Research Article

Similar Classification Algorithm for Educational and Teaching Knowledge Based on Machine Learning

Yuping Li

School of Literature, Journalism and Communication, Zhengzhou Business University, Gongyi, 451200 Henan, China

Correspondence should be addressed to Yuping Li; 120212202038@ncepu.edu.cn

Received 18 February 2022; Revised 10 March 2022; Accepted 11 March 2022; Published 23 May 2022

Academic Editor: Mohammad Farukh Hashmi

Copyright © 2022 Yuping Li. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

From ancient times, machines did adhere to the commands that a human or a user prepared. According to the program, the machines are controlled by implementing machine learning (ML). It plays a significant part in the development of information technology (IT) companies and the rise of the education system. Using stored memories, people learn new things, making them feel better than before. Machines are pretty different from human knowledge. Instead of using memory power, they use statistical comparison to analyze the data. Here, the amount of data is stored in a database, and according to the reaction received from the user, it gets additional data to create new data. For example, once a person hears music using the application, they will hear repeated music before further entry. In this case, the application is working based on the machine learning algorithm. First, it collects the information from the user, and then, it uses the same information (data) to make the user’s work more efficient when they return. The existing system like Support Vector Machine (SVM) and learning management system approaches the necessity and development of the higher education system using machine learning algorithms. This proposed system focuses on classifying education and teaching knowledge by implementing the machine learning-based similar classification algorithm (ML-SCA). ML-SCA focuses on classifying similar teaching videos and the recommendations to improve the teaching and academic knowledge for the teachers and the students. ML-SCA is compared with the existing neural network and $K$-means algorithms. Based on the efficiency results, it is observed that the proposed ML-SCA has achieved 92% higher than the existing algorithms.

1. Introduction

The advent of information technology is transforming education by introducing new technologies such as Massive Open Online Courses (MOOCs), mobile learning, and blended learning. The advantages of MOOC learning include low costs, remarkable efficiency, and the ability to learn on the go and in small chunks [1]. However, most courses are mostly video-based and lack contact and connection with lecturers, which is not ideal for deep learning. “Learner-centered” principles indicate that hybrid learning modes combine the significant advantages of online and traditional classrooms for students and teachers alike [2]. One can safely say that educational reformers worldwide are increasingly resorting to hybrid teaching approaches to investigate better and disseminate high-value educational resources [3]. Software development, platform enhancement, and instructional practice all fall under the umbrella of research in the field of hybrid education. Armando Fox was the mastermind behind the MOOC’s inception. The typical classroom on campus raises the degree of educational quality. Student responses to teacher questions are combined with self-directed study and testing in a SPOC (Small Private Online Course), a hybrid learning technique described by the researcher. The author investigated the components in frequent SPOC circumstances, such as learning needs, learning strategies, material preparations,
assessment, and evaluation [4]. However, hybrid education fails to address a few critical challenges. These are as follows:

(i) In what ways do students’ online learning habits reflect their personal learning preferences?

(ii) Do both of these online learning habits have the ability to predict future performance?

(iii) How can the findings be used to help students improve their academic performance in the classroom in the future?

ML’s most important subfield in data mining employs data mining to find helpful information in massive amounts of data to advance AI (artificial intelligence). Ayala’s machine learning consists of “learning from experience” and “optimizing the analysis by reviewing the findings” [5]. Machine learning methods such as logistic regression, decision trees, neural networks, Bayesian networks, clustering, and supporting vector machines are all standard. Big data is a cutting-edge new technology that can transform many industries. Data mining in education is a hot new research subject that is both a manifestation of current digital education research and a sign of the looming need [6]. Using EDM, a brand-new field of study, it is possible to understand students and their learning settings better. A semester’s worth of data is often collected from online courses, but they are not used to improve student performance in the traditional offline classroom setting [7]. To solve these issues in hybrid education, this article employs machine learning to help instructors better understand students’ online behaviors, focus on student learning styles, and pay greater attention to students who need assistance [8]. To achieve our goals, we first formalized the online learning analysis problem using machine learning methods and then built a prediction model [9].

