Hindawi
Wireless Communications and Mobile Computing
Volume 2021, Article ID 1909345, 11 pages
https://doi.org/10.1155/2021/1909345

Research Article

Cloud Education Chain and Education Quality Evaluation Based on Hybrid Quantum Neural Network Algorithm

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Received 8 June 2021; Revised 7 July 2021; Accepted 22 July 2021; Published 15 August 2021

Academic Editor: Yuanpeng Zhang

This paper proposes the functional model and application service implementation process of the education cloud platform application service architecture. The entire cloud application service architecture mainly includes four parts: cloud service management, cloud application service rapid creation and deployment, dynamic process configuration, and unified identity authentication. Based on the basic theory of workflow, the process status and business services of cloud application services are discussed. The BP neural network weight optimization model based on the improved quantum evolution method is studied, and a method that combines the improved quantum evolution algorithm (IQEA) and the BP algorithm to complete the back propagation neural network training is proposed, that is, the IQEA-BP algorithm. Firstly, the traditional quantum evolution algorithm is improved, and then, the improved quantum evolution algorithm is used to optimize the network weights as a whole to overcome the shortcomings of the BP algorithm that is easy to fall into the local optimum; then, we use the BP algorithm to find the better weight as the initial value to improve the training and prediction accuracy of the network. In order to enrich the school education quality evaluation system, this article adds soft indicators that can reflect school education performance on the basis of the existing "National Education Inspection Team" indicators and uses analytical methods to prove the effectiveness and feasibility of the new evaluation indicators. The X1-X10 index data is selected as the evaluation index of the school education quality evaluation system in this paper. Testing the performance of the BP neural network, the accuracy rate of the school education quality evaluation is 93.3%, the average absolute error is 0.067, and the accuracy and recall rate of the test set grade gradient of 0, 1, 2, 3, 5, 6, and 8 are all 93%, indicating that the IQEA-BP neural network algorithm has a good effect on the evaluation of school education quality.

1. Introduction

The classroom teaching process and the supervision of the teaching quality in the classroom are an effective method to ensure the quality of classroom teaching [1]. The direct performance of teachers' classroom teaching effect is the students' mastery and application of knowledge; in order to ensure the quality of teachers' classroom teaching, it is necessary to strengthen the control of teaching quality [2]. Teaching evaluation is one of the most commonly used methods in teaching supervision activities. It is to objectively inspect and judge both the teacher's teaching process in the classroom and the student's learning quality [3]. Through the supervision and assessment of students' learning quality, the results of the implementation can be fed back to teachers, so that they can improve or strengthen certain aspects of teaching, so as to better and more timely ensure that teachers complete teaching tasks within the corresponding teaching timeliness. Nowadays, in order to continuously improve the learning ability of students and the teaching ability of teachers, a comprehensive and systematic teaching quality monitoring system should be established and improved, which can play a positive role in cultivating talents who adapt to the times and have innovative spirit and practical ability [4].

The information network center opens the port, breaking through the geographical limitations of the original paper-based evaluation. Users can log in to the evaluation system in various forms at any time to evaluate the objects or content that need to be evaluated. This makes teaching evaluation more flexible. In today's society where informatization continues to develop, information technology can be used to establish a more complete teaching evaluation system [5]. Through this system, teachers' teaching conditions can be monitored in real time, and teachers can understand how they are teaching in a shorter period of time. The real-time situation in the process can help teachers adjust their teaching plans in a shorter time and better meet the teaching needs of students. The popularization of information technology in every industry is an inevitable trend in the development of contemporary information society. The teaching evaluation system established by information technology not only is a manifestation of social and technological progress but also can improve the quality of teaching better and faster [6].

