and prediction in education. For this reason, based on a series of questions such as "why to analyze, what to analyze, why to analyze and how to apply", the appropriateness of machine learning and wisdom education is discussed through the analysis of the object, process and specific methods of machine learning. Combining with the analysis and summary of the case studies on the application of machine learning education based on real data abroad in recent years, it is found that the current application of machine learning education mainly focuses on six aspects: student modeling, student behavior modeling, prediction of learning behavior, early warning of the risk of dropout, learning support and evaluation, and resource recommendation.

1. Introduction

In 2017, Master, the mysterious chess player, won successively over several world-class top players in China, Japan and South Korea, and then Master was proved to be 2016.AlphaGo defeated Li Shishi in March. This is the absolute "historical event" in the history of Artifi-cial Intelligence (AI). The Autonomous Vehicles proposed by Google has been illuminated from textbooks and can be realized by intelligent driving devices inside the vehicle. The robot's footsteps are also expanding from exploring Mars to the human body. A swallowable miniature folding robot enters the human body, which can help repair wounds or remove button batteries that have been eaten by mistake [1].

The field of education is also changing under the influence and infiltration of the wave of artificial intelligence research. On the one hand, the combination of AI and learning science forms a new field - Educational Ar-tificial Intelligence (EAI) [2]. Its core goal is to obtain precise and clear forms of educational, psychological and social knowledge through calculation, which is often implici[3]t. Knowledge is presented in the form of learner model, domain knowledge model and teaching model. Algorithms are the core technology to acquire these knowledge[4]. At present, a large number of educational artificial intelligence systems have been applied in schools[5]. These systems integrate educational artificial intelligence and Educational Data Mining (EDM) technology to track students'behavior data and predict their learning performance to support personalized learning. On the other hand, it has become an inevitable trend in the information age to lead the innovative development of education informationization by wisdom education, thus driving the innovative development of education and teaching[6].

2. Introduction to Machine Learning

2.1 Definition of Machine Learning

Some foreign scholars have defined machine learning. Mitchell believes that machine learning is the study of computer algorithms that can be automatically improved through experience [7]. Alpaydin believes that machine learning refers to the use of data or past experience to optimize the performance standards of computer programs [8].

From this we can see that machine learning is to improve the algorithm through experience or data, aiming at letting machines learn rules from a large number of historical data, automatically discover patterns and use them for prediction. In other words, machine learning means that machines learn from data. The more data they process, the more accurate the prediction is.

2.2 Two Stages of Machine Learning

2.2.1 Shallow Learning

In the late 1980s, the emergence of back propagation algorithm (also known as Back Propagation algorithm or BP algorithm) for artificial neural networks opened the curtain of shallow learning. Using BP algorithm, the artificial neural network model can learn rules from a large number of samples and predict them. However, the shallow learning model relies on manual experience to extract the features of samples, which often requires developers to mine good features.

2.2.2 Deep Learning

In 2006, Hinton, a professor at the University of Toronto, Canada, and Salakhutdinov, published an article[9], which opened a new chapter of in-depth learning. Subsequently, in-depth learning continues to heat up in the academic circles. At present, many well-known universities have joined in the research of in-depth learning. Unlike shallow learning models, which rely on manual experience, deep learning models learn more useful features by building machine learning models and massive training data, thus ultimately improving the accuracy of classification or prediction.

3. The Appropriateness of Machine Learning and Intelligence Education design

Wisdom education has become a new realm and new demand of education informationization. The core goal of wisdom education is to build a learning environment of technology integration, to enable teachers to implement efficient teaching methods, and to enable learners to obtain appropriate personalized learning services and good development experience. In the environment of intelligent education, learners'data are collected to form big data of education. Intelligent means are urgently needed to mine these data in order to find potential patterns and knowledge to support the innovative development of intelligent education. Therefore, it is certain that machine learning can help the wisdom education to deeply understand the learners'learning.