Acknowledgment is the final step in the process. One of the hottest topics in technology is the rise of artificial intelligence (AI) [10]. Conceptually, it permits robots to learn from a range of circumstances. Statistical artificial intelligence is a branch of computer science that uses statistical methods to allow computers to “learn” and make decisions [11]. Many businesses use it to help them perform better, but it also has some intriguing applications in education. Many kids now prefer to pay someone to do their homework because they do not grasp what they are taught in school [12]. Machine learning can help students improve their academic performance by analyzing and recommending the best learning technique. There is a lot more to machine learning than what people have seen in recent years, and it has the potential to transform the entire education system [13]. A method of education in which students receive personalized learning experiences adapted to their requirements is called “learning” [14]. With the development of machine learning algorithms, our teaching methods and curriculum may be adapted to each student’s individual needs. With the development of machine learning, it is now much easier to allow personalized interaction to adjust to the individual's needs to give a better education [15]. The software aids the learner in determining which courses to pursue. However, ML-powered software also recommends study materials and learning methods more suited to the student’s learning style. With the development of machine learning, schools and universities can now better organize and manage their content and curriculum [16]. As a result, the work is better distributed because everyone’s potential is better understood. This method makes it easy to determine what works best for the individual instructors and the students. Students are more engaged and interested in learning and participating when machine learning makes education easy for teachers and students. It is a no-brainer that it improves the educational system’s efficiency. Furthermore, machine learning assists educators in becoming more productive by addressing issues such as classroom management and scheduling [17]. Teachers can now devote their energy to tasks that AI and machine learning are still unable to accomplish. Teachers are often baffled by the materials they use to teach their students. Students miss out on important insights and takeaways when teachers become bogged down in the middle of a class. By using machine learning-powered learning analytics, teachers can improve their understanding of their data. In teaching and learning, teachers move through a vast amount of material, analyze it, interpret it, and draw conclusions from it [18]. In addition, learning analytics can help determine the best course of action for each particular learner. There are several advantages for students as well, because the software provides recommendations for resources and other learning methods. Many firms have benefited from machine learning’s predictive analytics capability during the past few years [19]. On the other hand, predictive analytics in education seeks to better understand the mindsets and requirements of students as individuals rather than as a group. It is also a good way to prepare for the changes likely to occur in education shortly. Teachers can learn a lot about their students’ abilities and weaknesses by looking at the outcomes of class examinations and half-year assessments. This will give teachers and parents the information to aid each pupil. As a result, teachers will be able to assist students more comprehensively due to this [20]. As some may have already discovered, it aids educators in better comprehending each student’s unique needs. It is now feasible to offer a customizable education model in which students can take control of their learning with this feature. Students are free to set their own pace for studying. Thanks to machine learning, students now have more freedom to tailor their education to their interests and choose which teachers and curricula they want to study from [21]. A learning environment tailored to each student’s requirements and interests is now possible. Assessments are also being revolutionized by machine learning. It can grade papers and tests with greater precision than a person. As many people have noticed, OMR answer sheets were (and still are) a difficult procedure to check. There was also the possibility of making a mistake while grading the papers. The evaluation can be more precise. Machine learning guarantees that the outcomes are as accurate as possible, even when human intervention is required. It can be said that machine learning provides a more valid and reliable way to
assess student achievement. It will take some time for all educational institutions to get acquainted with machine learning’s capabilities. More effort remains to be made to fully utilize these technologies in educational settings [22]. However, machine learning and artificial intelligence have already had a positive impact on the educational landscape. Hence, this study implements the similar classification for analyzing educational and teaching knowledge. The contributions of this work are as follows:

(i) This study focuses on classifying education and teaching knowledge by implementing the machine learning-based similar classification algorithm (ML-SCA)

(ii) ML-SCA focuses on classifying similar teaching videos and the recommendations to improve the teaching and academic knowledge for the teachers and the students

(iii) ML-SCA is compared with the existing neural network and $K$-means algorithms

1.1. Motivation of the Study. The investigation into educational teaching focuses on determining how academic institutions that provide knowledge will have to comply with purely online teaching in a relatively short period. People investigated students’ perceptions of online courses, their ability to help certainly, and their use of educational and learning platforms in this regard. An online survey based on a moderately structured questionnaire was conducted. The data was provided for educational teaching classes from academic institutions. According to the study’s findings, Romanian higher education institutions cannot prepare purely for online teaching. Machine learning is being used to educate and train students about knowledge performance indicators. The similar classification algorithm is being used in the classroom to support children’s physical and emotional development. A few students disagree only with the ML-similar classification algorithm, trying to define this as an eventual inclination against innovative capability and the subjective education method.

