Migration Letters

Volume: 20, No: 7, pp. 1053-1070

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Deep Learning-based Ideological and Political Education Intelligent Classroom Research

Zenan Zou[1]

Abstract

With the rapid development of deep learning technology, the application of deep learning in the field of education has become an important way to improve the effect of ideological and political education. The purpose of this paper is to deeply explore the feasibility of applying deep learning technology to build a intelligent classroom in ideological and political education. First, the basic principles of deep learning are introduced in detail, including the structure of neural network and the training process . Then, the application of deep learning in the field of education, such as the research results of student behavior analysis, learning outcome prediction and personalized teaching, is elaborated. Then, the value and significance of intelligent classroom in Ideological and Political Education are discussed, such as enhancing students' ideological and moral qualities through intelligent teaching tools and personalized learning resources, and the design framework of Deep Learning-based intelligent Classroom is proposed, including the elements of intelligent integration of teaching resources, personalized guidance of the learning process and real-time analysis of students' performance. Finally, the validity of the framework is verified through empirical research, and the impact of the intelligent classroom on ideological education is discussed. The results show that deep learning technology has an important application value in the construction of a intelligent classroom for civic and political education. This paper has important reference significance for improving the effect of Civic and Political Education.

Keywords: *Deep Learning; Ideological and Political Education; intelligent Classroom.*

1. Introduction

With the current rapid development of society, social life and the main contradiction of society has changed, the development of informationization and intelligence has penetrated into every aspect of life, which determines that the function and value role of ideological and political education is bound to change. Nowadays, the concept of intelligent education has been continuously applied and developed in subject teaching, and it has become a new classroom teaching method (Rong, 2023).

Deep learning As an important branch of artificial intelligence , based on the design and training of multi-layer neural networks, it is able to realize automatic learning and abstraction of large-scale data, and Figure 1 shows the development history of deep learning. Its principle is to connect neurons of multiple hidden layers to each other and optimize the model through back propagation algorithm, so as to achieve efficient processing and analysis of complex tasks. The significance of deep learning is that it is

[1] International Education, The university of Exeter, England, Email: zouzenan1999@outlook.com

able to process and utilize massive amounts of data, extract the potential features and patterns hidden behind the data, and provide us with a more accurate and efficient basis for decision-making and application services (Wang & Ma, 2023).

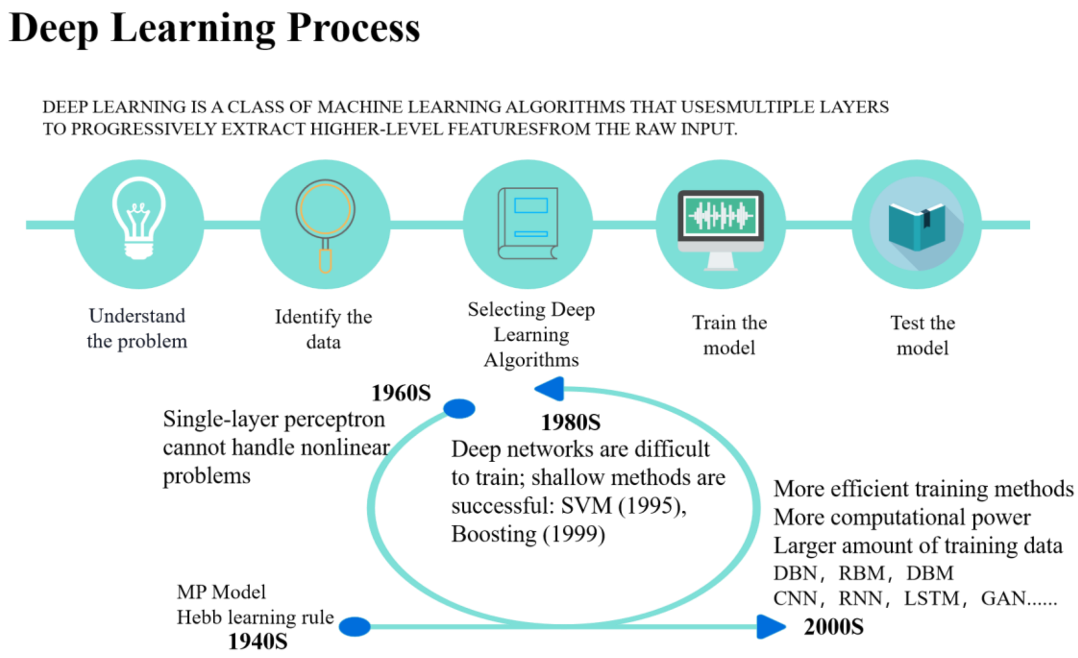

Figure 1 Deep learning development history

Ideological and Political Education intelligent classroom refers to a way of reforming and innovating traditional civic and political education by utilizing modern information technology and artificial intelligence technology. Through the use of intelligent equipment and software in the classroom, personalized teaching and accurate assessment of students can be realized, and the effect and quality of Civic and Political Education can be improved. The intelligent classroom can promote students' participation and learning enthusiasm, enhance their interest in and understanding of the Ideological and Political Education course, improve their independent thinking and innovation ability, and cultivate their sense of social responsibility and civic awareness. Deep learning has a wide range of applications in the wisdom classroom of Ideological and Political Education. First, using deep learning technology, it can analyze and predict students' learning behavior, help teachers understand students' learning situation and needs, and provide personalized learning advice and counseling. Second, deep learning can assess students' learning outcomes, and through an automated grading system, it can evaluate students' thinking ability and expression ability more objectively, helping teachers guide students' learning more accurately (Lu, 2021). In addition, deep learning can provide more comprehensive and in-depth knowledge and practical guidance through the training and analysis of data models, enrich the content and methods of Civic Education, and enhance students' understanding and recognition of social issues and values.

The research content of this paper is the construction and application of a intelligent classroom for Ideological and Political Education based on deep learning. We will explore the application potential of deep learning in the field of Ideological and Political Education, design and develop a corresponding intelligent classroom system, and verify its effectiveness and practicality through actual teaching experiments and data analysis. The research significance of this paper is to provide a new path and method of wisdom in Ideological and Political Education, which provides theoretical and practical support for improving the quality and effect of Ideological and Political Education.

2. Deep Learning and the Civic Education intelligent Classroom Overview

2.1 Deep Learning Theory Overview

2.1.1 Deep Learning Concept Definition

Deep learning is a machine learning method that aims to achieve intelligent task processing capabilities of computers by simulating the neural network structure and function of the human brain. It is based on multi-layer neural networks, which are trained to automatically learn and extract features from data by training a model with a large amount of sample data to perform operations such as classification, recognition, prediction, and generation in a variety of tasks. The concept of deep learning focuses on its multilayer network structure, as shown in Figure 2, where the connections between these network layers are weighted by empirical data so that the model can be automatically adapted to the input data (Chen & Guan, 2022).

