Research Article
DA-CNN-Driven Innovative Ideological Politics Education Management System

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1. Introduction

At present, with the emergence and wide application of various new technologies such as the Internet, cloud computing, big data, and artificial intelligence [1–9], the environment faced by ideological and political management is becoming more and more complex, which puts forward new requirements for ideological and political management and gives birth to new changes in ideological and political education and management in the new era [10–15]. Therefore, in the era of big data, the reform and innovation of ideological and political management are imminent [16–18].

The significance of building an intelligent ideological and political management system from the perspective of big data mainly lies in the following aspects.

(1) By constructing the intelligent system of ideological and political management, we can realize the interactive exchange of information, work task deployment, emergency reporting, and timely crisis control between the network ideological and political center and ideological and political workers, which can effectively solve the problems of information island and data island between different subjects of ideological and political management, improve the efficiency of ideological and political work, and strengthen the level of ideological and political work.

(2) The intelligent system of ideological and political management provides students with high-quality ideological and political resources, such as excellent courses, excellent cases, tutoring materials, learning, feedback, communication, organization, participation, and feedback of ideological and political activities. Through the construction of student-oriented applications, we can realize the full coverage of ideological and political publicity, education, and teaching and practical activities, and provide new working methods and ideas for constructing a new pattern of network education in the new era.
(3) We can make use of the existing system data resources in colleges and universities, such as learning and work, educational administration, scientific research, all-in-one card, online behavior system, and campus Wi-Fi, so as to realize the early warning and identification function of students’ thought, speech, behavior, body, psychology, and consumption, and solve the problems of single tracking means, untimely, and low accuracy in the work of problem students in the traditional working methods.

(4) Building an intelligent system of ideological and political management can deeply carry out research on students’ physical and mental health and provide support for improving the scientific research level of colleges and universities.

2. Analysis of Practical Problems

At present, most colleges and universities in China are faced with such problems: the school grass-roots facilities, especially the intelligent information system facilities, are relatively weak, and the problems of information island, process fragmentation, information barriers between departments, and so on are prominent. These problems can be attributed to the following aspects.

2.1. Weak Informatization Support of Ideological and Political Work. The informatization support of ideological and political work in colleges and universities is weak, and the original campus intelligent resources cannot meet the needs of current ideological and political work. There is a lack of information system support for information exchange, key work deployment, key thematic research of ideological and political work, organization of important activities and tasks, and management and control of major emergencies. Although some colleges’ information systems can play a supporting role, there are a large number of information islands and data islands, which cannot realize the accurate management functions of issuing, tracking, monitoring, analysis, and early warning of ideological and political work tasks. Therefore, there is an urgent need to build a working mechanism under the condition of big data technology to meet the current needs of ideological and political work and improve the efficiency of ideological and political work.

2.2. New Challenges of Ideological and Political Propaganda. Facing the information age, the position of ideological and political education management in colleges and universities has gradually moved from offline to online. With the development of mobile terminals and new social media, the multichannel nature of information dissemination and the uncertainty of communication content have brought new challenges to the ideological and political work. There is an urgent need to build a new ideological and political publicity position from the whole school and even a wider perspective, so as to realize the functions of publicity, education, learning, activities, communication, sharing, monitoring, early warning, control, and so on. Using new technological means to strengthen publicity and education has become a powerful means of cultural education and organizational education in colleges and universities.

2.3. Challenges Faced by Student Management. Most of China’s college students come from rural areas, many of them are left behind children, and a considerable part of them are children brought out by single parent families and grandparents. In primary school, there is a great lack of emotion and many psychological hidden dangers and improper behavior left by exam-oriented education. After college, the mental health problems represented by anxiety, loneliness, compulsion, and depression show a rising trend. The initiative, accuracy, and timeliness of traditional monitoring methods need to be improved. The construction of the intelligent system of ideological and political management in higher vocational colleges will effectively improve the scientificity, pertinence, and timeliness of ideological and political management in higher vocational colleges through the integration, processing, and analysis of data and the final utilization of data.