2. Materials and Methods

While machine learning is an important thing that is being popular these days, introducing the machine learning concept into the development of the education system is being made worse by its activities. First, the platform is designed for the classroom; second, there is learning software that can be used by the instructor and distributed to students who want to learn or are enrolled in the course. Moreover, the third option is the platform that permits the students to access it directly without teachers’ knowledge. There was no online education system prior to 2010, and even now, it has had little impact on the participants. Right now, the entire world is sitting on online applications. However, neither students’ nor teachers’ ways of communication are made through online platforms due to the pandemic circumstances. While analyzing the data mining concepts, it is most important to deal with contemporary algorithms and modern data methods for developing technological prospects. When the limitations of the algorithm increase, it also affects the utilization of the system. Only after finalizing the report from the survey has it been analyzed whether machine learning would impact the education system or not.

The algorithm used in machine learning to improve the country’s educational system is possible by making the controlling work done by the system itself and not by a separate faculty. It will be possible to create new tasks only after the student’s input dataset has been saved in the cloud. The author deals with algorithms similar to naive Bayes, ID3, C4.5, etc. The classification of the input dataset is performed here to make the final decision and the working procedure for the machine. With the help of 35 attributes and nearly 700 instances, the machines are operated by using such an algorithm. Monitoring is the process of doing entire tasks that are mandatory for student management. From the first week to the last week of learning, the machine should act as a teacher and instruct the student from the testing reports. At the same time, the accuracy of the results is taken from SVM reports with 90% accuracy, and the naive Bayes algorithm seats with 80% accuracy. If the number of datasets was collected more, the output would be alternated. Finally, the most important thing is that the learner should be satisfied with the teaching session conducted by machines. Anyhow, the teaching videos and the recommendations are recorded with video sessions, but the authorization and management are entirely made by the algorithm that the user gives, and the architectural representation is given in Figure 1.

They use machine learning to educate and train pupils based on knowledge performance indicators. The similar classification algorithm supports kids’ physical and emotional growth in the classroom. Some students disagree with the ML-similar classification algorithm (ML-SCA), defining the similar classification algorithm as the eventual inclination against innovative strategy and mental education approach. The ideas developed by students’ experiences must be evaluated for such instructional requirements and the chance of growing talent and by measuring knowledge growth through scientific and technological innovation in learning.

Its classification algorithm seems to be a learning-based technique that uses training data to determine the category given new observations. Classification is a process of software learning from a dataset or observation and then classifying fresh observations into one of several classes or groupings. According to the study’s conclusions, Romanian higher education institutions will be unable to educate students solely for online instruction. Students are being educated and trained using machine learning regarding knowledge performance measures. The similar classification algorithm is utilized to enhance children’s physical and emotional development in the classroom. A few students are solely opposed to the ML-similar classification algorithm (ML-SCM), attempting to characterize this as an eventual bias against innovative talent and the subjective educational technique.

The observation similar classification algorithm is represented by $x$-score. The equation below illustrates the similarity in between $x$ and the dataset of students in the $[|x|]$. The $x$
-score represents the observable similar classification algorithm. The following equation \( T \) depicts the similarity between \( \omega \) and also the dataset for students in \( |x| \) following

\[
x = \sum_{x=1}^{x} \left[ \frac{(Tx - \delta)}{\omega} \right] + sT\varphi. \tag{1}
\]

Here, mean data represent \( \delta \), standard deviation represents \( \varphi \), and \( x \) is specified as the number of students. In this case, \( \delta \) is the function of human willingness and \( \varphi \) is the sensation of activities in educational systems, and educational and teaching knowledge follows

\[
x = \sum_{x=1}^{x} \frac{Tx - T\bar{s}}{xsF} + \frac{(Tx - \delta)}{\varphi}. \tag{2}
\]

