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Based on improved BP neural network of college students jump performance prediction and computer simulation

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ABSTRACT

Because now commonly used artificial intelligence to predict the BP neural network has some deficiency, which needs a lot of samples in practical application, and the prediction accuracy of difficulty grasping and other defects. Based on the analysis of the traditional BP algorithm particle swarm algorithm is proposed to improve the BP neural network algorithm ideas. And his application to the college students jump performance prediction, through computer simulation and actual long jump results show that the improved BP neural network algorithm accuracy is higher and relatively reasonable sample requirement. The algorithm is highly recognized by the industry.

KEYWORDS

Improved BP neural network algorithm; Artificial Intelligence; Prediction Model; Prediction accuracy; Predicted samples.



INTRODUCTION

With advances in computer science, more and more researchers began to explore the use of artificial intelligence methods to predict the long-term load forecasting. According to the principle of an important indicator of college physical education requirements and professional assessment of the specific circumstances and KANO theory, the establishment of tangibles, reliability, responsiveness, security and empathy five teaching quality evaluation College Sports. Specifically, tangible means tangible teaching venues. Reliability refers to the physical education teachers who can reliably complete the task of teaching. Responsiveness refers to physical education teachers can take the initiative to help students learn. Security refers to physical education teachers with professional knowledge and ability credible performance. Empathy refers to the students' physical education teachers can stand the issue of perspective to help students. And higher education is the primary means of cultivating high-quality talents, which is the culmination of the school physical education. It is that students learn the theoretical knowledge, skills and establish an important platform for scientific thinking. However, from the perspective of the current status quo of higher education, physical health of college students has declined, mainly as follows: physically weak, sub-health, emotional instability, etc. In addition to objective factors, representing colleges and universities invest in quality evaluation of physical education less, there is no uniform evaluation criterion. It is difficult to reflect differences in the quality of teaching various sports. Build a combination forecasting model based on improved BP network.

BP NEURAL NETWORK PREDICTION MODEL

In the 23 quality properties, a total of nine basic quality attributes, accounting for 39.1% share. Charm total of five quality attributes is accounting for 21.7% share. Proportion classified section 18 properties, contradictions and disputes, so give up this property. And in this 23 quality properties with no difference in quality is no rebellious quality classification, which further validates the reliability of the questionnaire, but also shows the quality of teaching college students for college sports evaluate affirmed. Theoretically, Metzler believe that the basic quality attributes are always important criteria, followed by the desired quality attributes, the charm mass properties, and finally no difference in quality attributes, get the expression: M>O>OA> I, working with paper surveys. The results validate are each other.

After this paper calculated by improving the quality of satisfaction, "site environment in class", "the quantity and quality of physical education equipment used" and "venue space in class" are not satisfied with the highest coefficient. Inadequate sports facilities and equipment have become students satisfied with the quality of teaching college sports major factor, so schools should focus on supporting sports and equipment complement. Active use of various resources on this basis to develop sports programs, which can meet the needs of physical education curriculum in order to improve the quality of teaching college sports satisfaction.

In this paper, PE teaching evaluation system based on student-centered and property rights is an important indicator reflecting the extent of its student concerns. By the above conclusions, it must first improve the basic properties. For example, teachers early in the semester introductory course outline. Teachers use different teaching methods to help students. Teachers demonstrate proper exercise techniques to help students and other students take for granted these properties. When the basic attributes, cannot be increased satisfaction with the quality of teaching, but the lack of basic properties, it will reduce the quality of teaching satisfaction. An effective model is a power load forecasting, prediction using gray theory.

Variable $x^{(0)}$ has the original data series $x^{(0)} = [x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n)]$, with a 1-AGO order to generate an accumulated generating sequence $x^{(1)} = [x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n)]$. Among them:

$$X^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i) \quad (1)$$

Since the sequence $X^{(1)}(k)$ has an exponential growth law, and the solution is just a first-order differential equations exponential growth in the form of solution. So it can be considered the sequence $X^{(1)}$ satisfies the following first-order linear differential equation model.

Secondly it also expected to improve the quality attributes. For example, venues environment in class, school grounds maintenance condition, quantity and quality of physical education equipment used hardware as well as teachers and other students in physical attention, timely adjustment of teaching methods and content, teacher promptly address and resolve problems and other software and so on. And students think these properties should have. If you are not satisfied with the lack of will. So it not only need to improve the properties expected from sports facilities and other hardware aspects, in addition to the teachers to teach motor skills in school during the student must properly care for students targeted guidance.

In addition, it should improve the quality attributes charm, such as teachers use different teaching methods to help students. Teachers respect students and exchange views with students. Teachers create a happy atmosphere for learning and so on. Schools can put this property as a competitive capital, if teachers can use different teaching methods in the teaching process, teacher-student interaction. It will improve the physical quality of teaching, which is to enhance student satisfaction best strategy.