3.1 Action Object and Environment

The object of the machine learning method is educational data, including all data generated by the interaction between learners and educational system, as well as demographic, emotional, collaborative and managerial data. These data sources come from different educational environments. We think that the intelligent education environment can be divided into traditional education environment and network education environment, as shown in Figure 1.
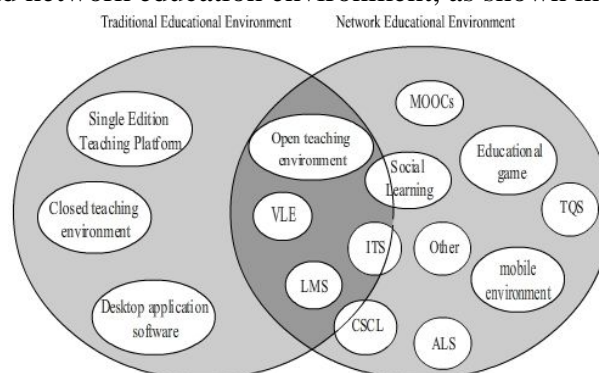

Fig.1. Map of Intelligence Education Environment

3.2 Action Process

Machine learning generally acts on the process of educational data mining. Educational data

mining involves the development, research and application of computer methods in the collection of a large number of educational data detection mode, is the integration of education and data mining. Data mining technology was first applied in the field of education in 1995, which opened the curtain of educational data mining research. Since then, it has gradually developed into an independent research field. Educational data mining includes pedagogy, computer science and statistics [22], as shown in Figure 2. Machine learning, as the integration of computer science and statistics, provides powerful technical support for educational data mining.
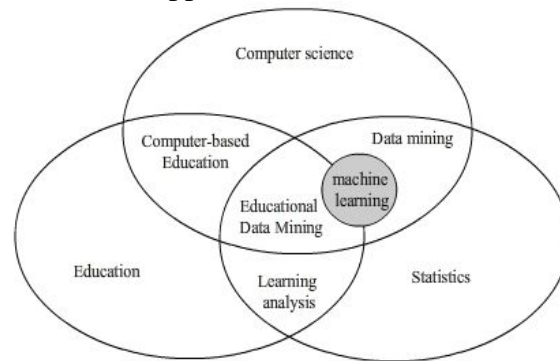
Fig.2. Integrating Multidisciplinary Educational Data Mining

3.3 Action Method

At present, there are many machine learning methods applied in the field of education, such as classification, regression, clustering, text mining, anomaly detection, association rule mining, social network analysis, pattern discovery and sequential pattern analysis. Among them, prediction and clustering are the most popular.

3.3.1 Prediction

Forecasting aims to develop a model to infer a single aspect of data (predicted variables) from a set of other aspects of data (predicted variables). In short, it is the process of inferring unknown events from known events. In the application of education, the commonly used prediction methods are classification and regression, which are generally used to predict students'performance and detect students' behavior.
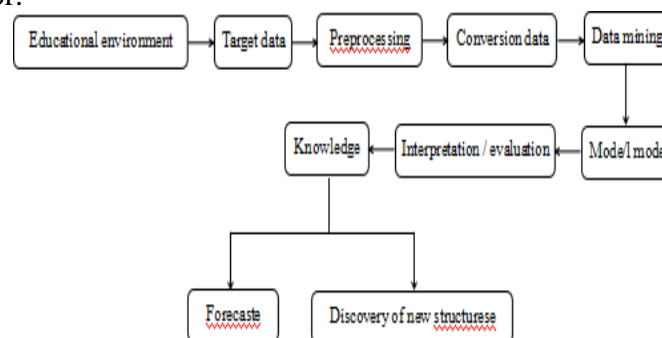
Fig.3. Educational Data Mining and Knowledge Discovery

(1) Classification: Generally used to predict students'learning performance, common algorithms include decision tree, random forest, role rules, stepwise regression and logical regression. For example, Lauri'a and others used machine learning methods such as logistic regression, support vector machine and C4.5 decision tree to analyze student data sets from different data sources; Thammasiri and others used machine learning techniques such as logistic regression, decision tree, neural network and support vector machine to analyze seven-year student learning data to predict whether freshmen would continue learning in the second semester [28].