\( T\bar{s} \) is represented as mean and it is treated as the direction of vector, and \( xsF \) is represented as standard deviation and is composed of the random example. As a result, the vector of direction \( T\bar{s} \) can also be written as

\[
x_i = \sum_{x=0}^{x} \beta_0 + \beta_1 Tx_i + \epsilon o_i. \tag{3}
\]

In equation (3) \( \beta_0 + \beta_1 Tx_i + \epsilon o_i \) represents the pedagogical teaching using similar classification algorithm framework. As indicated by equation (4), \( (Tx - T\bar{s})/xsF \) a centralized repository is an educational framework that ties to identifying the unjust progress of an \( (Tx - \delta) \) information society that has lost its crucial role in teaching.

\[
\sum_{R=1}^{R} \gamma_i \sim \sqrt{R} \frac{\gamma}{\sqrt{\gamma^2 + R - 1}}. \tag{4}
\]

\( \gamma_i \) is specified for a random variable; the \( \sqrt{\gamma^2 + R - 1} \) standard deviation is being used to standardize the variable’s modifications. Equation (5) is used to \( \sum_{i=1}^{\lambda_{mov}}/q^{mov} \) determine the minute scalability variance.

\[
MSV = \sum_{i=1}^{\lambda_{mov}} + \frac{\gamma}{\sqrt{\gamma^2 + R - 1}}. \tag{5}
\]

\( msv \) is specified as minute scalability variance utilized in

\[
\lambda_{mov} = \sum_{i=1}^{\nu} \exp(v(Ti - \alpha)^{mov}) msv. \tag{6}
\]

From teaching configuration to a present level of determining similar classification algorithm through implementing its equation, the goal is to educate people in a thorough and simple order to incorporate educated predetermined attitudes and ethics that are suitable for specific mental factors. \( Ti \) is specified for a random variable, \( \gamma_c \) is specified for coefficient variation, and \( \exp v \) is specified as the expected value in

\[
\theta_{\gamma m} = \sum_{i=1}^{T} (\sqrt{\exp v(Ti - \alpha)^{mov}})^2 + \gamma_c \frac{msv}{TT}. \tag{7}
\]

Students think that education seems to be the objective and also that the topic of education is about more than education; advancement, admiration, recognizing, service, and support enable students to enhance their skills. If we define \( x = (x_1, x_2) \) and \( \omega = (a,-1) \), then we obtain

\[
F(x_1) = \alpha x_1 + x_2 + b = 0 + \begin{cases} +1, & \text{if } R.x + b \geq 0, \\ 1, & \text{if } R.x + b < 0. \end{cases} \tag{8}
\]

The observation mean is represented by \( X = (X_1, X_2, \cdots, X_n) \). The similarity between the \( x \) and the database of college students in the \( ||X|| \) is demonstrated in

\[
||X|| = \sum_{i=0}^{n} X_1^2 + X_2^2 + \cdots + X_n^2 + \sum_{x=1}^{b} \alpha x_1 = x_2 + b = 0. \tag{9}
\]

\( \delta \) is specified for the functional derivative with regard to the \( x \) function assumed to be a variable and independent, while equation (10) is kept unchanged.

\[
X = \sum_{x=1}^{b} \alpha x_1 = x_2 + b = 0 + \frac{(TX - \delta)}{\omega}. \tag{10}
\]

\( \omega \) is represented as the first limit ordinal denoted by this symbol. It is signified as \( \omega \) and identifiable by the \( \sqrt{\exp v(Ti - \alpha)^{mov}} \) organised variety of environmental percentages as in equation (11). In \( X = (X_1, X_2) \), the sense of tasks in education systems and educational teaching has obscured.

\[
X = \sum_{i=1}^{T} \frac{TX - T\bar{s}}{xsF} + \sum_{i=1}^{T} \left( \sqrt{\exp v(Ti - \alpha)^{mov}} \right)^2. \tag{11}
\]

\( T\bar{s} \) is represented as the mean which is the direction of
vector and XSF is represented as the standard deviation. Here, \( w \) in equation (12) of human desire is blurred.

\[
\omega = \sum_{x=1}^{b} \left( \frac{X_1}{\|X\|}, \frac{X_2}{\|X\|} \right) + \sum_{x=1}^{b} \alpha x_1 = x_2 + b = 0. \tag{12}
\]

