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Optimization Method of English Listening Classroom Teaching for College Students Based on Neural Network

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Abstract: The existing teaching evaluation methods and models have some problems, such as strong subjectivity and randomness, difficulty in determining index weight, over-fitting, slow convergence and weak computing ability. Firstly, this paper states the research background, research status, research questions, research methods, expected research results and innovation points of the subject in detail. Then the relevant theoretical basis of convolutional neural network used in this paper is described. In this paper, a teaching evaluation model based on (BPNN)(BPNN) is established. Taking the actual situation of English listening teaching in a college in this city as an example, the data were collected and preprocessed. Then the structure of BPNN is determined according to the established evaluation system, and the data is input to train the network, and the evaluation result is obtained. Finally, the error analysis of the results is carried out.

1. Introduction

In today's world, competition among countries is, in the final analysis, competition for talents. At present, when the country is in short supply of talents, colleges and universities should play their role in training high-quality talents timely for the country. However, the training of talents should not only adapt to the speed of social and economic construction, but also proceed from the long term, follow the development of The Times, train all-round talents, and ensure the continuity of future talent supply [1-2]. At present, there are a large number of colleges and universities and the level of teaching quality is not uniform among the universities, so the major problem is how to improve the teaching quality of colleges and universities. With the transformation of society, the new technology such as electronic technology and the Internet gradually deep into every aspect of human life, countries have to profoundly understand the opportunities and challenges of the information age, the higher education network information new strategy, and put forward a series of

new concepts, new ideas constantly introduced policies to promote higher education network information construction [3]. At present, Internet education develops rapidly, and offline education has also been affected to a certain extent. Therefore, in order to ensure the continuous promotion of offline education, it is necessary to learn the advantages and attractions of online education, integrate them into offline education, and find a better development trend for offline education [4-5]. In accordance with the development of The Times, by exploring and summarizing the internal essential connection and difference between traditional classroom teaching and online teaching, this paper finds the regularity of the development of students' personality, makes full use of the advantages of online and offline teaching model, and explores and studies a classroom teaching model in line with the new situation of modern society.

Originating in the 1940s, neural network is a nonlinear system composed of numerous neurons. It is called neural network because its structure is similar to the connection structure of neural synapses in the brain. According to their functions, it can be divided into two categories: biological neural network and artificial neural network [6]. Artificial neural network is an intelligent information processing system that can simulate the learning and memory function of human brain neural network system. Since 1986, the research on neural networks has shown a trend of explosion. So far, various new neural networks have been proposed and applied in various industries, which has become a hot topic now. Among these new neural networks, the most typical one is BP(Back ProPagation) neural network, which not only has strong robustness and generalization ability, but also has widespread applications in function approximation, pattern recognition, prediction and other fields [7]. Foreign scholars used BPNN to establish the teaching quality evaluation model for training, which proved that the BPNN method is highly operable, not only avoiding the complexity of the evaluation process, but also solving the shortcomings of the analytic hierarchy process, such as too strong subjectivity and randomness [8]. Some domestic scholars have adopted the principle of genetic algorithm to select the optimal individual, initialized the optimal weight and threshold for BPNN, and improved the accuracy of classroom teaching quality evaluation through data training [9].

By studying the advantages and development difficulties of traditional classroom teaching and the advantages and disadvantages of online teaching, this paper tries to summarize the experience from the actual situation of colleges and universities, put forward reasonable suggestions for the reform of classroom teaching in colleges and universities during the epidemic prevention and control period.

2. Evaluation of English Listening Teaching Quality Based on Neural Network

2.1. Artificial Neural Network

Human behavior is controlled by the brain. Although scientists have been exploring the human brain in great depth, they know only a small part of it. Human consciousness, emotions, reactions and behavior are all controlled by the human brain. The brain is the most delicate organ in the human body, with 15 billion cells distributed among nerve cells, glial cells, neural stem cells, and the arteries that make up the nervous system. In the nervous system, neurons are the tiniest units responsible for solving problems. The human brain contains about tens of billions of neurons, which are connected by synapses, and each neuron is connected to a neuron in the upper trunk, that is, there are thousands of synapses [9-10].

To study the information transmission and processing mechanism of nerve cells biologically. Nerve cells work in two states: excitatory and inhibitory. Under normal circumstances, nerve cells are not active and are in a state of "inhibition". When receiving external information, some nerves will be stimulated first, changing from "inhibition" to "excitation", and then the information will be

transmitted to the nerve cells connected with it [11-12]. A nerve cell consists of four parts: nucleus, dendrite, axon and synapse.