The original basic quality attributes may be because of changes in time and no difference in the environment and become quality. From the customer psychology research conclusion and verification of view findings that the quality of charm, quality and basic quality expectations have changes over time in order to sink characteristics. It means that charm quality attributes over time will gradually become the desired quality, and finally becoming a basic quality.

$$\frac{dx^{(1)}}{dt} + \alpha x^{(1)} = \mu \quad (2)$$

In the formula, α and μ are parameters. μ is the control. Solution of the differential equation as follows:

$$x^{(1)}(k+1) = \left[x^{(0)}(1) - \frac{\mu}{\alpha} \right] e^{-\bar{\alpha}k} + \frac{\mu}{\alpha} \quad (3)$$

Among them, $\bar{\alpha}$ and μ are the approximate solution of formula (2), according to the least squares method to obtain:

$$\begin{bmatrix} \bar{\alpha} \\ \mu \end{bmatrix} = (B^T B)^{-1} B^T Y \quad (4)$$

$$Y_n = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \dots \\ x^{(0)}(4) \end{bmatrix}_{n-1} \quad (5)$$

Formula (5) called GM (1,1) model of response time function model, it is a specific formula for calculating GM (1,1) model of gray prediction, this type do regressive reduction, gray had predicted the number of columns in the original model:

$$\bar{x}^{(0)}(k+1) = \bar{x}^{(1)}(k+1) - \bar{x}^{(1)}(k) \tag{6}$$

TIME SERIES PREDICTION

Time series analysis is to extract useful information from the order information, which is an important mathematical statistics branch. After the recovery of the questionnaire, the use of total correlation and T-test method for analysis, T test were significant level (ie, P<0.05), while the total relevant levels have reached a significant level (ie, P<0.05). Finally it retain all entitled later analysis for the most preparation. First hypothesis test reliability for each subscales and total scale reliability was Cronbach's factor. When the reliability of x>0.7, it means that reliability is quite high. When 0.35<x<0.7, it indicates the general reliability. When x<0.35, it indicates low confidence. This questionnaire forward style title five levels x coefficients were: tangible factor of 0.85, reliability coefficient of 0.82, response coefficient 0.74, protection coefficient was 0.66, empathy factor of 0.80 and total scale factor of 0.86.

While higher education is the primary means of cultivating high-quality talents, which is the culmination of the school physical education. It is that students learn the theoretical knowledge, skills and establish an important platform for scientific thinking. However, from the perspective of the current status quo of higher education, physical health of college students has declined, mainly as follows: physically weak, sub-health, emotional instability, etc. In addition to objective factors, representing colleges and universities invest in quality evaluation of physical education less. There is no uniform evaluation criterion; it is difficult to reflect differences in the quality of teaching various sports.

It can clearly understand the students through questionnaires forward and reverse evaluation of the quality of teaching in college sports properties. According to answer each question and choice of frequency, the proportion of each attribute, quality attributes as the last question. Moreover, charm is represented by A. Expected is represented by O. Basic is represented by M. No difference is represented by I. Rebellious is represented by R, and there is a dispute represents the answer Q.

PSO ALGORITHM IMPROVED BP NEURAL NETWORK

The basic principle

BP network is an error back propagation algorithm by former training multi-layer feed-forward network. This paper also analyzes the results of the process evaluation of the advantages and limitations. On the basis of its limits the research put forward the way to improving the effectiveness of teaching evaluation. And it put forward the process of evaluation that it is not exist in isolation. It can put the evaluation process and the traditional summative assessment together effectively, so as to achieve the sustainable development of teaching, achieve better teaching purpose, the better teaching effect. BP neural network topology includes input layer (input), hide layer (hide layer) and output layer (output layer).

Particle swarm optimization algorithm

PSO algorithm is a population-based optimization method, called particle swarm algorithm, individuals called particles. Traditional perception quality of teaching is one-dimensional, that is when the property meets the quality of teaching, and the students will be satisfied. And when property does not meet the quality of teaching, the students will be not satisfied. However, the quality of teaching evaluation of this single dimension too monotonous is not able to fully explain the student evaluation.