As a result, the vector of direction \( \vec{T} \) can also be written as

\[
X_i = \beta_0 + \beta_1 TX_i + \varepsilon_i + \sum_{x=1}^{i}\frac{TX - \vec{T}}{xsF} + (Tx - \varepsilon). \tag{13}
\]

If we can see that \( \cos (\theta) = X_i/\|X\| \) and \( \cos (\alpha) = X_2/\|X\| \), thus the direction vector \( w \) can also be written as

\[
w = \sum_{X \rightarrow Y} \left( \cos (\theta), \cos (\alpha) \right) + \sum_{X \rightarrow Y} X.Y = \|X\|\|Y\| \cos (\theta)
+ \beta_0 + \beta_1 TX_i + \varepsilon_i. \tag{14}
\]

It can be seen that if \( \theta = \beta - \alpha \), then we can get to determine

\[
\cos (\theta) = \sum_{X \rightarrow Y} \cos (\beta - \alpha) = \cos \beta \cos \alpha + \sin \beta \sin \alpha
\]

\[
= \sum_{X \rightarrow Y} \frac{X_1 Y_1}{\|X\|\|Y\|} + \frac{X_2 Y_2}{\|X\|\|Y\|}
\]

\[
= \sum_{X \rightarrow Y} \frac{X_1 Y_1 + X_2 Y_2}{\|X\|\|Y\|}. \tag{15}
\]

As \( \cos (\beta - \alpha) = \cos \beta \cos \alpha + \sin \beta \sin \alpha \) is illustrated in the equation below, the \( X_i/\|X\|Y_i/\|Y\| \) educational teaching centralized repository of the framework is an educational framework that connects with identifying \( X_2/\|X\|Y_2/\|Y\| \) the unreasonable evolution of a knowledge economy following Equation (16), which has lost its essential place in life teaching.

\[
X.Y = \sum_{X \rightarrow Y} \|X\|\|Y\| \frac{X_1 Y_1 + X_2 Y_2}{\|X\|\|Y\|}
\]

\[
= \sum_{X \rightarrow Y} X_1 Y_1 + X_2 Y_2 + \sum_{x=1}^{b} \alpha x_1 = x_2 + b = 0. \tag{16}
\]

From teaching design to the current level of determining classification methods by applying the equation, the goal is to educate individuals in a systematic and simple manner to incorporate educated predefined values and behaviour that are acceptable for specific thinking patterns. The inquiry into

![Figure 2: Performance analysis for the number of educational and teaching knowledge using the machine learning-based similar classification algorithm.](image-url)
educational teaching focuses on determining how academic institutions were able to deliver knowledge during which they would have to comply with fully online teaching in a short period. Students’ impressions of online courses, their ability to assist, and their use of educational and learning tools in this respect were explored. A moderately structured questionnaire was used to conduct an online survey. Academic institutions contributed the data for educational training classes. According to the study’s conclusions, Romanian higher education institutions are unable to prepare solely for online instruction. Students are being educated and trained using machine learning regarding knowledge performance measures. The similar classification algorithm is utilized to enhance children’s physical and emotional development in the classroom. A few students are solely opposed to the ML-similar classification algorithm, attempting to characterize this as an eventual bias against innovative talent and the subjective educational technique.

3. Results and Discussion

\[ \beta_0 + \beta_1 T \gamma + \epsilon \delta \] represents the pedagogical teaching based on the machine learning-based similar classification algorithm framework. As indicated by the equation below, \((T \gamma - T \delta)/x\) a centralized repository is an educational framework that ties to identifying the unjust progress of an \((T \gamma - \delta)\) information society that has lost its crucial role in teaching based on the similar classification algorithm, as shown in Figure 2, which is a data analysis technique which can also extract the greatest value from data processing through analyzing and altering basic data. Machine learning methods are easy to detect trend lines in information even though data processing is normally extra-intelligent and the amount of free data is relatively large. Table 1 displays the outcome of the ML-SCA in the context of option-based position, education value, importance model of education, and turning point and conflict.