One neuron receives and processes information from the previous neuron, and then passes on the processed information to the next neuron. First, the previous neuron sends the information through the axon in the form of electrical impulses to the axon's tail. When the electrical impulses accumulate to a certain point, the axon releases a chemical, which is received by the nerve cells connected to the axon. The neuron that receives the chemical then recognizes it and produces a new electrical impulse. The transmission channel of the nerve cell is opened, and the electrical impulse is transmitted through the dendrite to the cell body. Finally, the cell body analyzes and processes the electrical pulse and sends it to the neuron that is connected to its axon terminal and needs to receive this information [13-14].

It can be seen that information transmission between neurons is based on dendrites as carriers, axons as nodes, and the mutual transformation of electrical impulses and chemical substances. The premise of this transmission is that electrical impulses at the end of the axon reach a certain level before chemicals are produced to stimulate the next neuron to complete the transmission. Artificial neural network is a mathematical model for deep learning based on the working principle between neurons [15]. This model is modeled according to the composition of the human nervous system. Artificial neurons are the smallest working unit of artificial neural network, and a large number of artificial neurons are interconnected, stimulated and transmitted information [16].

2.2. BPNN Evaluation Model

BPNN is a multi-layer feedforward network trained according to error Back Propagation algorithm, which is one of the most widely used neural network models [17].

BPNN of connections between nodes in each layer weights is adjustable, the BPNN in training process, input and output data obtained through learning the rules of "reasonable", and adaptive learning content stored in the weights of network, the BPNN has high degree of self learning and adaptive capacity [18].

The distributed data storage mode of BPNN makes the local damage of input information not affect the global training result, that is, BPNN has a certain fault tolerance ability. In practice, we can't be sure that every sample is absolutely correct, so this is very important in the application.

BPNN uses the connection weights between nodes to store information. The distributed information storage mode of BPNN is reflected in that the information is distributed on the whole network according to the content, rather than stored in only one place. A node on the network stores part of the content of multiple information, that is, the necessary processing of information in the process of network training, and then the information is scattered and stored throughout the network.

The BPNN evaluation model constructed in this paper is shown as follows.

Let n input data be x= (x1, x2... The output of,xn)T, m hidden layer units is y= (y1, y2... ,yn)T, the result of output layer is, and the target output is. The specific steps are as follows:

The output result of the hidden layer is calculated according to Formula 1, where F is the transfer function of the hidden layer, and WIk represents the connection weight between the input layer neuron and the hidden layer neuron K in the network:

$$y_k = f(\sum_{i=0}^{n} w_{ik} x_i) \tag{1}$$

The output layer result is calculated according to Equation 2, where G is the transfer function of the output layer, and WKL represents the connection weight between neuron K of the hidden layer and neuron L of the output layer in the network:

$$z = g(\sum_{k=0}^{m} w_{kl} y_k) \tag{2}$$

The error between the output value and the target value can be calculated according to Formula 3:

$$MSE = \frac{1}{l}\sum_{l=1}^{1}(t_l - z_l)^2 \tag{3}$$

By adjusting the connection weights between the hidden layer and the output layer, the error between the output and the desired output is reduced until the error meets the requirements.

3. Model Experiment Setup

3.1. Experimental Environment

The experimental environment in this paper is Window10 operating system on the same experimental platform. The algorithm part adopts Python coding and is developed based on the machine learning library Tensorflow. The specific experimental hardware and software environment configuration is shown in Table 1 below:

Table 1. Experiment software and hardware environment parameters

Configuration items	Configuration information
System	Windows 10
Anacoda	4.9.2
Python	3.7.6
Tensorflow	1.16.0
CPU	Intel i5-10400
GPU	RTX2060

3.2. Raw Data Collection

In this paper, the factors affecting the evaluation results are extracted by combining the theories and practices of college English listening teaching. The index data of offline classroom is obtained by first designing the questionnaire, then distributing the questionnaire and analyzing and screening the results of the questionnaire. The questionnaire was designed according to the content of the evaluation index, and the content of the open questions was not included in the total score of the questionnaire from the perspective of data analysis. The index data of the online part is collected from the online teaching platform and can be exported from the platform according to the

evaluation system.

This article takes the English listening course of a college in this city as an example. The data generated in the teaching process of this semester are preprocessed to obtain 90 groups of sample data.