This paper analyzes the existing cloud application service architecture and model of cloud application services, puts forward the architecture model of education cloud platform application services, and elaborates the application service implementation process. This paper introduces the method of initial weight optimization of a neural network, analyzes and discusses the advantages and disadvantages of various methods, and proposes a combination of improved quantum evolution algorithm (IQEA) and BP algorithm to complete the back propagation neural network. The algorithm first improves the traditional quantum evolution algorithm and then uses the improved quantum evolution algorithm to optimize the network weights as a whole, to overcome the shortcomings of the BP algorithm of easily falling into the local optimum. The BP algorithm is further optimized to improve the training and prediction accuracy of the network. This article uses analytical methods to classify the educational quality of some schools in a certain city. Through the evaluation and analysis of the old and new evaluation indexes, the appropriate evaluation indexes are determined. We calculate the evaluation scores of the comprehensive principal components and obtain the evaluation results of the education quality of each school. The comparison and analysis of the evaluation results of the new and old evaluation indicators show that the accuracy of the new evaluation index is higher than that of the old evaluation index, and the average absolute error is lower than that of the old evaluation index, which proves the feasibility and effectiveness of the new evaluation index. This paper selects 11 indicators of compulsory education balance index X1-X10 and the new school admission score X11 as the evaluation index of the school education quality evaluation system, which provides good data support for school education quality evaluation. We use the BP neural network evaluation model to comprehensively evaluate the quality of school education and explore the important and difficult points of the BP neural network evaluation model based on the compulsory education balance index, including the network structure design of the BP neural network and the determination of the number of neurons in the hidden layer.

2. Related Work

Relevant scholars merged quantum computing with traditional neural computing and proposed a quantum competitive learning algorithm capable of pattern classification and associative memory, expounding the dynamics of quantum neural network and its application in information security [7]. Researchers use universal quantum logic gates as calculation basis functions to propose a quantum neural computing model [8]. The simulation results show that this model is better than the traditional neural network model. Relevant scholars analyzed the motivation and form of the evolution of the artificial neural network vector subneural network, the advantages of the quantum neural network, and possible implementation methods and expounded the preliminary application of the quantum neural network in pattern recognition, entanglement calculation, function approximation, and so on [9]. Related scholars introduced the quantum neural network with multilayer activation function into the multisensor information fusion and proposed a multisensor information fusion integrated circuit fault diagnosis algorithm based on the quantum neural network [10].

Related scholars have studied the weight learning problem of a quantum neural network model. Researchers proposed a quantum self-organizing feature mapping network model and clustering algorithm, studied the application of the quantum neural network in pattern recognition and multimode high probability Grover algorithm, and achieved good application results [11]. Related scholars proposed a quantum BP neural network model and its learning algorithm based on the evolution of a universal quantum gate and studied the application of quantum M-P and perceptron network models as well as quantum Hopfield in image processing [12]. Based on the in-depth study of quantum revolving gates and control NOT gates, the researchers proposed a quantum gate circuit-based quantum control NOT gate neural network model and algorithm [13]. At the same time, they proposed a quantum genetic algorithm and applied it to fuzzy neural control. Based on the quantum self-organizing neural network model, the original parallel quantum neural network has been studied more deeply, and good application results have been achieved. Related scholars apply a quantum gate neural network to the field of image compression and optimize the network weights through genetic algorithm, which improves the overall performance of the network [14].

Cloud computing originated in the United States and later spread to many countries including Singapore, Japan, the United Kingdom, and India. Cloud computing first appeared as a commercial service, and then, new cloud computing technology began to be continuously developed under the promotion of Google, IBM, Amazon, and other world companies, enriching the functions of cloud computing technology and opening cooperation projects with universities. The platform uses cloud computing to serve school management and teaching development, save management costs, broaden interschool and intraschool interaction channels between teachers and students, and expand the use of resources [15]. Cloud computing was first applied to large

Internet companies and e-commerce companies. Since then, Tsinghua University and Google have cooperated to launch a cloud computing technology promotion plan and strengthen the connection between education and cloud computing technology by building a cloud computing-based teaching network platform [16].