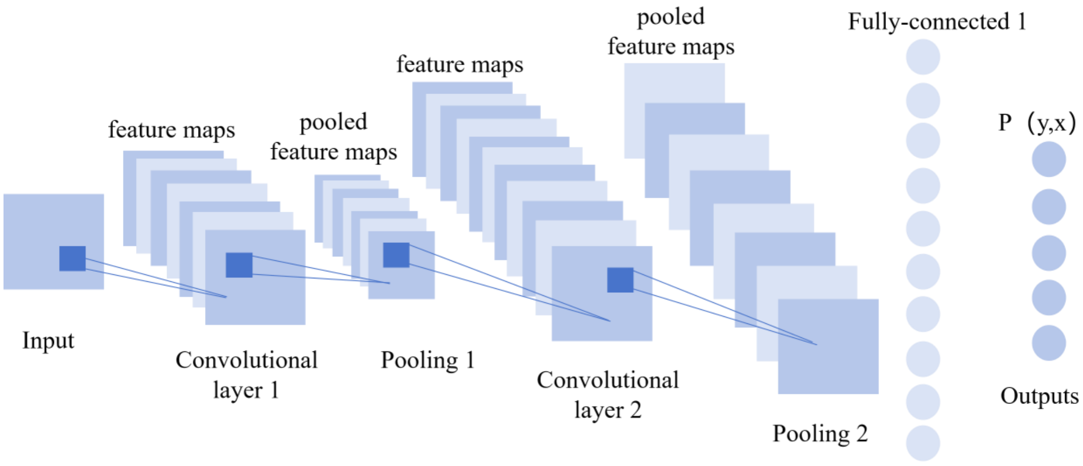

Figure 2 Multilayer network structure for deep learning

2.1.2 Characterization of deep learning

The characteristics of deep learning include the following:

(1) Automatic learning: Deep learning models can automatically learn features in data without manual extraction. By training a neural network, the model can automatically learn complex patterns and representations in the data through multiple layers of abstraction.

(2) Hierarchical structure: deep learning models consist of multiple layers, each of which abstracts the input data at a different level, from low-level features to high-level semantic features. This hierarchical structure helps the model to better understand and represent the data (Li, 2021).

(3) Large-scale data: deep learning models usually require a large amount of sample data for training. By utilizing large-scale data, the model can more fully learn the patterns and associations in the data and improve the accuracy and generalization ability of the model.

(4) Nonlinear transformations: deep learning models use nonlinear transformation functions (e.g., activation function) to introduce nonlinear relationships that allow for better fitting of complex data distributions. This nonlinear processing capability allows the model to handle a variety of complex problems (Liu, 2023).

(5) End-to-End Learning : Deep learning models can learn the mapping relationships of data in an end-to-end manner, going directly from input to output. This means that the whole task can be done by a unified model, avoiding manual design of features and multiple stages of processing. Figure 3 shows the end-to-end deep learning process .

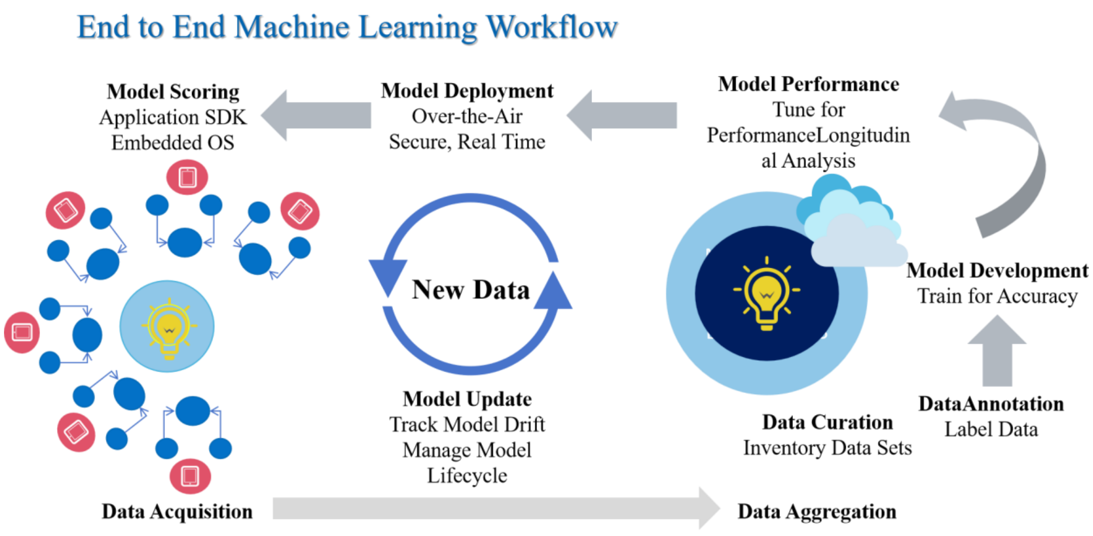

Figure 3 End-to-end deep learning process

(6) Powerful generalization ability: deep learning models have powerful generalization ability through the training of large-scale data and the ability of multi-layer abstraction. Even on unseen data, the model can predict and classify well.

(7) Parallel computing: due to the parallel computing nature of deep learning models, the training and inference process can be accelerated with the help of modern hardware and massively parallel computing platforms (e.g., GPUs) to improve the efficiency and speed of the models (Long & Zhao, 2020).

Together, these features make deep learning a powerful tool for processing complex data and solving a variety of tasks. The development and advancement of deep learning has also given a great boost to the application of artificial intelligence, enabling computers to better understand, process and generate data and information of interest to humans.

2.2 Overview of the Ideological and Political Education intelligent Classroom

Ideological and Political Education intelligent classroom refers to an educational model that uses information technology and intelligent tools to improve the teaching effect and management efficiency of the Ideological and Political classroom. In the Ideological and Political Education intelligent Classroom, teachers and students can conduct teaching and learning activities through technological means such as the Internet, digital devices and apps. This educational model aims to provide a richer, more innovative and personalized teaching experience, and to increase students' motivation and engagement in learning. Table 1 shows the current status of the development of the intelligent classroom for political and economic education.

Table 1 Current status of the development of the intelligent classroom in Ideological and Political

Development dimension	Descriptive
Technical Support	The Ideological and Political intelligent Classroom is widely supported by modern educational technologies, including the Internet, multimedia technologies, and teaching management systems.
Scope of Application	Ideological and Political intelligent classrooms are gradually being applied in higher education and primary and secondary education, and the construction of intelligent classrooms in schools at all levels is constantly being promoted.

Abundant teaching resources	Many schools and educational institutions have provided rich teaching resources for the intelligent classroom of Ideological and Political through digital resource construction and sharing.
Teacher training support	Schools and educational institutions provide teachers with training and support in intelligent classroom teaching concepts, technology applications and teaching methods.
Increased student engagement	Students' active participation in the Ideological and Political intelligent Classroom has increased, and their motivation and interest in learning has been enhanced.
Effectiveness evaluation and research	Academics and educational institutions have assessed and researched the intelligent classroom of Ideological and Political Education, and have put forward some effective practice cases and improvement suggestions.
Intelligent Teaching Management	Through the construction of intelligent classrooms, schools and educational management organizations have improved the efficiency and accuracy of teaching management and promoted the intelligent development of teaching management.
Further development needs	The development of the intelligent classroom of Ideological and Political Education still faces some challenges, such as teacher training and resource integration, which need to be further promoted and improved for development.