Therefore, with the rapid development of computer information technology, network society has become the second living space of modern people and has a profound impact on people’s life with its unique communication mode and powerful function. College students are always a group of young people at the forefront of society. They are active in thinking, like to experience new technology, pursue new things, and become the backbone of the Internet. This makes their ideological culture deeply influenced by the Internet. Therefore, it also brings challenges to the ideological and political education in colleges and universities. The traditional ideological and political education cannot meet the learning requirements of students.

Based on the above analysis, it is extremely important to design and develop an innovative ideological and political education management system. The core of the system is to improve the teaching level and quality of ideological and political theory course in colleges and universities through the research of classroom teaching evaluation index and its system. This paper puts forward an evaluation method of ideological and political classroom teaching quality in colleges and universities based on DA-CNN neural network and applies this method to the design of ideological and political education management system.

3. DA-CNN Neural Network Evaluation Method

3.1. Dragonfly Algorithm. In the dragonfly algorithm (DA) [19–21], dragonfly individuals conduct foraging and optimization through five behaviors, including collision avoidance behavior, pairing behavior, aggregation behavior, foraging behavior, and enemy avoidance behavior. These individual behaviors are described in detail as follows:

The position vector update strategy of collision avoidance behavior is shown in
In the formula, $X$ is the position of the current dragonfly individual; $X_j$ is the position of the $j$-th adjacent dragonfly individual; $N$ is the number of adjoining dragonfly individuals; and the position vector update strategy pairing behavior is shown in

$$S_i = -\sum_{j=1}^{N} X - X_j. \quad (1)$$

In the formula, $X$ is the position of the current dragonfly individual; $X_j$ is the position of the $j$-th adjacent dragonfly individual; $N$ is the number of adjoining dragonfly individuals; and the position vector update strategy pairing behavior is shown in

$$A_i = -\frac{\sum_{j=1}^{N} V_j}{N}. \quad (2)$$

In the formula, $V_j$ is the individual velocity of the $j$-th adjacent dragonfly. The update strategy of the position vector of aggregation behavior is as shown in

$$C_i = -\frac{\sum_{j=1}^{N} X_j}{N} - X. \quad (3)$$

The position vector update strategy of foraging behavior is shown in

$$F_i = X^+ - X. \quad (4)$$

In the formula, $X^+$ is the location of the food source (the current optimal solution). The update strategy of the position vector of enemy avoidance behavior is shown in

$$E_i = X^- + X. \quad (5)$$

In the formula, the position of the natural enemy is $X^-$ (the current worst solution). Synthesizing the five dragonfly group behaviors, the step size vector update strategy of the dragonfly individual is shown in

$$\Delta X_{t+1} = (sS_i + aA_i + cC_i + fF_i + eE_i) + w\Delta X_i. \quad (6)$$

In the formula, $s$, $a$, $c$, $f$, $e$ are the weights of the five dragonfly group behaviors, respectively; $w$ represents the inertia weight; and $t$ is the current number of iterations, as shown in formula (7).

The dragonfly position update strategy is

$$X_{t+1} = X_t + \Delta X_{t+1}. \quad (7)$$

3.2. DA-CNN-Based Teaching Quality Evaluation

3.2.1. Convolutional Neural Network. Convolutional neural network [22–25] is a multilayer feedforward neural network composed of input, hidden, and output layers. Suppose the convolutional network’s input and output dimensions are $m$ and 1, respectively, and the number of hidden layers is $p$. Then, the mapping mathematical expression of the convolutional neural network is shown in

$$x_{j+1} = f(x_j) = \frac{1}{1 + \exp \left( -\sum_{j=1}^{p} c_j b_j + \varepsilon \right)} \quad j = 1, 2, \cdots, p. \quad (8)$$

In the formula, $f$ is the activation function of the hidden layer; $\varepsilon$ is the threshold of the output layer; and $c_j$ and $b_j$ are the connection weights from the hidden layer to the output layer and the output of the hidden layer nodes, respectively. Therefore, the output of the hidden layer node of the convolutional neural network can be expressed as shown in

$$b_j = \frac{1}{1 + \exp \left( -\sum_{j=1}^{m} \omega_{ij}x_i + \theta_j \right)} \quad i = 1, 2, \cdots, m. \quad (9)$$

In the formula, $\omega_{ij}$ is the connection weight from the input layer to the hidden layer and $\theta_j$ is the threshold of the hidden layer node.