Many companies such as China Telecom and Huawei have cooperated with universities to develop "Education Cloud" platform projects to expand the coverage of high-quality educational resources and promote educational equity. In addition, the state has launched cloud education programs such as the coconstruction and sharing of classroom teaching resources, electronic schoolbags, and dual classroom teaching applications in the pilot education cloud. Yunwei Technology Co., Ltd. has developed the world's first cloud computing application platform dedicated to the field of education—the Yun Education Network, which provides one-stop teaching organization and management services [17]. At present, many colleges and universities have built their own educational information service platforms to provide services for teaching. In addition, many educational institutions and Internet companies have begun to develop and promote their own teaching platforms. However, there are still few complete education platforms based on cloud storage, many basic functions of the system are not yet complete, and various platforms cannot communicate with each other.

Relevant scholars pointed out that blindly adopting qualitative or quantitative methods for teaching evaluation is not comprehensive [18]. Only some general data can be obtained. In order to obtain more comprehensive data, a fuzzy comprehensive evaluation method combining qualitative and quantitative methods can be used. The analytic hierarchy process can make a better and more comprehensive evaluation of teaching quality. The use of effective evaluation methods is a prerequisite to ensure that the evaluation results are objective, fair, and accurate. Some schools use quantitative teaching evaluation forms and trust the results of a large amount of data [19]. The use of quantitative teaching evaluation forms only simplifies the content of the evaluation at the beginning, but the evaluation process needs to consume more students. It takes a lot of time for calculating data when summing up the evaluation results. Time is wasted and accurate data cannot be obtained. Some schools use the form of "listening to lectures" to evaluate teaching, but this way will affect the teacher's teaching plan [20]. The teacher's teaching plan has been set at the beginning of the semester. During the teaching process, it is constantly based on the situation of the students. However, the school adopts this kind of evaluation method. If teachers want to get a better evaluation, they need to take out the best state of the usual class. It is inevitable to conduct a drill with the students, and this kind of evaluation method will not reach it at all. At present, domestic universities and colleges mainly adopt the form of questionnaires supported by large amounts of data and the form of online evaluation using network information as support. Both evaluation forms have been baptized by time and are always under the continuous development of time and society. The one with the lower utilization rate will be eliminated, and a more feasible way will be adopted to evaluate the teaching of teachers.

3. Education Cloud Platform Application Service Architecture Modeling

3.1. Analysis of Application Service Architecture of Education Cloud Platform. The education cloud platform application service refers to the education application service resources running on the cloud platform. The deployment of education application resources on the cloud platform is mainly to reduce the cost of education resources, provide resource sharing rates, and solve the problems of uneven distribution of education resources. For the education cloud platform application service as the application of software as a service in the education field, its architecture model follows the basic architecture of software as a service, and as a special case of active service, its architecture model also retains the characteristics of the active service model. From the above two points, it can be concluded that the architecture of cloud application services is as shown in Figure 1.

The basic model of cloud application services includes three roles and five basic operations. The three roles are service registry, service user, and service provider [21–23]. The five basic operations are publishing, authorization, search, binding, and execution. This architecture corresponds to the payment model of cloud application services "on-demand leasing" and provides a solution for the integrated utilization of educational resources. In this architecture model, the existing education application system can be provided as a service to schools or educational institutions. They order services according to their own needs, and after obtaining service authorization, they can access software services through a browser or client. Based on the analysis of the existing application service software architecture foundation, combined with the special needs of education cloud platform application services, a complete cloud application service architecture should have the following characteristics:

(1) *Multitenancy*: cloud application services are software-as-a-service based on cloud platforms that are released by service providers and hosted by the service registry. This mode of operation requires cloud application services to support multitenancy in order to maximize the interests of the three parties.

(2) *Configurability*: according to changes in tenants' demand for cloud application services, tenants can configure the functions in the service to meet different needs.

(3) *Openness*: the application service resources on the education cloud platform should be open and shareable, so that the maximum use of educational resources and the sharing of educational resources can be realized to a certain extent.

(4) *Ease of use*: based on the characteristics of openness, to realize resource sharing between different application systems, the convenience of switching between different application systems must be considered.