ML-based educational teaching covers topics such as effect approach position, defining moment, disagreement, and educational value as depicted in Figure 3. The percentage of adjustment in each of these subjects is shown in Table 2. According to the ideological and methodological model, individual people have resulted in intellectual and social education of suggestions, a certain type of development, and rationale. \( \gamma \) is specified for a random variable; the \( \gamma^2 + R - 1 \) standard deviation is being used to standardize the variable’s modifications. Equation (5) is used to determine the minute scalability variance. In aspects of the social and intellectual education framework, for the conceptual scientific process, refer to Figure 3, and thus, the educational theory and practice of links and interconnection were integrated into sensible teaching methods.

A similar classification algorithm can get the best possible deal on data processing by analyzing and modifying the core data. Machine learning methods find it difficult to

![Figure 3: Median scores and differences in educational teaching statistics using the similar classification algorithm with machine learning.](image-url)

**Table 2: Result analysis of median scores and differences in educational teaching statistics using the similar classification algorithm with machine learning statistics.**

| Student        | Similar classification algorithm | Performance analysis (%) |
|----------------|----------------------------------|--------------------------|
| Teaching attitude | 3                               | 0.765                    | 86                     |
| Teaching acceptance | 2.5                             | 0.853                    | 76                     |
| Learning situation  | 2.7                             | 0.793                    | 73                     |
| Class room effect    | 3                               | 0.884                    | 80                     |
detect trends in information even though data processing is typically more complex and there is large availability of information. The observation mean is represented by $X = (X_1, X_2, \ldots, X_n)$. The similarity between the $x$ and the database of college students in the $||X||$ is demonstrated in equation (9). $\omega$ is represented as the first limit ordinal denoted by this symbol. It is signified as $\omega$ and identifiable by the $\sqrt{\exp v(Ti - \alpha)^{\text{max}}}$ organised variety of environmental percentages. The $X = (X_1, X_2)$ sense of tasks in education systems and educational teaching has obscured. The reviewed student is given in Figure 4. The use of analyses and retrieval data technology in student ideological and educational teaching allows for the analysis of subnet educators’ work predictors, assessing their extensive functionality, and enhancing teaching planners for students and accurately placing to enhance education. Table 3 shows the outcome.

The system efficiency is validated based on the aforesaid analysis. Relating to decision analysis, the real need is to check the performance of a higher education classroom teaching method by using a higher education as an example and is represented in the Equation (5). Through evaluation, its teaching technique and the student learning technique are assessed and statistically analyzed with quantitative grading. Teachers and students review the system after utilising it.
in higher education institutions for a length of time. First and foremost, this article validates the impact of teaching assessment on the system. If we can see that \( \cos (\theta) = \frac{X}{\|X\|} \) and \( \cos (\alpha) = \frac{Y}{\|Y\|} \), thus the direction vector \( w \) can also be written with the results provided in Figure 5.

In this research, we analyze the efficacy of the prediction model in issue extraction of the high-efficiency teaching methods with the machine learning and comparable classification algorithms and the effect of statistical issue mining. As \( \cos (\beta - \alpha) = \cos \beta \cos \alpha + \sin \beta \sin \alpha \) is illustrated in the equation below, the \( \frac{X}{\|X\|}\frac{Y}{\|Y\|} \) educational teaching centralized repository of the framework is an educational framework that connects with identifying \( X\frac{Y}{\|Y\|} \) the unreasonable evolution of a knowledge economy following equation (16), which has lost its essential place in life teaching. Figure 6 depicts the results. It is also clear from this paper that the results of the evaluation of the teaching planning process are more logical, and also, the formulation has some relevance to teaching techniques. As a result, the system model presented in this paper offers some advantages to update the teaching tactics.

4. Conclusions

Machines have always obeyed human- or user-prepared orders from the dawn of time. Using computer software, the machine learned to operate consistently with its design. It has a significant impact on the growth of both the IT industry and the educational system. Support Vector Machine (SVM) and learning management system (LMS) use machine learning algorithms to address the need for and development of higher education systems. Machine learning-based similar classification algorithm (ML-SCA) is used to classify education and teaching knowledge in this proposed system. In order to help teachers and students improve their academic knowledge, ML-SCA categorises similar teaching videos. The neural network and K-means algorithms are compared to the new SCA. It has been found that the proposed ML-SCA is 92% more efficient than the current algorithms.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

References

[1] U. Cakiroglu, “Analyzing the effect of learning styles and study habits of distance learners on learning performances: a case of an introductory programming course,” *International Review of Research in Open and Distance Learning*, vol. 15, no. 4, pp. 161–184, 2014.