The main features of the Ideological and Political Education intelligent Classroom include:

(1) Rich teaching resources: using the Internet and digital technology, teachers can access and use a large number of rich teaching resources, such as online courseware, teaching videos, e-books and so on. These resources can help teachers present the teaching content more vividly, provide more examples and case studies, and thus improve teaching effectiveness (Pranathi et al., 2022).

(2) Diversified learning modes: The Ideological and Political Education intelligent Classroom provides a variety of learning modes, including online learning, interactive learning and collaborative learning. Students can learn independently through the online platform, participate in classroom interaction, group discussion and project cooperation, etc., which promotes students' active learning and cooperation ability.

(3) Personalized learning support: The technical means of the intelligent classroom can collect and analyze students' learning data, such as learning habits, hobbies, learning performance, etc., and provide personalized learning support for each student. Teachers can adjust the teaching content and methods according to the different needs and learning styles of students, and provide personalized learning guidance.

(4) Real-time interaction and feedback: in a intelligent classroom, students can interact with the teacher in real time by asking questions, answering questions and participating in discussions through an online platform. Teachers can provide timely feedback and guidance to help students solve problems and stimulate their thinking and creativity (Singh & Kumar, 2020).

(5) Improvement of teaching management efficiency: With the management system of intelligent classroom, teachers and school administrators can realize intelligent and automated teaching management. Teachers can use the teaching management system for resource management, student performance management and teaching evaluation, improving management efficiency and reducing workload.

The construction of a intelligent classroom for civic and political education requires comprehensive consideration of teaching objectives, student needs and the development of educational technology. By making full use of modern technological means and teaching methods, the intelligent classroom helps to improve the quality and effect of Ideological and Political Education, cultivate students' comprehensive quality and innovation ability, and promote Ideological and Political Education to keep pace with the times and realize the modernization of education.

2.3 Introduction to the algorithms related to the deep learning-based intelligent classroom for Ideological and Political Education

The Civic Education Intelligent Teaching system mainly uses deep learning algorithms, including Long Short-Term Memory (LSTM), Residual Network (ResNet), YOLO, Deep Neural Networks (DNN) and XGBoost. Deep learning algorithms are used to model and classify different instructional data, and model fusion techniques are used to achieve collaborative learning between models (Alwan & Hussain, 2021).

2.3.1 LSTM

In the classroom, students' attention is a dynamic feature with certain regularity over time, so it is suitable to use LSTM modeling in deep learning techniques. The algorithm can avoid the long-term dependence problem, is a special Recurrent Neural Network (RNN), Figure 4 shows a simple example of Recurrent Neural Network (RNN). It can build an early warning model for accurately assessing the change of students' attention in the next ten minutes for the characteristics of students' attention over time in the classroom. The model can quickly and accurately predict whether students' attention will decline in the next ten minutes, and give teachers timely warning, providing sufficient preparation time for teachers to enliven the classroom atmosphere, which can play a double warning role for teachers and students. Figure 4 shows a simple example of recurrent neural network (RNN).

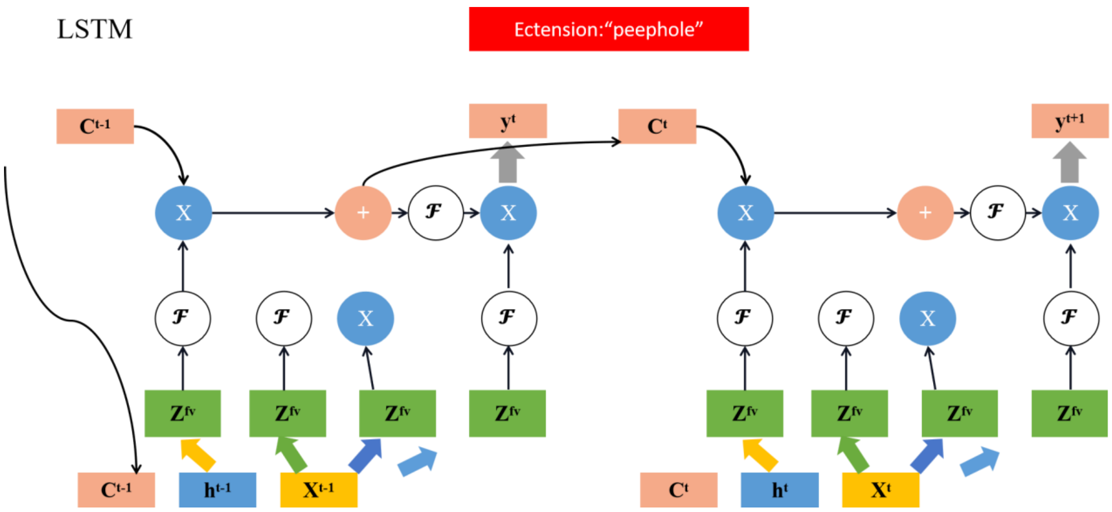

Figure 4 Simple recurrent neural network (RNN)

2.3.2 ResNet

During the teaching process, the change of students' overall facial expression can be used as an important basis for judging students' learning status, so the expression recognition algorithm can be designed by using the ResNet model of deep learning, and Figure 5 shows the basic unit of ResNet. It is usually believed that as the number of network layers increases, the expressiveness of the model increases, but the gradient degradation problem that occurs as the number of network layers increases prevents the model from being further optimized.The ResNet model can effectively solve this problem, and is suitable for the classification task in the conditionally demanding training data. Classification of human expressions is a complex and highly variable process, so ResNet was used to capture and classify overall changes in students' facial expressions during class (Bodendorf Merbele & Franke, 2022).

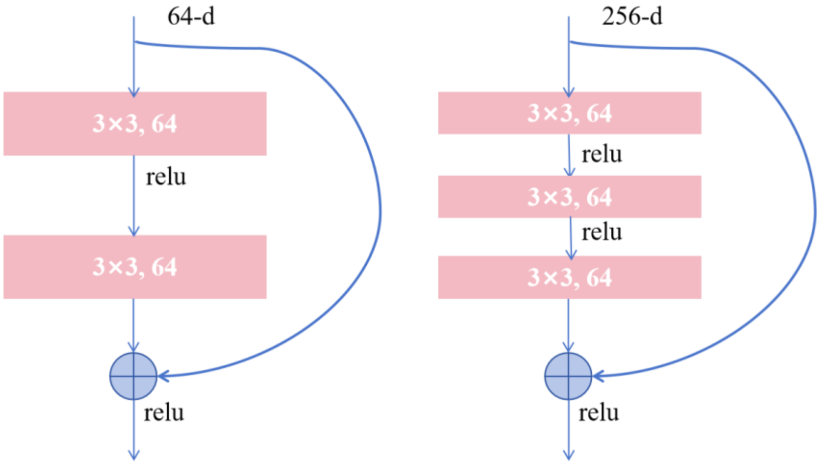

Figure 5 ResNet basic unit

2.3.3 YOLO

Micro-expression recognition and extraction can effectively reflect students' learning attention, so effective extraction of micro-expressions is an important prerequisite for quantifying students' attention. Adopting YOLO algorithm can solve the object detection as a regression problem, completing the output from the input of the original image to the location and category of the object. As for the object detection algorithm, its output value is shown in Formula 1:

$$y = \begin{bmatrix} p_c \\ b_x \\ b_y \\ b_h \\ b_w \\ c_1 \\ c_2 \\ c_3 \end{bmatrix} \text{(Formula 1)}$$

Where pc is 1, it means an object is detected, and vice versa, no object is detected, so the other output values can be ignored; bx represents the relative coordinate from the upper left corner of the x-coordinate value to the center of the object; by represents the relative coordinate from the lower right corner of the y-coordinate value to the center of the object; the bh-area box represents the height of the bounding box; and the bw-area box represents the width of the bounding box.