Since the prediction results of the convolutional neural network are easily affected by the initial connection weights $c_j$, $\omega_{ij}$, and thresholds $\varepsilon$, $\theta_j$, and it is easy to fall into the problem of local extremes, this paper uses DA to optimize the initial connection weights and thresholds of convolutional neural network.

3.2.2. DA-CNN Algorithm Flow. The algorithm flow of teaching quality evaluation of ideological and political classrooms in colleges and universities based on DA-CNN can be summarized as follows.

Step 1. Initialize the convolutional neural network model and determine the network structure. Determine the number of layers, transfer function, and training function type of convolutional neural network and the number of nodes in each layer according to the data samples; read the teaching quality evaluation data of ideological and political classrooms in colleges and universities, and preprocess the data to divide the data into a training set and test set.

Step 2. Coding—the DA algorithm adopts real number coding, and the connection weight $c_j$, $\omega_{ij}$ and the threshold $\varepsilon$, $\theta_j$ are coded as a whole. The search space dimension of the algorithm is $m$; if the number of nodes in the input layer, hidden layer, and output layer is $R$, $S_1$, $S_2$, then the encoding length $S$ is shown in

$$S = RS + S_1S_2 + S_1 + S_2. \quad (10)$$

Step 3. DA algorithm parameter initialization: population size $N$ and the maximum number of iterations $T$.

Step 4. Randomly initialize the step size vector $\Delta X$ and randomly generate the initial position $X$ of the dragonfly individual.

Step 5. Set the current number of iterations $t = 1$, input the training set into convolutional neural network, calculate the fitness of all dragonfly individuals according to the fitness function formula (11), and sort and record the current optimal solution.

$$\text{fitness} = \frac{1}{k} \sum_{i=1}^{k} (y_i - \hat{y}_i)^2. \quad (11)$$

The mean square error is chosen as the fitness function, shown in formula (11). In the formula, $y_i$, $\hat{y}_i$ is the actual
output and expected output of the \( i \)th sample, respectively; \( k \) is the number of samples.

**Step 6.** Update the food source position \( X^+ \) (the current optimal solution) and the natural enemy position \( X^- \) (current worst solution), and update 5 behavioral weights \( s, a, c, f, e \) and inertia weight \( w \).

**Step 7.** Update \( S, A, C, E, F \) according to formulas (3)–(7).

**Step 8.** Update the step vector and position vector according to formulas (8) and (9).

**Step 9.** If the number of iterations \( t > T \), save the optimal connection weights \( c_{ij}, \omega_{ij} \) and thresholds \( \varepsilon, \theta_j \); otherwise, \( t = t + 1 \), and return to Step 5.

**Step 10.** Take the connection weights \( c_{ij}, \omega_{ij} \) and thresholds \( \varepsilon, \theta_j \) corresponding to the optimal solution as the initial connection weights and thresholds of the convolutional neural network, train the convolutional neural network, and make predictions.

### 4. Experimental Analysis

#### 4.1. Quality Evaluation System

Combined with reference literature and teaching experience, the AHP structure model of ideological and political classroom teaching quality evaluation in colleges and universities is constructed using the analytic hierarchy process, as shown in Figure 1. It mainly includes three layers: the target layer, the criterion layer, and the element layer.

Selecting the ideological and political teaching quality data of a Project 211 university from 2008 to 2017 as the research object, this paper uses the maximum value method to standardize the data. The two comparison methods, the constructed physical education quality evaluation index scores, are shown in Table 1, and the evaluation scores are shown in Table 2.