PSO particle optimization algorithm basic formula is as follows:

$$v_i^{n+1} = wv_i^n + c_{1i} \times r_1 \times (P_i^n - X_i^n) + c_{2i} \times r_2 \times (G^n - X_i^n) \tag{7}$$

$$X_i^{n+1} = X_i^n + v_i^n \tag{8}$$

Optimization of neural network learning algorithm

Design algorithm

Traditional perception quality of teaching is one-dimensional, that is when the property meets the quality of teaching, and the students will be satisfied. And when property does not meet the quality of teaching, the students will be not satisfied. However, the quality of teaching evaluation of this single dimension too monotonous. It cannot explain completely that student assessment BP network activation function is selected as the Sigmoid function. Then with the PSO algorithm search the optimal position, so as to minimize the mean square error indicators:

$$E(X) = \frac{1}{2N} \sum_{p=1}^n \sum_{k=0}^c (Y_{k,p}(X) - t_{k,p}) \quad (9)$$

Algorithm implementation steps

Thereby establishing a two-dimensional perception of quality can meet the condition of the property and the degree of customer. KANO theoretical performance based on objective and subjective feelings of the recipient of the service, the quality of service attributes are divided into five categories: 1. Charm mass (A): When the property to meet, customer is satisfaction. But when the property is not met, the customer can accept. 2. Expected quality level (O): When the property to meet customer satisfaction. But when the property is not met, the customer is not satisfied. The basic mass (M): When property satisfied, customers think it should be so. But when the property is not met, the customer is not satisfied. No difference in quality (I): Whether property is satisfied, customers will be satisfied or dissatisfied. Rebellious quality (R): When property is satisfied, customer dissatisfaction. When the property is not met, the customer will be satisfied.

Traditional perception quality of teaching is one-dimensional, that is when the property meets the quality of teaching, and the students will be satisfied. And when property does not meet the quality of teaching, the students will be satisfied. However, the quality of teaching evaluation of this single dimension too monotonous is not able to fully explain the student evaluation. So it can use KANO theory and SERVQUAL theory of university teaching quality satisfaction survey, in order to help the university teachers understand the various needs of the students as well as induction affect students' satisfaction with teaching quality factors.

The three level BP neural network shown in Figure 1. Where: N1 is the input layer node. N2 intermediates layer nodes. N3 is output layer node.

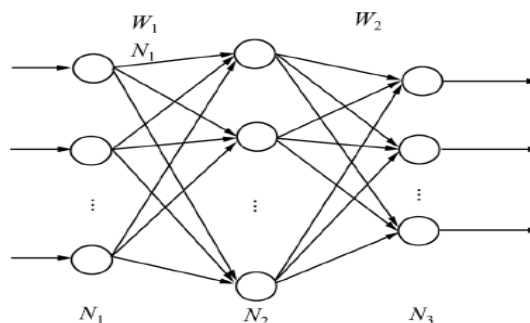


Figure 1 : Three level BP neural network

IMPROVED NEURAL NETWORKS COMBINED FORECASTING MODEL

The three level BP neural network shown in Figure 2. Where: N1 is the input layer node. N2 intermediates layer node. N3 is output layer node.

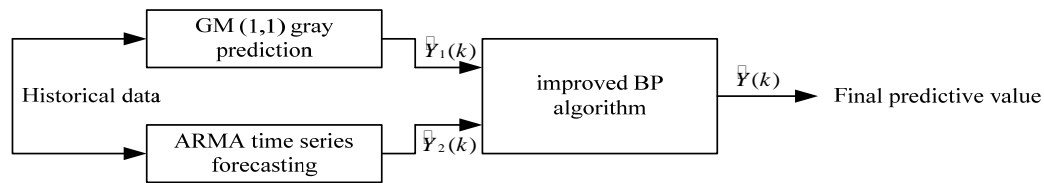


Figure 2 : Improved BP neural network combined forecasting model

IMPROVED BP NEURAL NETWORK COMBINATION FORECASTING METHOD USED IN THE PREDICTION OF COLLEGE STUDENTS IN THE LONG JUMP RESULTS

It also shows the quality of teaching college students to give a positive evaluation of college sports. Theoretically, Metzler believe that the basic quality attributes are always important criteria, followed by the desired quality attributes, the charm mass properties. Finally no difference in quality attributes to get the expression: M> O>OA> I, working with paper surveys. The results are validating each other.

After this paper calculated by improving the quality of satisfaction, “site environment in class”, “the quantity and quality of physical education equipment used” and “venue space in class” are not satisfied with the highest coefficient. Inadequate sports facilities and equipment have become students satisfied with the quality of teaching college sports major factor, so schools should focus on supporting sports and equipment complement. Active use of various resources on this basis to develop sports programs, which can meet the needs of physical education curriculum in order to improve the quality of teaching college sports satisfaction.

PE teaching evaluation system based on student-centered and property rights is an important indicator reflecting the extent of its student concerns. By the above conclusions, it must first improve the basic properties. For example, teachers early in the semester introductory course outline. Teachers use different teaching methods to help students. Teachers demonstrate proper exercise techniques to help students and other students take for granted these properties. When the basic attributes, cannot be increased satisfaction with the quality of teaching, but the lack of basic properties, it will reduce the quality of teaching satisfaction.