The algorithm is characterized by its versatility, good results in detecting objects in artistic works, and a much higher detection rate for unnatural image objects than most relevant detection methods (Bolhasani & Jassbi, 2020). Therefore, it is used to recognize human eyes, mouth, and the whole head position and quantified into a specified concentration index to monitor the change of students' attention.YOLO recognizes and extracts complex micro-expressions and then quantifies them into a concentration index, which can be used for teachers to assess and record the students' daily learning status and attitudes, and to improve the quality of classroom teaching and assessment.Figure 6 shows the structure of YOLO.

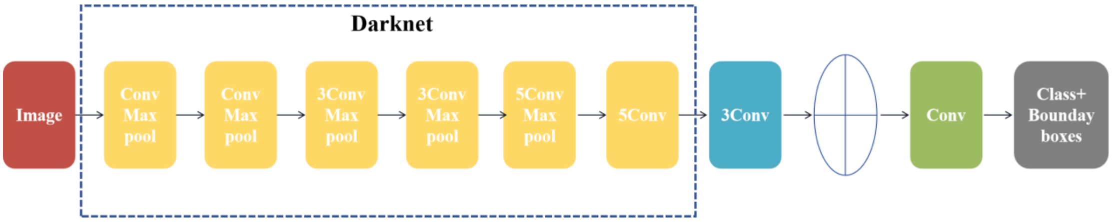

Figure 6 YOLO structure

2.3.4 DNN and XGBoost

There is some kind of complex intrinsic causal relationship between students' learning states and attention indices and their corresponding moments of teachers' teaching contents. This fuzzy relationship is suitable for using DNN to establish the corresponding implicit function model. By quantifying various indexes and establishing the causal relationship between the indexes, it can be used not only for the intelligent recommendation module of the teaching system, but also for constructing the evaluation model of the teacher's teaching content, and Figure 7 shows the typical structure of DNN. In the process of image processing, we often use matrix convolution to calculate the images and features , there are two kinds of matrix convolution: full convolution and valid convolution(Merrifield et al., 2022).

The defining equation for the full convolution is:

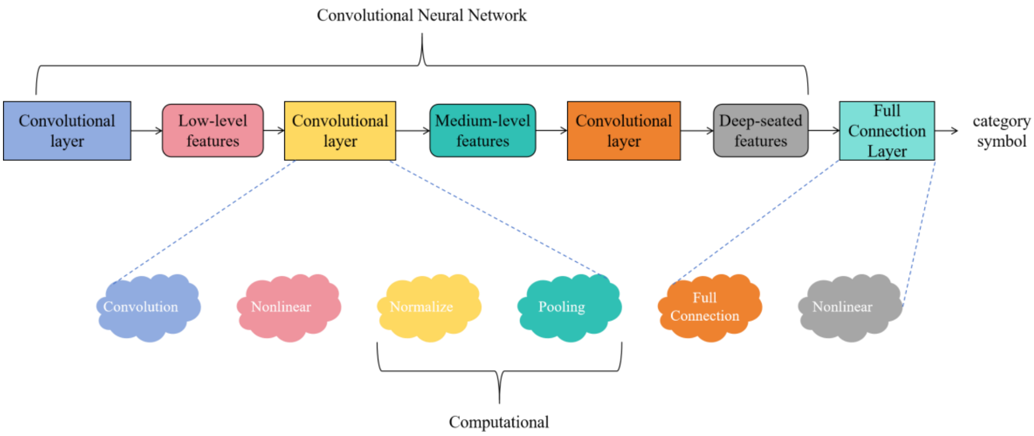

Figure 7 Typical structure of convolutional neural network

XGBoost is essentially a Gradient Boosting Decision Tree (GBDT) model, which is widely used in connected big data, such as various shopper recommendation models, market sales prediction models, risk decision models, etc. XGBoost operates with high accuracy and parallelization efficiency, and thus can be used to integrate with individual teachers' teaching strategy models are fused to obtain an overall strategy recommendation model. XGBoost refers to summing multiple learners to produce a new strong learner, i.e., multiple classification regression trees are used to realize joint decision making. For GBDT, each categorical regression tree learns the residual of the sum of the conclusions of all previous categorical regression trees, and this residual plus the predicted values gives the true values (Ruospo et al., 2023). Based on the GBDT algorithm, the speculative model is built, and the specific steps are as follows:

(1) For the training set $\{(xi, yi)\}_{i=1}^{n}$ combine the constant γ to carry out the model F

initialization, i.e.

$$F_0(\mathrm{x}) = \arg\min_{\gamma} \sum_{i=1}^{n} L(yi, \gamma) \quad \text{(Formula 2)}$$

$$L(yi, \gamma) = \frac{1}{n}(yi, \gamma)^2 \quad \text{(Formula 3)}$$

Where L is the loss function, here the mean square error is used, x_i corresponds to the input geoengineering parameters, y_i corresponds to the output yield value, n is the number of samples in the training set, and the argmin function will return the parameter γ corresponding to the time when the loss function L is taken to its minimum value.

(2) set the maximum number of iterations to M and then carry out M iterations with m = 1:M.

Calculate the residual r_{im}

$$r_{im} = -\left[\frac{\partial L(yi, F(xi))}{\partial F(xi)}\right]_{F(x)=F_{m-1}(x)} \quad \text{(Formula 4)}$$

Train the weak learner h_m (x) based on the computed residuals r_{im} and x_i , i.e., the dataset.

(3) Determine the multiplier γ_m by solving the following one-dimensional optimization problem, i.e.

$$\gamma_m = \arg\min_{\gamma} \sum_{i=1}^{n} L\left[y_i, F_{m-1}(x_i) + \gamma h_m(x_i)\right] \quad \text{(Formula 5)}$$

$$L\left[\mathrm{y_i}, F_{m-1}(x_i) + \gamma h_m(x_i)\right] = \frac{1}{\mathrm{n}}\left\{y_i - \left[F_{m-1}(x_i) + \gamma h_m(x_i)\right]\right\} \quad \text{(Formula 6)}$$

(4) Updating the model

$$F_{\mathrm{m}}(x) = F_{m-1}(x) + \gamma_m h_m(x) \quad \text{(Formula 7)}$$

After M iterations, i.e., the maximum number of iterations is reached, the update is stopped, and finally the speculative model based on the gradient boosting decision tree algorithm F $F_{M(x),\ M(x)}$ is obtained as an implicit expression.