#### 4.2. Evaluation Index

The root means square error (RMSE) and the correlation coefficient \( R \) are selected to test the quality evaluation results of ideological and political classroom teaching in colleges and universities. The evaluation index formulas are

\[
RMSE = \sqrt{\frac{1}{n} \sum_{k=1}^{n} (x_k - \tilde{x}_k)^2}, \tag{12}
\]

\[
R = \frac{\sum_{k=1}^{n} x_k \tilde{x}_k}{\sqrt{\sum_{k=1}^{n} x_k^2 \sum_{k=1}^{n} \tilde{x}_k^2}}. \tag{13}
\]

Among them, \( x_k \) and \( \tilde{x}_k \) represent the actual value and predicted value of the \( k \)-th sample, respectively; \( n \) represents the number of sample sets; \( RMSE \) is mainly used to measure the degree of dispersion of the model; and \( R \) is primarily used to describe the degree of correlation between the predicted value and the actual value. The closer the absolute value of \( R \) is to 1, the higher the correlation between the predicted value and the actual value.

#### 4.3. Result Analysis

The teaching quality of ideological and political classrooms can be divided into 5 grades, namely, excellent, good, average, poor, and very poor, and the evaluation grades are shown in Table 3. Experts scored the collected data, and a total of 10 sets of data were obtained.

The data are divided into two parts; the first 6 groups of data are used as training sets to establish the DA-CNN...
ideological and political classroom teaching evaluation model; the last 4 groups of data are used as test sets to test the DA-CNN ideological and political classroom teaching evaluation model correctness. DA algorithm parameters are dragonfly population size $N = 10$ and the maximum number of iterations $T = 100$.

To verify the accuracy and validity of the DA-CNN model, DA-CNN is compared with GA-CNN, PSO-CNN, and CNN; particle swarm optimization (PSO) algorithm parameters are maximum number of iterations $T = 100$, population size $N = 10$, learning factor $c_1 = c_2 = 2$, and search interval $[-1, 1]$. Genetic algorithm (GA) parameters are population size $N = 10$, the maximum number of iterations $T = 100$, crossover probability $p_c = 0.7$, and mutation probability $p_m = 0.1$; convolutional neural network parameters are set as follows: input layer. The number of nodes inputnum = 25, the number of hidden layer nodes hiddennum = 50, the number of output layer nodes outputnum = 1, the maximum number of convolutional neural network training is 1 000, the hidden layer and output layer transfer functions are logsig and purelin, the training function is trainlm, the learning rate is 0.01, and the training error target is 0.001.

The comparison results of different algorithms are shown in Table 4.

| Method | Training set RMSE | Test set RMSE | $R$ |
|--------|-------------------|---------------|-----|
| DA-CNN | 0.0101 | 0.9968 | 0.0385 | 0.9905 |
| GA-CNN [26] | 0.0174 | 0.9798 | 0.0404 | 0.9723 |
| PSO–CNN [27] | 0.0180 | 0.9775 | 0.0507 | 0.9654 |
| CNN [28, 29] | 0.0188 | 0.9664 | 0.0484 | 0.9468 |

DA-CNN has the smallest RMSE, and the correlation coefficient $R$ reaches the maximum, indicating that the DA-CNN model's ideological and political classroom teaching evaluation value and the actual value of ideological and political classroom teaching evaluation have the highest correlation, and the prediction effect is the best; (2) the evaluation accuracy of DA-CNN, GA-CNN, and PSO-CNN is better than CNN. The main reason is that the swarm intelligence algorithms DA, GA, and PSO optimize the CNN model's parameters and improve the CNN model's evaluation accuracy.

4.4. Discussion and Suggestions. Through the DA-CNN course evaluation, it is of great help to improve the teaching quality of ideological and political classrooms in colleges and universities, so the following countermeasures and suggestions are put forward:

(1) Strengthen the attention of university leaders and increase supervision.
(2) To innovate and improve teaching models and teaching methods.
(3) Fully motivate the main body of students.
(4) Combined with the actual situation, strengthen student guidance.
(5) Clarify the purpose, evaluation index, and teaching evaluation system.
(6) Strengthen case teaching and improve students’ comprehension and perception.

5. System Design

5.1. Overall Design. The designed innovative ideological and political education management system takes Eclipse as the development platform, MySQL as the background database, and Java as the language to construct the application. Because the system is mainly for university teachers and students, the system adopts B/S architecture. B/S architecture has the following advantages: (1) the architecture has a wider range of applications and can give full play to the advantages of the Internet; (2) the system with this architecture has very good security and high performance; (3) the system with this architecture has fast response speed and transparent data storage and management function.

