Construction of Ideological Education Evaluation System for College Students -- Based on BP Neural Network Model Algorithm

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Abstract. Because of the characteristics of Ideological Education, it cannot be expressed accurately by simple mathematical analysis like other disciplines. The emergence of artificial neural network can solve this problem, but there are not many researches about BPNN (BP neural network) in the evaluation system of Ideological Education in Colleges and universities. Therefore, this paper puts forward the construction of Ideological Education evaluation system for college students --- Based on BPNN model algorithm research. In this paper, the existing Ideological Education in Colleges and universities and the application of BPNN in the evaluation system of Ideological Education are deeply studied. It is considered that the existing evaluation system of Ideological Education has some technical problems such as large evaluation error. In view of this, according to the actual needs of Ideological Education evaluation in Colleges and universities, combined with the latest BPNN technology, this paper establishes a new evaluation system of Ideological Education in Colleges and Universities Based on BPNN. This paper optimizes the traditional BPNN algorithm, simplifies the calculation steps and improves the calculation accuracy of the model. In order to further verify the actual effect of the evaluation model in this paper, the relevant comparative experiments are carried out, and the simulation results are analyzed by comparing with the expert evaluation. The experimental results show that the error value of the simulation results of the evaluation model in this paper is kept below 1.5%, and the accurate value is within the acceptable range, which can meet most of the current Ideological Education evaluation needs.

Keywords: Ideological Education, BP Neural Network, Evaluation Model, Education Evaluation

1. Introduction
With the in-depth study of Ideological Education, as a branch of Ideological Education, has been paid more and more attention in recent years [1-3]. Especially as China enters the era of social transformation, the situation of Ideological Education in Colleges and universities is increasingly complex. Analyzing and correcting the problems of Ideological Education in universities, and in building a sustainable Ideological Education system [4-5].
The operation of the current evaluation system of Ideological Education lacks clear standards in terms of its boundary and unity [6-8]. Because there are many factors that affect the Ideological Education and each factor has different influence on the evaluation, which belongs to the nonlinear and complex classification problem. It has the basic characteristics of nonlinear mapping, and opens up a new way for pattern recognition and nonlinear classification [9-10].

This paper deeply studies the evaluation system of Ideological Education in Colleges and universities in China and the application of BPNN in the system, and understands that the application of BPNN is still in the primary stage in the evaluation system of Ideological Education in China. It is difficult to accurately express it through the conventional mathematical analysis, so there is no effective evaluation system of Ideological Education. Therefore, this paper puts forward the research on the evaluation system of Ideological Education in Colleges and Universities Based on BPNN. It is hoped that through the optimization and improvement of the traditional BPNN, the accuracy and comprehensive performance of the traditional Ideological Education evaluation system in China can be further improved. According to the characteristics of Ideological Education, combined with the advantages of BPNN, a set of education evaluation system is established. In the related comparative experiments, the experimental results further verify the actual effect of the model. The error between the simulation results and the expert evaluation results is less than 1.5%, which shows that the evaluation system in this paper has high prediction accuracy. The analysis shows that the research in this paper has achieved ideal results and made a contribution to the development of Ideological Education evaluation field in China's colleges and universities.

2. Evaluation of Ideological Education and BPNN

2.1. Understanding of Teaching Evaluation of Ideological Education for College Students
The teaching evaluation of Ideological Education is a standard value evaluation and supervision and management activity. According to the teaching effect of Ideological Education and the goal of personnel training, the index system and norms are formulated. Due to the problems of college students themselves, the evaluation of Ideological Education also depends on the evaluation of Ideological Education, and its content and method are also related. From the perspective of social development, the so-called evaluation of Ideological Education is the process of judging the social value of the evaluation of Ideological Education of the people who evaluate teaching.

The design and establishment of teaching evaluation index system should be scientific, objective and effective. The principle of evaluation is to combine quantitative and qualitative. Under the guidance of certain principles, using the method of expert consultation, this paper establishes the political evaluation standards, quantitative symbols and other indicators of Ideological Education, thus forming the index system of Ideological Education.

2.2. Concept of BPNN
BPNN is a kind of complex network system which simulates human brain neural processing information and nonlinear transformation. BP network is a neural network composed of three or more layers of neurons, including input layer, hidden layer and output layer. The introduction of BPNN makes the whole evaluation model not only connect more samples, but also reverse intelligent learning and adjust from output to input, which greatly reduces the interference of human factors in the evaluation process and greatly improves the efficiency of evaluation.

2.3. Overall Design Ideas of the System
Through the investigation of colleges and universities, it is found that some colleges and universities have developed the technology and implementation process of efficient quantitative assessment system, which realizes the collection and analysis of web and mobile terminal information. However, these systems lack the participation of parents and can only realize the web or mobile terminal. No system can run on the network.
Through detailed analysis, the mobile network system of Ideological and moral education evaluation is established, so that evaluators can register and use anytime and anywhere, and establish a systematic early warning mechanism. When the score of Ideological and moral education is lower than a certain score, the evaluation system based on mobile Internet technology will issue different color warnings to remind managers to pay attention to students. The system will provide assessment registration and evaluation query services for students, teachers, parents and administrators.