3. Intelligent classroom for Ideological and Political Education based on deep learning

3.1 A framework for designing a intelligent classroom based on deep learning

3.1.1 Data collection and analysis

In the design of a intelligent classroom based on deep learning, the first step is to conduct data collection and analysis. This involves collecting students' learning behavior data, learning history data, interest data, etc. Table 2 shows a sample form for data collection and analysis for students. Using deep learning techniques and algorithms, this data can be processed and analyzed to extract valuable information and patterns. Through the analysis of student data, teachers can understand the learning needs and characteristics of students and provide a basis for personalized teaching.

Table 2 A sample form for data collection and analysis for students

Data type	Descriptive
Learning behavior data	Including students' class attendance, class answers, online learning hours, homework completion, etc.
Learning Historical Data	Includes student academic performance, test scores, homework completion, class participation, etc.
Hobby data	Including students' interests, specialties, participation in clubs, research topics, etc.

3.1.2 Personalized Learning Model Construction

The next step in the framework for designing a intelligent classroom based on deep learning is to build a personalized learning model. This involves using deep learning algorithms and techniques to build student learning models. Teachers can combine student data with learning objectives and build learning models that are appropriate for individual students through deep learning model training. These personalized learning models can predict and analyze students' learning progress, learning styles, and learning interests to support instructional decision-making and instructional design.

The process of constructing a personalized learning model can be divided into the following key steps:

(1) Data preprocessing: student data need to be preprocessed before constructing a personalized learning model. This includes steps such as data cleaning, removing noisy data, feature selection and normalization to ensure the accuracy and consistency of the data (Shin et al., 2023).

(2) Model selection and design: for students' learning objectives and data characteristics, teachers need to select appropriate deep learning models and conduct model design. Common models include Deep Neural Network (DNN), Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), and variant models such as Long Short-Term Memory Network (LSTM) and Attention Mechanism. Depending on the situation, teachers can choose a single model or combine multiple models.

(3) Model training and optimization: during the construction of personalized learning models, teachers need to prepare training datasets and validation datasets, and use these data to train and optimize the models. Deep learning models usually require large amounts of data and computational resources for training, so teachers may need to use distributed computing or cloud computing platforms to speed up model training (Strawn, 2022).

(4) Model evaluation and adjustment: after the training is completed, the personalized learning model needs to be evaluated and adjusted. Teachers can use the validation dataset to evaluate the performance of the model, and adjust and optimize the model according to the evaluation results. Common evaluation metrics include accuracy, recall, precision, F1 score, etc.

(5) Model application and personalized recommendation: After completing the construction and adjustment of the personalized learning model, teachers can apply the model to the actual intelligent classroom. By analyzing students' learning progress, learning styles and interests through the model, teachers can provide personalized learning recommendations and guidance for each student. For example, based on a student's learning history and interests, the model can recommend learning resources, learning paths, or personalized assignments that fit their needs and interests (Kim et al., 2023). Table 3 is used to illustrate the key steps in personalized learning model construction.

Table 3 Key steps in personalized learning model construction

Move	Content and description
Data preprocessing	Steps such as cleaning, removal of noisy data, feature selection, and normalization of the
Model selection and design	Appropriate deep learning models are selected and modeled based on students' learning objectives and data characteristics.
Model training and optimization	Prepare the training dataset and validation dataset and use these data to train and optimize the model.
Model evaluation and adjustment	The performance of the model is evaluated using a validation dataset, and the model is tuned and optimized based on the results of the evaluation.

3.1.3 Development of Intelligent Teaching Aids

Intelligent classroom design based on deep learning also requires the development of intelligent teaching aids. With the help of deep learning technology, intelligent tools such as automatic assessment and feedback systems, personalized learning recommendation systems, and teaching resource generation systems can be developed. These tools can automate the provision of personalized learning support and guidance, and provide teachers and students with targeted teaching and learning resources based on students' learning status and needs (Thanoon et al., 2023). At the same time, these tools can monitor students' learning and provide feedback in real time, helping teachers to achieve refined instructional management.

3.1.4 intelligent classroom operations and continuous improvement

The design of a intelligent classroom based on deep learning also needs to focus on the operation and continuous improvement of the intelligent classroom. After modeling and tool development, the intelligent classroom needs to be practiced and operated in actual teaching. By collecting the operational data and feedback of the intelligent classroom, deep learning technology is used to analyze and improve, and continuously optimize the design and teaching effect of the intelligent classroom. At the same time, it is necessary to pay continuous attention to the latest deep learning technology and educational research results to update the design and practice of the intelligent classroom and promote the development and innovation of the intelligent classroom.

This framework for deep learning-based intelligent classroom design is a cyclical and iterative process that allows for personalized instruction and intelligent educational approaches to improve teaching effectiveness and student learning experiences through continuous data collection, modeling, tool development, and continuous improvement (Waagen, Hulsey, Godwin & Gray, 2020).

3.2 Innovation of Intelligent Classroom Teaching Model Based on Deep Learning

Deep learning technology can be incorporated to recommend different content for each student in the classroom. Even if the intelligent classroom is on the same learning topic, students can access the information on their desktop computers. For different learning content, the key datasets in the deep learning system come from students' personal information and their daily performance in the intelligent classroom. The system can also recommend content based on a student's daily after-school concerns and personality. When the classroom is able to provide the best learning content for each student based on the subject matter, the intelligent classroom is best utilized and students' interest in learning is greatly increased. It is found that the intelligent classroom combined with deep learning technology is more effective in the direction of cultivating students' learning interest. The specific situation is shown in Figure 8.

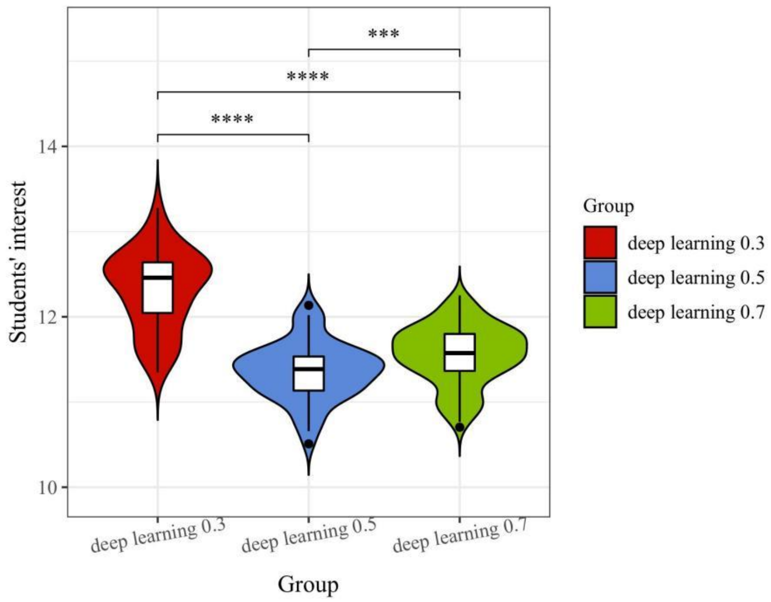

Figure 8 Student interest in learning combined with deep learning

The most important process in deep learning techniques is the training of neural networks. In the training process of neural networks, if the training dataset is too small and the parameters of the training model are too large, overfitting is likely to occur. Simply put, it means that the training accuracy of neural network is high and the testing accuracy is low. In this paper, the specific situation of using Dropout algorithm to analyze students' learning interest is shown in Formula 8-11.