Secondly it also expected to improve the quality attributes. For example, venues environment in class, school grounds maintenance condition, quantity and quality of physical education equipment used hardware as well as teachers and other students in physical attention, timely adjustment of teaching methods and content, teacher promptly address and resolve student problems and other software and so on. And students think these properties should have. If you are not satisfied with the lack of will. So it not only need to improve the properties expected from sports facilities and other hardware aspects, in addition to the teachers to teach motor skills in school during the student must properly care for students targeted guidance.

In addition, it should improve the quality attributes charm, such as teachers use different teaching methods to help students. Teachers respect students and exchange views with students. Teachers create a happy atmosphere for learning and so on. The comparison results as shown in Figure 3.

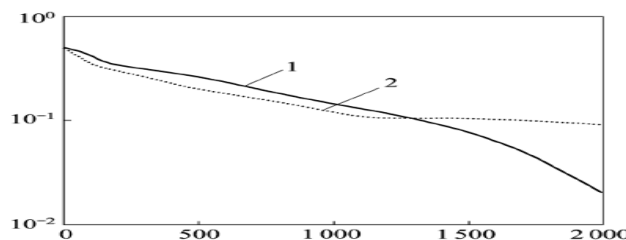


Figure 3 : Relationship between the relative error and the number of training under different algorithm

It can see from Figure 3, with the increase in the number of iterations, it shows the quality of teaching college students for college sports evaluate affirmed. Theoretically, Metzler believe that the basic quality attributes are always important criteria, followed by the desired quality attributes, the charm mass properties. Finally no difference in quality attributes to get the expression: $M > O > OA > I$, working with paper surveys. The results are validating each other.

In this paper, after improving computing satisfaction through quality, so schools should focus on supporting sports and equipment complement. It can active use of various resources on this basis to develop sports programs to meet the needs of physical education curriculum, to improve the quality of teaching students of college sports satisfaction.

PE teaching evaluation system based on student-centered and property rights is an important indicator reflecting the extent of its student concerns. By the above conclusions, it must first improve the basic properties. For example, teachers early in the semester introductory course outline. Teachers use different teaching methods to help students. Teachers demonstrate proper exercise techniques to help students and other students take for granted these properties. When the basic attributes, cannot be increased satisfaction with the quality of teaching, but the lack of basic properties, it will reduce the quality of teaching satisfaction.

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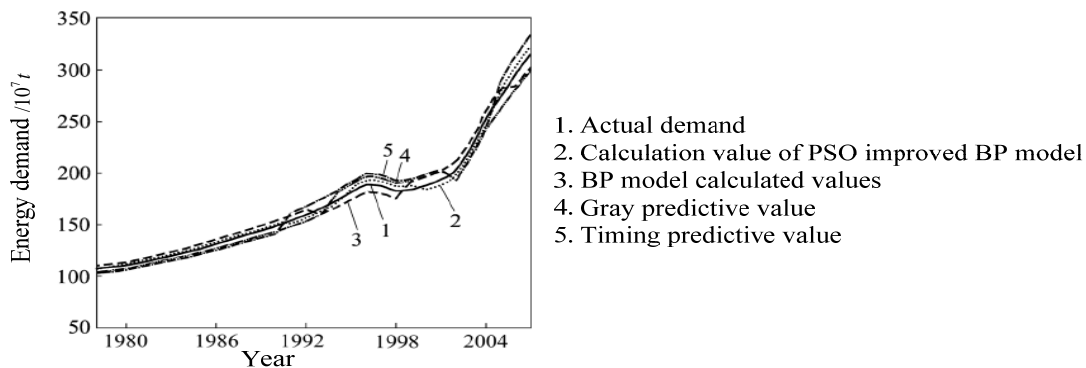


Figure 4 : Different methods to predict the results

In addition, it should improve the quality attributes charm: such as teachers use different teaching methods to help students. Teachers respect students and exchange views with students. Teachers create a happy atmosphere for learning and so on. PSO improved BP algorithm and BP neural network, gray forecasting accuracy method and ARIMA forecasting method comparison results are shown in TABLE 1.

TABLE 1 : Compares the prediction accuracy of the proposed method study with other methods

method	prediction accuracy %	relative error %
PSO combination improved BP forecast	97.9	-2.1
BP combination forecast	93.1	6.9
Gray prediction	91.8	-8.2
ARIMA forecast	92.6	7.4

CONCLUSIONS

On the basis of analysis of this subject the traditional BP algorithm based on particle swarm algorithm is proposed to improve the BP neural network algorithm ideas. And it was applied to college students in long jump results predicted. By computer simulation and actual long jump results show that improved BP neural network algorithm has high prediction accuracy. The sample requirement is relatively reasonable, and the method is effective.

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