2.4. Intelligent Training and Simulation with BPNN

The input and output are the same, that is, \( X_n = X_m \), where \( K \) is the sample value. The output of hidden layer sample mode \( i \) is calculated as follows:

\[
y_y = f \left( \sum_{l=1}^{q} \omega_{ly} X_l - \theta_l \right) \quad l = 1, 2, \cdots, q
\]

(1)

Where \( \theta_l \) is the offset value of hidden layer node \( l \).

The total error function between the actual output \( b_p \) and the expected output \( b_p \) of \( m \) sample patterns is defined as follows:

\[
E = \sum_{i=1}^{m} (b_i - h_i)^2 / 2
\]

(2)

The neuron node \( (\omega_i, \omega_j) \) and bias value \( (\theta_i, \theta_j) \) were calculated according to the following rules:

\[
\theta_i(t+1) = \theta_i(t) + \eta \delta + \alpha [\theta_i(t) - \theta_i(t-1)]
\]

(3)

The neural network with more accurate internal representation is obtained through continuous iteration until the error limit is satisfied.

3. Experimental Methods

3.1. Experimental Design

The process is as follows:

1. According to the evaluation system of classroom teaching quality, the quantitative evaluation index scale of classroom teaching quality is obtained, and then the sample data is normalized through online evaluation of students;

2. The number of hidden layer neurons, transformation function and training algorithm function are determined;

3. Set the learning rate and learning time, and start the neural network training. When the error meets the requirements, stop training;

4. After training, the corresponding neural network model is generated, and the test data is read and simulated.

3.2. Sample Data Collection

In the process of evaluation, each student's evaluation needs to be carried out independently. At the same time, in addition to evaluation, students can also express their views or opinions on a certain course. From the online evaluation system of a university, the representative classroom evaluation data are selected as the network input training samples.

3.3. Sample Data Processing

In this paper, the minimax method is used for normalization, which can better retain its original meaning and will not cause the loss of information.

3
3.4. Simulation Process

Read the training data and training target data, generate the corresponding network model according to the neural network model structure, set the learning rate, learning times and error accuracy, and start the model training. In this paper, the first 10 data are used as training data.

4. Discussion

4.1. Experimental Results and Analysis

The evaluation results of the network are shown in Table 1. From the analysis results in Figure 1, it can be seen that all the training samples are close to the expert evaluation results.

Table 1. Comparison between expert evaluation results and neural network evaluation results

| Test sample number | Expert evaluation value | Evaluation value of neural network |
|--------------------|-------------------------|-----------------------------------|
| 1                  | 0.92                    | 0.91627                           |
| 2                  | 0.62                    | 0.6224                            |
| 3                  | 0.76                    | 0.7592                            |
| 4                  | 0.88                    | 0.8769                            |
| 5                  | 0.52                    | 0.5117                            |
| 6                  | 0.66                    | 0.6623                            |
| 7                  | 0.78                    | 0.7775                            |
| 8                  | 0.59                    | 0.5881                            |
| 9                  | 0.84                    | 0.8407                            |
| 10                 | 0.71                    | 0.7066                            |

Figure 1. Comparative analysis of evaluation results of different evaluation methods
The simulation results and expert evaluation results are shown in Figure 2. It can be seen from the results in Figure 2 that the simulation results are close to the evaluation results given by experts. Compared with Figure 1 and Figure 2, not only the training and the error rate is kept below 1.5%. Therefore, the student evaluation model based on BPNN is a reasonable.

![Figure 2. Comparative analysis of simulation evaluation results and expert evaluation results](image)

4.2. Establishing and Perfecting the System of Ideological Education for College Students

Which is not achieved overnight, but needs to establish and improve a set of Ideological Education system. The system consists of the following three parts:

1. Theory Teaching

   This is the main part of the Ideological Education of college students. With the development of network, the teaching of Ideological and political theory course must make full use of modern network technology and network resources, reform the traditional teaching mode, keep pace with the times, and combine Ideological Education with modern network.

2. The establishment of scientific research institutions should meet the following three points:

   1) Leaders attach importance to it. The Party committee of colleges and universities should pay attention to the Ideological Education. The top leaders of the university should be responsible for the work of Party committees at all levels.

   2) We should improve the educational organization systematically. It includes the party organization, the League organization and the student union organization, and the personnel involves the political work cadre, the class teacher, the ideological and political theory course teacher and so on.

   In the process of system construction, we should strive to improve the effectiveness of Ideological Education. Pay attention to teaching reform and practice.
5. Conclusions
In view of the low prediction accuracy of the traditional evaluation system of Ideological Education in Colleges and universities, the evaluation system of Ideological Education based on BPNN proposed in this paper can make up for this shortcoming to a certain extent. Through the optimization and improvement of BPNN, this paper further improves the accuracy of Ideological Education evaluation system.

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