The designed innovative ideological and political education management system is divided into three modules: user management module, information management module, and category management module. Super-administrator and ordinary administrator have different administrative rights. The function is shown in Figure 2.

Among them, the user management module has the following functions: (1) the super-administrator manages the registration information of their own users and provides functions such as new creation, modification, deletion, and query; (2) ordinary administrators manage their own accounts and provide functions such as new creation, modification, and deletion. The following requirements are considered in the user management module: (1) ordinary administrators add, delete, modify, and query their own accounts; (2) super-administrators have all the functions of ordinary administrators and can also view and manage all management information and add, delete, modify, and query operations.

5.2. Database Design. The system uses MySQL database. It mainly uses five data tables: user information table (tb_users), news information table (tb_articles), role information table (tb_roles), system column table (tb_columns), and news category table (tb_subcolumns).

User information table (tb_users) is a table used by users (including ordinary administrators and super-administrators) when logging in. It mainly includes user name, user password, real name, number, and other fields. The user ID is the primary key and also the foreign key, which is associated with other tables through this field. Table 5 describes the details of the user information table.

The news information table records all news articles of the website. The fields in the table mainly include number, title, article type, information source, release time, publisher, picture address, etc. This table takes the ID number as the primary key and is also a foreign key. It is associated with other tables through this field. Table 6 describes the details of the news information.

The role information table records the role information of all users in the system. This table has only two fields: number and role name. The number is the primary key and
also the foreign key. This field is used to associate with other tables. Table 7 describes the details of the role information table.

The system column table records all column names in the website. This table contains two fields: column number and column name. The column number is the primary key and also the foreign key. This field is used to associate with other tables. Table 8 describes the details of the system column table.

The news category table records all types of information of news and articles in the website. This table mainly includes four fields: number, column name, column category, and column ID. The number is the primary key and also the foreign key. Through this field, it is associated with other tables. Table 9 describes the details of the news category table.

5.3. System Composition. The designed innovative ideological and political education management system is based on improving the ideological and political management level of colleges and universities, integrating the existing smart campus information resources, relying on the Internet, big data, and other modern information technologies, exploring the construction of an ideological and political portal system, an ideological and political teaching and training system, an ideological and political activity system, and a student behavior monitoring and tracking system, so as to realize the ideological and political work management, the business platforms of superior departments, and the data docking between colleges and universities. Promote the digitization, intelligence, convenience, systematization, and institutionalization of ideological and political management in colleges and universities.

5.4. System Construction. We make use of the big data platform’s data collection and exchange capabilities, storage and analysis capabilities, intelligent computing, open sharing capabilities, and data visualization and analysis capabilities to realize the establishment of the ideological and political big data resource base and integrate it into several subject resource bases according to the business type to provide data support for the information collection, management services, and decision support system of ideological and political work. The construction of intelligent system for ideological and political management in colleges and universities mainly covers data collection and exchange system, big data storage and analysis system, big data open sharing system, and data visualization tools.

6. Conclusions
The introduction of intelligent ideological and political management system is the inevitable result of the development of big data, intelligent technology, and mobile
Internet technology. In order to promote the process of informatization and networking of ideological and political education, this paper designs an innovative ideological and political education management system based on convolutional neural network. Aiming at the influence of parameter selection on the evaluation accuracy of convolutional neural network (CNN), this paper applies the dragonfly algorithm (DA) algorithm to the parameter optimization of initial connection weight and threshold of convolutional model, and puts forward an evaluation method of ideological and political classroom teaching quality in colleges and universities based on DA-CNN. Then, this method is applied to the design of ideological and political education management system, and an ideological and political education management system based on convolutional neural network is developed and implemented.

The results show that compared with GA-CNN, PSO-CNN, and CNN, DA-CNN can effectively improve the evaluation accuracy of ideological and political classroom teaching quality in colleges and universities. The innovative ideological and political education management system based on convolutional neural network provides a new method and way for the quality evaluation of ideological and political classroom teaching in colleges and universities.

Data Availability

The dataset can be obtained from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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