4. Analysis of Experimental Results

4.1. Model Training and Error Analysis

Table 2. The actual evaluation results are compared with the simulation evaluation results

Sample number	Actual evaluation results	Simulation evaluation result	Error
1	96.8	90.2	6.6
2	91.3	89.5	1.8
3	90.4	87.9	2.5
4	91.2	88.7	2.5
5	84.1	87.9	3.8

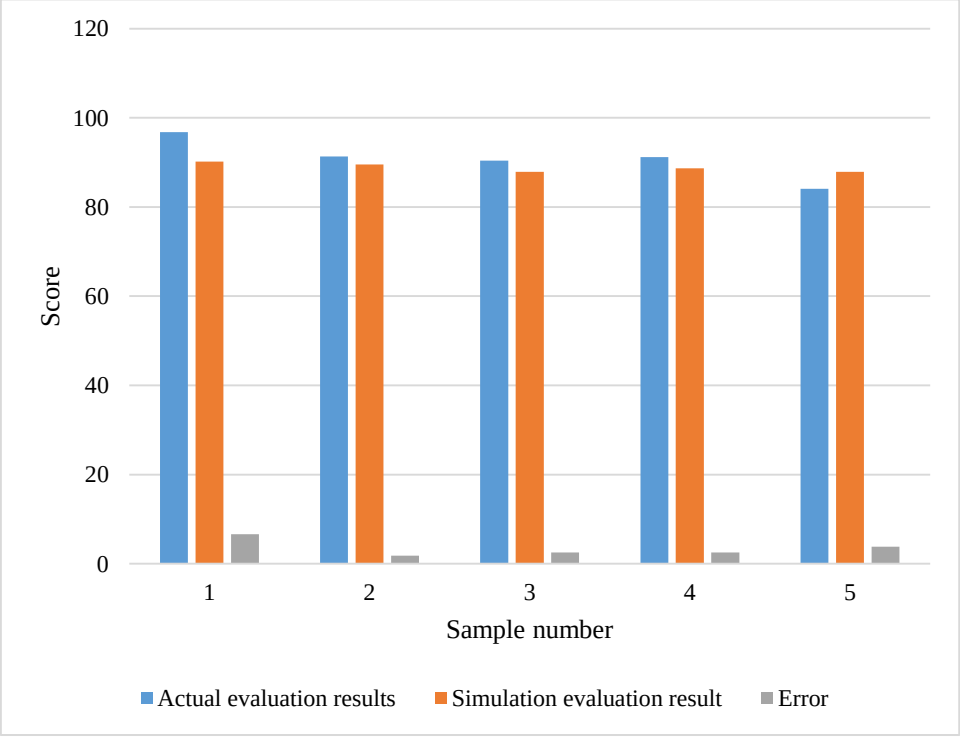

Figure 1. Comparison of errors between actual results and model simulation results

As shown in Figure 1 and Table 2, the predicted results are basically consistent with the actual results, and the average test error is 3.44. The fluctuation of the error score between the model simulation results and the actual results is relatively gentle. The predictions were all within 10 points of error.