$$E\ (neral) = \sum_{node_j \in c} (\sum_{d_i \in D_j} Node_X - K) - Node\mathrm{Pr}ocess\{Neural_{i,j}\})$$ (Formula 8)

$$\mathrm{Node} - Interest = between\{A_{social-mMedia}, A - class - A\inf o\}$$ (Formula 9)

$$\lim_{x \to \infty}(Rx - teaching - Data^{\frac{k!}{k!(x-k!)}})$$ (Formula 10)

$$\frac{-Student \pm \sqrt{Student^2}}{2a} = \sum_{stu_j \in stu_i \in D_j}\sum(Interest_{i,j}) + \varpi \sum_{d \in D_j}(J_i^b - K_i^a)$$ (Formula 11)

Where E(.) denotes the learning output of the neural network, K denotes the nodes ignored by the hidden layer, i and j denote the input fitting variables, A denotes the learning interest set of the students, and R and x denote the test function and the error rate, respectively. A represents the total number of students in the intelligent classroom.

In the case of overfitting, good results can usually be achieved by using the Dropout algorithm.The Dropout algorithm works by ignoring some neurons with probability P when training to a certain hidden layer, which reduces the correlation between neurons. In other words, the neural network does not rely too much on a particular feature during training. Of course, the ignored neurons are not really discarded, but temporarily discarded, and these discarded neurons will be recovered eventually. After the simulation of the intelligent classroom technology solution in schools, it is found that the intelligent classroom combined with the Internet of Things, fuzzy control technology and deep learning technology can achieve better results in the direction of technological richness for teachers. By investigating the above changes in the technological richness of the intelligent classroom, we can find that as the depth of testing of the intelligent teaching system on the quality of classroom teaching continues to deepen, it is better able to stimulate students' learning (Chiu & Tseng, 2021). Intelligent classroom provides more comprehensive and sufficient learning resources for students' learning, which greatly improves their interest in learning.

In the application of intelligent classroom teaching, we can see from Table 4 that the quality of classroom teaching can be better realized through the use of different technologies, as well as the application of Internet of Things (IoT) technology, fuzzy control technology, and deep learning technology, and the enhancement of students' interest in and quality of learning is more obvious in the process of technology integration.

Table 4 Impact of different technology applications on teaching quality in the intelligent classroom

Technology used in the intelligent classroom	The complexity of technology	Teaching efficiency of the classroom	Quality of teaching
Internet of Things technology	0.45	1.5	1.5
Fuzzy control technology	0.48	1.4	1.2
Deep learning technology	0.52	1.8	1.9
A variety of fusion technologies	0.96	2.5	1.9

3.3 Application of Deep Learning Technology in Ideological and Political Education intelligent Classroom Assessment System

3.3.1 Modeling of classroom monitoring and evaluation

The classroom testing and evaluation model is responsible for real-time collection of classroom data. When the teacher prepares the teaching PPT, he/she needs to set the teaching focus rating of each page of PPT according to the teaching content, and recognize and record it through the camera, as shown in Figure 9. At the same time, the students' real-time expressions at the corresponding moments are also recognized by the ResNet-based algorithm and saved as training data. After the lesson, the performance model of this lesson is built based on the collected lesson focus ratings and student performance. At the same time, all the data from the previous lesson will also build a model of the overall classroom performance of the students, which will be compared with the performance model of the current lesson to find out whether the quality of the students in this lesson has been improved. The teaching evaluation system not only establishes a feedback platform for students' learning, but also needs to establish a monitoring and warning platform that effectively restrains students' bad behavior in class, as shown in Figure 10. The YOLO algorithm is used to identify students' micro-expressions in real time, and three different concentration indices are established according to the changes of micro-expressions in different areas of the human face. Three micro-expressions over time are used to establish a short-term early warning model based on the LSTM model to monitor students' behavior in real time. When the LSTM-based prediction model predicts that students will be fatigued or distracted in a large area after 5 min, it will send an early warning to the teacher, and timely extract some activities that enrich the atmosphere of the subject from the intelligent recommendation model to provide the teacher with activities to improve the interest of the classroom and the students' motivation to listen to the lesson, as shown in Figure 11.