(2) Regression: Generally used to analyze the relationship between learning behavior and learning performance. The commonly used algorithms are linear regression and regression tree. For example, Kotsiantis uses regression algorithm to analyze the score data of students submitting

homework online and the key demographic data of students to predict students'learning performance ; Hachey and others use binary logistic regression algorithm to analyze students' online course records and GPA to predict whether students can complete online courses .

3.3.2 Clustering

Clustering is usually used to discover common classifications in data sets that are unknown beforehand. In educational applications, it is usually used to group students or similar course materials based on students'learning and interaction patterns. For example, Yanto et al. demonstrated the applicability of using variable precision rough set model to cluster anxious students based on the accuracy mean of approximate values using variable precision attributes. Aher and Lobo used clustering algorithm and association rule mining to cluster and analyze learning records of Moodle courses, and then recommended appropriate courses to learners.

4. Application of Machine Learning in Intelligence Education

Machine learning belongs to the analysis technology of data mining, and data mining technology was first applied in the field of education in 1995. After that, it went through adolescence, research and development stages and up to now, foreign machine learning based on real data is mainly based on the results of case studies of educational application. Through sorting out the application of machine learning technology in educational data mining and its educational application, we find that The application of machine learning intelligence education mainly focuses on student modeling, student behavior modeling, prediction of learning performance, early warning of school dropout risk, learning support and evaluation.

4.1 Student modeling

Student modeling is the process of creating and maintaining student model module, which is mainly responsible for the development and maintenance of students'current knowledge state model, aiming at making assumptions about students' misunderstanding and sub-optimal performance, so that teachers can point out and propose amendments. Student model includes student model and diagnostic model. Student model stores data structure of student knowledge, diagnostic model executes diagnostic process and updates student model.

4.2 Student Behavior Modeling

Student behavior modeling is a process of analyzing students'performance, eliminating potential misunderstandings, presenting students' goals and plans, determining prior and acquired knowledge, maintaining situational memory, and describing personality characteristics. Machine learning methods can support automatic detection, recognition and modeling of learning behavior, aiming at adapting the system to learners'preferences by describing or predicting pattern behavior. The application of these algorithms describes learner behavior at different stages of problem solving. Provide design guidance for system maintenance.

4.3 Predicting Learning Performance

Top-test learning performance generally includes predicting students'final scores or academic performance. T Some studies directly predict learning outcomes by analyzing student data. For example, The research experiment is divided into two stages. In the training stage, the collected data is used to train the algorithm. In the testing stage, 10 sets of collected data are used to detect the accuracy of the algorithm.

4.4 Early warning of school dropout risk

The rate of negligence has always been an important indicator in the field of education management. Machine learning method can analyze and classify the data characteristics of students, analyze the reasons for dropping out, and measure dropout behavior. Although there are a large number of student data in the education management department, due to the lack of appropriate data

or limited by data privacy, quantitative research on early warning dropouts is relatively rare.

4.5 Learning support and assessment

Learning support and feedback is the key to strengthen the individualization and customization of online education system. In the process of interaction between learners and the system, learning support provides personalized learning services to improve learning performance, or to correct students'learning errors. For example, Ahai et al. combined machine learning with source code snapshot data in college students' programming process to enable the system to accurately detect students with high and low performance in the first week of the course.

5. Conclusion

In summary, machine learning can effectively help intelligence education, and its role in education artificial intelligence and education data mining can not be replaced by other technologies. With the continuous development and application of machine learning technology, its integration with the field of education will continue to promote educational innovation.

Acknowledgment

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