4.2. Comparison of Different Models

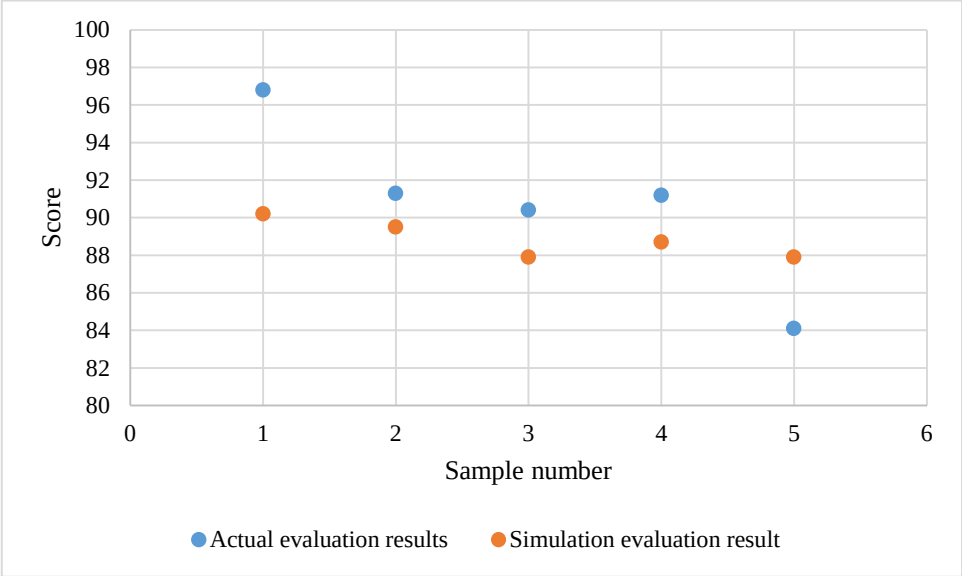

Figure 2. BPNN model evaluation results

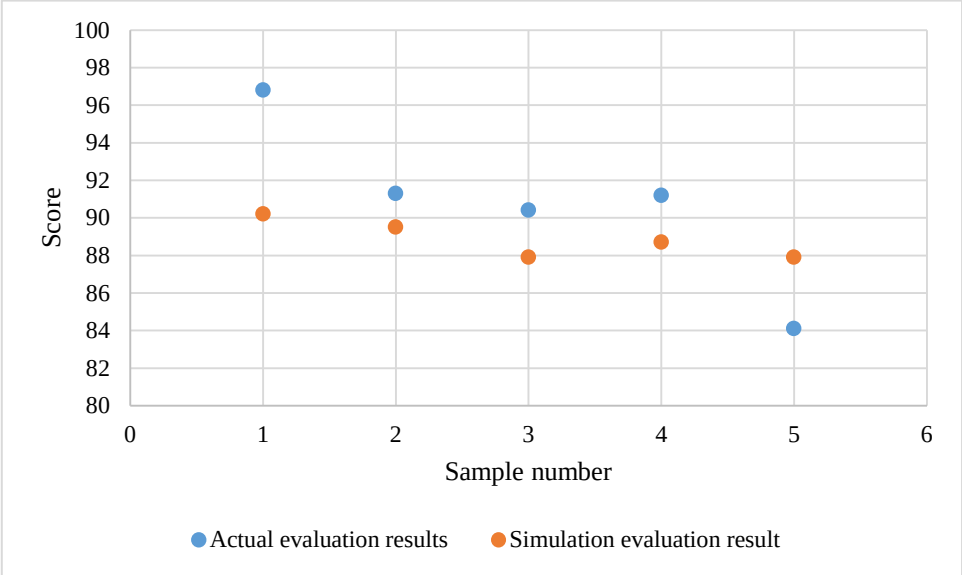

Figure 3. Traditional evolutionary algorithm evaluation model

As shown in Figure 2 and Figure 3, although the traditional evolutionary algorithm can produce prediction results according to students' various grades, it can be seen from the five groups of evaluation data in the figure that the evaluation results of the traditional evolutionary algorithm are relatively flexible. And the BPNN algorithm can predict the students' grades in the range of scores whether it is improved or not.

5. Conclusion

Epidemic prevention and control during the university to really improve the quality of personnel training, cultivating qualified talents for the society, the classroom teaching is a major means to

realize the objective of college education, teaching reform is not a single patterns, but according to the actual situation of students to the province, pay attention to each link of classroom teaching, using new technology and new mode, to improve the effectiveness of classroom teaching, Seek the classroom teaching reform that suits the college development. The widespread use of the Internet during the epidemic prevention and control period has also brought transformative challenges and opportunities to university classroom teaching. Based on the advantages of online and offline classroom teaching, this paper puts forward thoughts and suggestions on the reform of classroom teaching in colleges and universities in Heilongjiang Province during the epidemic prevention and control period, seeks a new model of blended classroom teaching, optimizes all aspects of classroom teaching, makes up for the shortcomings of traditional classroom teaching, and effectively improves the overall teaching level of colleges and universities.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Palea L L, S Boştină-Bratu, Negoescu A. Fundamental Aspects of Evaluation in the Context of Enhancing the Quality of the Educational Act. Land Forces Academy Review, 2018, 22(4):233-238. https://doi.org/10.1515/raft-2017-0031

[2] Nojavan M, Heidary A, Mohammaditabar D. A fuzzy service quality based approach for performance evaluation of educational units. Socio-Economic Planning Sciences, 2020, 73(2):100816. https://doi.org/10.1016/j.seps.2020.100816