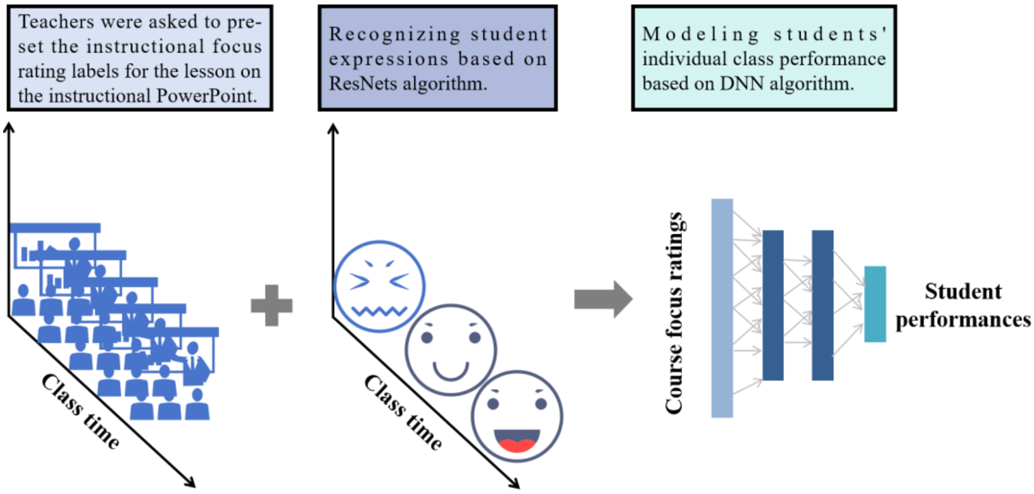

Figure 9 Schematic diagram of the single student single course assessment model

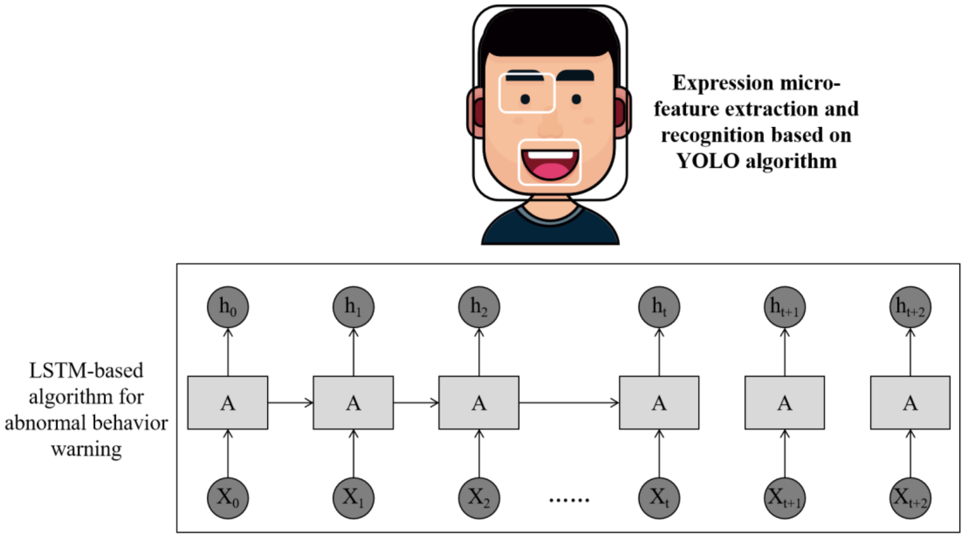

Figure 10 Early warning model for monitoring the attention of the whole class

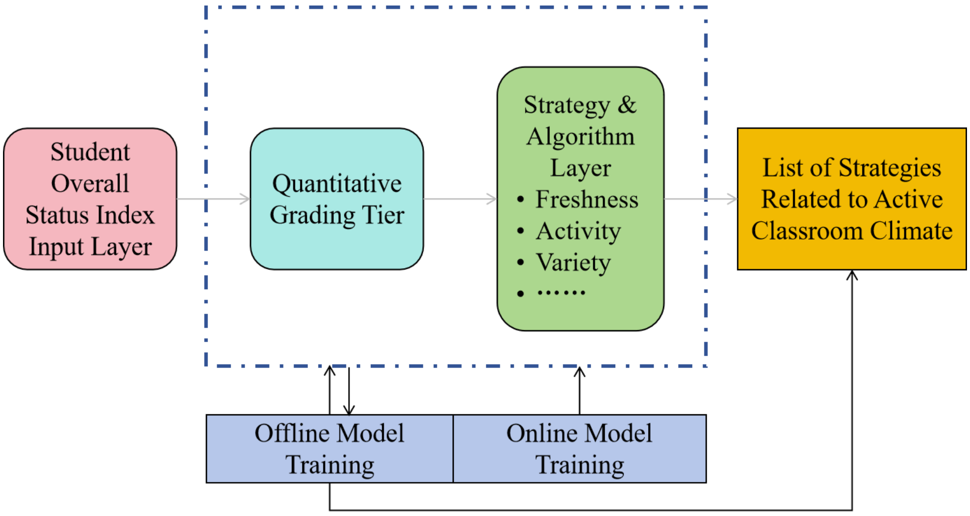

Figure 11 Schematic diagram of intelligent recommendation model

The intelligent recommendation model receives real-time information from the attention monitoring early warning model and formulates the early warning threshold in advance. When the overall attention index of students reaches a certain warning threshold set by the system, the intelligent recommendation system quantifies and grades the current student behavior according to the offline model, and ultimately realizes the timely provision of a list of relevant strategies to the teacher to liven up the subject atmosphere. Teachers can turn on the online update function to update the active classroom strategies in real time according to the importance of the course (Geng, John & Chinnappan, 2023).

3.3.2 Instructional Strategy Recommendation Model

Teaching strategy recommendation model is an important module of intelligent teaching system, which can effectively give teachers accurate teaching data and information. Teachers can improve teaching content, revise curriculum standards, develop teaching plans and talent cultivation programs based on the relevant information to improve the teaching level (Murugesan & Chettiar, 2021). The data of the system comes from student performance in the classroom and after-class assignments, as shown in Figure 12. The teaching strategy recommendation model is an intelligent recommendation module based on the fusion model of DNN and XGBoost, which is able to quantify the level of students' assignments and the impact of teachers' strategies, and establish inference relationships. However, different teachers can produce different results even with the same strategy, so the model is a proprietary teaching model built for each teacher. Using multiple individual teacher models, an overall strategy recommendation model can be built.

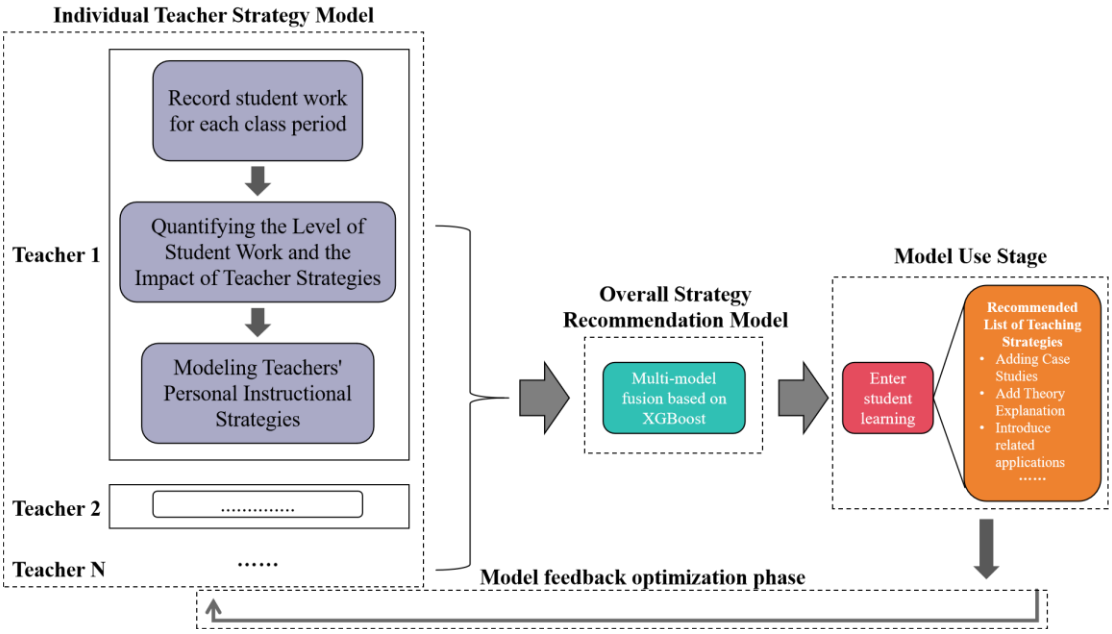

Figure 12 Schematic of the After School Instructional Strategies Recommendation Module

The most important feature of the overall strategy recommendation model is that it can provide teachers with widely adopted by other teachers in response to teaching problems. The model reflects the "wisdom" of the teacher group, which is essentially the integration and utilization of teaching resources. As shown in Figure 12, the overall decision-making recommendation model will be optimized according to the feedback of teachers. The whole teaching strategy recommendation system actually establishes a close relationship between individual teachers and groups of teachers on teaching strategies, which is conducive to teachers' self-improvement and mutual growth. By inputting student learning in the model, a list of teaching strategy recommendations can be seen, such as adding case studies, adding theoretical explanations, introducing related applications, and introducing relevant content such as industry heat. Teachers can make their own choices and optimization based on the recommendations and the actual situation (Niu, 2022).