[2] M. Robert, W. W. Gagne, W. Xiaoming, P. Weiguo, C. Baohua, and L. Yali, (Translation). *Principle of Instructional Design*, The Fifth Edition Normal University Press, East China, 2007.

[3] C. Liu and C. Li, “On the analysis of learning situation in junior middle school physics teaching under the new curriculum concept [J],” *Basic education courses*, vol. 11, pp. 11–15, 2014.

[4] Fox, “From MOOCs to SPOCs,” *Communications of the ACM*, vol. 56, no. 12, pp. 38–40, 2013.

[5] W. Di, *Research on the Application of Mixed Learning Model Based on SPOC [D]*, Chongqing normal university, 2017.

[6] Y. Sun, *Research of Design and Practice Based on SPOC College Basis Computer Courses in the Post MOOC*, Hebei normal university, 2015.

[7] X. He, *Flip the Classroom Interaction Based on SPOC Decay Course Design and Development*, Hebei Normal University, 2015.

[8] I. H. Witten, E. Frank, and M. A. Hall, *Data Mining: Practical Machine Learning Tools and Techniques, (the 4th edition)*, Morgan Kaufmann publishers, San Francisco, 2016.

[9] P. Ayala, “Learning analytics: a glance of evolution, status, and trends according to a proposed taxonomy,” *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 8, no. 3, pp. 1–29, 2018.

[10] T. Zipei, *The Big Data Revolution*, Guangxi Normal University Press, 2012.

[11] E. Fernandes, M. Holanda, M. Victorino, V. Borges, R. Carvalho, and G. V. Erven, “Educational data mining: predictive analysis of academic performance of public school students in the capital of Brazil,” *Journal of Business Research*, vol. 94, no. 34, pp. 335–343, 2019.

[12] L. Qiange, Z. H. A. O. Chenjie, and L. U. O. Xianlu, “Analysis and design of the academic analysis system based on big data application technology,” *Software Engineering*, vol. 21, no. 5, pp. 34–37, 2018.

[13] S. F. Tseng, Y. W. Tsao, L. C. Yu, C. L. Chan, and K. R. Lai, “Who will pass? Analyzing learners behaviors in MOOCs,” *Research and Practice in Technology Enhanced Learning*, vol. 11, no. 1, pp. 1–11, 2016.

[14] S. B. Asher and L. M. R. J. Lobo, “Combination of machine learning algorithms for recommendation of courses in e-learning system based on historical data,” *Knowledge-Based Systems*, vol. 51, no. 1, pp. 1–14, 2013.
[15] R. Gawande, “Evaluation of automotive data mining and pattern recognition techniques for bug analysis,” Journal of Neural Engineering, vol. 9, no. 2, pp. 26008–26021, 2016.

[16] C. Zhang, Design and Implementation of Learning Early Warning System Based on Teaching Data Analysis, Shandong Normal University, 2018.

[17] F. Dalipi, S. Y. Yayilgan, A. S. Imran, and Z. Kastrati, “Towards understanding the MOOC trend: pedagogical challenges and business opportunities,” International conference on learning and collaboration technologies, vol. 9753, no. 1, pp. 281–291, 2016.

[18] L. Lu, Learning State Analysis of Students Based on Outlier Detection, Huazhong university of science and technology, 2016.

[19] H. J. Chen, Y. H. Dai, Y. J. Feng, B. Jiang, J. Xiao, and B. You, “Construction of affective education in mobile learning: the study based on learner’s interest and emotion recognition,” Computer Science and Information Systems, vol. 14, no. 3, pp. 685–702, 2017.

[20] Y. Zhang and W. Jiang, “Score prediction model of MOOCs learners based on neural network,” International Journal of Emerging Technologies in Learning, vol. 13, no. 10, pp. 171–182, 2018.

[21] J. Wang and W. Zhang, Support Vector Machine and Its Intelligent Optimization, Tsinghua Press, Beijing, 2015.

[22] J. Liang, Application of Support Vector Machine Algorithms in Large-Scale Sample Data, China petrochemical press, Beijing, 2017.