[3] Noh Y , Lee S Y . An evaluation of the library′ s educational value based on the perception of public library users and librarians in Korea. The Electronic Library, 2020, 38(4):677-694. https://doi.org/10.1108/EL-04-2019-0098

[4] Scott K, King A, Estes M, et al. Evaluation of an Intervention to Improve Quality of Single-best Answer Multiple-choice Questions. Western Journal of Emergency Medicine, 2018, 20(1):11-14. https://doi.org/10.5811/westjem.2018.11.39805

[5] Diasamidze M, Gvindjhilia T, Motskobili I, et al. Evaluation of the "Quality of Education" in higher educational institutions (on the example of the Batumi State Maritime Academy). Fundamental and applied researches in practice of leading scientific schools, 2019, 31(1):54-57. https://doi.org/10.33531/farplss.2019.1.10

[6] Ghavimi M A, Rahbar M, Kalvanag A F, et al. Evaluation of the Quality of Educational Services of Tabriz University of Medical Sciences based on SERVQUAL Model. World Journal of Dentistry, 2017, 8(2):114-118. https://doi.org/10.5005/jp-journals-10015-1423

[7] Ryzhkov A. Evaluation of the quality of teaching as an element of management of joint

international educational project. ScienceRise, 2017, 3(1):51-59. https://doi.org/10.15587/2313-8416.2017.95710

[8] N Pérez-Soto, C Hernández-Melo, Marulanda-Ascanio C. Teaching job performance and its impact on the Synthetic Index of Educational Quality (ISCE) in the Municipality of Cucuta during the 2016-2019 period. Revista Perspectivas, 2021, 6(1):24-33. https://doi.org/10.22463/25909215.2919

[9] Ferhatoglu S Y, Kudsioglu T. Evaluation of the reliability, utility, and quality of the information in cardiopulmonary resuscitation videos shared on Open access video sharing platform YouTube. Australasian Emergency Care, 2020, 23(3):211-216. https://doi.org/10.1016/j.auec.2020.05.005

[10] Botek M. Comparison of education evaluation models. Quality - Access to Success, 2018, 19(165):63-67.

[11] Villanueva-Jimenez L F, Vazquez-Lopez J A, Yanez-Mendiola J, et al. Decision-making system based on a Fuzzy Hierarchical Analysis Process and an Artificial Neural Network for Flow Shop machine scheduling model under uncertainty. IEEE Access, 2021, PP(99):1-1. https://doi.org/10.1109/ACCESS.2021.3099342

[12] Gunathilake M B, Senarath T, Rathnayake U. Artificial Neural Network based PERSIANN data sets in evaluation of hydrologic utility of precipitation estimations in a tropical watershed of Sri Lanka. AIMS Geosciences, 2021, 7(3):478–489. https://doi.org/10.3934/geosci.2021027

[13] Aprilia B, Marzuki, Taufiq I. Performance of backpropagation artificial neural network to predict el nino southern oscillation using several indexes as onset indicators. Journal of Physics Conference Series, 2021, 1876(1):012004. https://doi.org/10.1088/1742-6596/1876/1/012004

[14] Dikici B, Tuntas R. An artificial neural network (ANN) solution to the prediction of age-hardening and corrosion behavior of an Al/TiC functional gradient material (FGM). Journal of Composite Materials, 2021, 55(2):303-317. https://doi.org/10.1177/0021998320948945

[15] Mehrasa M, Babaie M, Sharifzadeh M, et al. An Input-Output Feedback Linearization Control Method Synthesized by Artificial Neural Network (ANN) for Grid-Tied Packed E-Cell Inverter. IEEE Transactions on Industry Applications, 2021, PP(99):1-1. https://doi.org/10.1109/TIA.2021.3049456

[16] Neves A C, I González, Karoumi R, et al. The influence of frequency content on the performance of artificial neural network–based damage detection systems tested on numerical and experimental bridge data. Structural Health Monitoring, 2021, 20(3):1331-1347. https://doi.org/10.1177/1475921720924320

[17] Peter A. Determination of the Optimum Maturity of New Rice for Africa Using Artificial Neural Network. FUDMA Journal of Sciences, 2021, 5(1):502-510. https://doi.org/10.33003/fjs-2021-0501-596

[18] Dumka B B, Kumar P. Modeling Rainfall-Runoff using Artificial Neural Network (ANNs) and Wavelet based ANNs (WANNs) for Haripura Dam, Uttarakhand. Indian Journal of Ecology, 2021, 48(1):271-274.