4. Conclusion

The purpose of this study is to explore the design of a intelligent classroom for Ideological and Political Education based on deep learning, and to verify the effectiveness of this design in enhancing the effectiveness of Ideological and Political Education and students' learning experience through empirical research, and we draw the following conclusions:

(1) Through the design and implementation of the intelligent classroom, the results of the study show that deep learning plays an important role in Ideological and Political Education and provides new ideas and methods for the teaching reform of Civics courses.

(2) By collecting and analyzing students' learning behavior data, learning history data and interest data, we can gain a deeper understanding of students' learning characteristics and needs and provide a basis for personalized teaching. Based on the results of the analysis of student data, we constructed a personalized learning model, using deep learning algorithms and technologies to provide personalized learning support and guidance for each student. The results of the study show that the personalized learning model can accurately predict students' learning progress, learning styles, and learning interests, and provide teachers with targeted instructional decision-making and instructional design support.

(3) In terms of the operation and continuous improvement of the intelligent classroom, we focus on the practical use of the intelligent classroom as well as the latest deep learning technologies and educational research results. By collecting operational data and feedback from the intelligent classroom and using deep learning technology for analysis and improvement, we continuously optimize the design and teaching effect of the intelligent classroom. At the same time, we continue to pay attention to the latest deep learning technologies and educational research results to update the design and practice of the intelligent classroom and promote the development and innovation of the intelligent classroom.

In summary, the design of a intelligent classroom for Ideological and Political Education based on deep learning is a complex and meaningful task. Through data collection and analysis, construction of personalized learning models, development of intelligent teaching aids, and operation and continuous improvement of the intelligent classroom, we can achieve personalized teaching and intelligent education methods, and improve the quality of Ideological and Political Education and students' learning experience. In the future, we need to further explore the wider application of deep learning in Ideological and Political Education, continuously improve the design and practice of the intelligent classroom, and promote the development of Ideological and Political Education to a higher level.

References

Alwan, N. A. S., & Hussain, Z. M. (2021) . Deep learning techniques for noise-resilient localization in wireless sensor networks. International Journal of Sensor Networks, 36(2), 59-67.

Bodendorf, F., Merbele, S., & Franke, J. (2022). Deep learning based cost estimation of circuit boards: a case study in the automotive industry. International Journal of Production Research, 60(23),. 6945-6966.

Bolhasani, H., & Jassbi, S. J. (2020) . Deep learning accelerators: a case study with MAESTRO. Journal of Big Data, 7(1), 1-11.

Chen, H., & Guan, J. (2022). Teacher-student behavior recognition in classroom teaching based on improved YOLO-v4 and Internet of Things technology. Electronics, 11(23), 3998.

Chiu, C.-K., & Tseng, J. C. R. (2021). A Bayesian Classification Network-based Learning Status Management System in an Intelligent Classroom. Educational Technology & Society, 24(3) , 274-285.

Geng, F., John, A. D., & Chinnappan, C. V. (2023) . Analysis of the teaching quality using novel deep learning-based intelligent classroom teaching framework. progress in Artificial Intelligence, 147 -162. doi:10.1007/s13748-021-00256-0.

Kim, C., Cha, H. S., Kim, J., Kwak, H., Lee, W., & Im, C. H. (2023). Facial Motion Capture System Based on Facial Electromyogram and Electrooculogram for Immersive Social Virtual Reality Applications. sensors, 23(7),. 3580.

Li, D. (2021). Deep learning technology based on intelligent teaching in social psychology courses. International Journal of Emerging Technologies in Learning, 16(24), 40-56.

Liu, L. (2023). Application of facial expression recognition based on domain-adapted convolutional neural network in English smart teaching system. Soft Computing, 27(12), 8437-8448.

Long, S., & Zhao, X. (2020). intelligent teaching mode based on particle swarm image recognition and human-computer interaction deep learning. Journal of Intelligent & Fuzzy Systems, 39(4), 5699-5711.

Lu, H. (2021). Application of wireless network and machine learning algorithm in entrepreneurship education of remote intelligent classroom. journal of Intelligent & Fuzzy Systems, 40(2), 2133-2144.

Merrifield, T. P., Griffith, D. P., Zamanian, S. A., Gesbert, S., Sen, S., Guzman, J. D. L. T., . . . Kuehl, H. (2022). Synthetic seismic data for training deep learning networks. interpretation-a Journal of Subsurface Characterization, 10(3), SE31-SE39.

Murugesan, L. J., & Chettiar, S. R. S. (2021) . Design and Implementation of Intelligent Classroom Framework Through Light-Weight Neural Networks Based on Multimodal Sensor Data Fusion Approach. Revue d'Intelligence Artificielle, 35(4), 291-300.

Niu, X. (2022). Deep-Learning-Guided Student Intelligent Classroom Management System. applied Bionics and Biomechanics, 2022. doi: 10.1155/2022/1961631.

Pranathi , V., Reddy, G. R., Kumar, K. S., Jhansi, G., & Rajitha, B. (2022). Analysis of deep learning in software engineering. AIP Conference Proceedings, 2418(1), 020042 (020045 pp.)-020042 (020045 pp.).

Rong Liang. (2023). Research on the design of interactive activities in intelligent classroom based on deep learning. Vocational Technology, 22(10),75-81.

Ruospo, A., Sanchez, E., Luza, L. M., Dilillo, L., Traiola, M., & Bosio, A. (2023). A Survey on Deep Learning Resilience Assessment Methodologies. computer, 56(2), 57-66.

Shin, H., Shin, H., Choi, W., Park, J., Park, M., Koh, E., & Woo, H. (2022). Sample-Efficient Deep Learning Techniques for Burn Severity Assessment with Limited Data Conditions. applied Sciences, 12(14), 7317.

Singh, V. P., & Kumar, P. (2020). Word sense disambiguation for Punjabi language using deep learning techniques. Neural Computing & Applications, 32(8), 2963-2973.

Strawn, G. O. (2022) . Masterminds of Deep Learning. it Professional, 24(3), 13-14.

Thanoon, M. A., Zulkifley, M. A., Mohd Zainuri, M. A. A., & Abdani, S. R. (2023). A Review of Deep Learning Techniques for Lung Cancer Screening and Diagnosis Based on CT Images. Diagnostics, 13(16), 2617.

Waagen, D., Hulsey, D., Godwin, J., & Gray, D. (2020) . Adventures in deep learning geometry. Proceedings of SPIE, 11394, 113940S (113915 pp.)-113940S (113915 pp.). doi: 10.1117/12.2558596.

Wang, Yujun & Zhiming Ma. (2023). A study on deep learning-based student behavior recognition in the classroom. Software Engineering, 26(07),40-43+62.