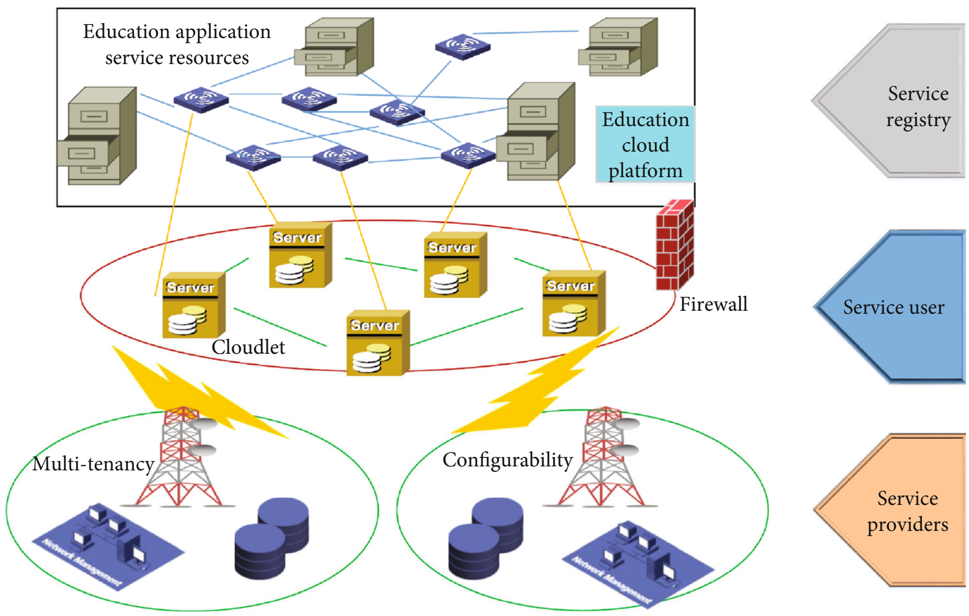

Figure 1: Cloud application service architecture.

3.2. Cloud Application Service Architecture Function Model. To provide application services based on the education cloud platform, we must first build a cloud service management platform with the function of a service registry. Based on the idea of active service, educational application software is provided as a service for tenants to choose, and a platform interface is provided for tenants to order application services; it also provides a management platform for application software released by service providers. Secondly, application services based on the cloud platform have the characteristics of multitenancy, so it must be able to configure the service and realize the convenient deployment of the service. Third, the ultimate goal of this topic is to realize the sharing of educational resources, so a convenient and effective resource utilization plan should be proposed. According to the above considerations, an architecture model based on the education cloud platform application service is proposed, as shown in Figure 2.

As can be seen from the architecture model diagram, the cloud application service architecture has four main parts: unified authentication platform, application service configuration, service publishing, and service management center [24–26].

(1) *Unified certification platform*: this part is responsible for the identity authentication of all application services. Users only need to have an application service account to access the shared resources of other trusted application services without additional account registration.

(2) *Application service configuration*: after the user subscribes to the service, according to his own individual needs, the initial application service related process is set to meet the user's dynamic requirements.

(3) *Application service release*: as the administrator of cloud application services, when users purchase corresponding application services on demand, these services must be published on the server for users to use. Service publishing provides relatively quick service deployment functions and education for service managers.

(4) *Application service management center*: this part is similar to the service registration center of active service, and its function is to manage service information and equipment information, service order management, service maintenance, and tenant management. Users can learn about the types of education application services and service functions that exist on the cloud platform through the service management center, such as office automation management system, library management system, and student attendance management system, and then complete the service ordering process.

For service managers, it provides service providers with the software, hardware operation platform, and network infrastructure required for service operation and collects the rental fees paid by service users when they rent the service. Although in the short term, all the funds invested will not be recovered, in the long run, the benefits brought by cloud service applications are considerable (see Figure 2).

3.3. Cloud Application Service Implementation Process. According to the above analysis of cloud application service architecture and the proposed cloud application service architecture function model, it can be understood that cloud application services are service software deployed on the cloud platform. These application software are managed

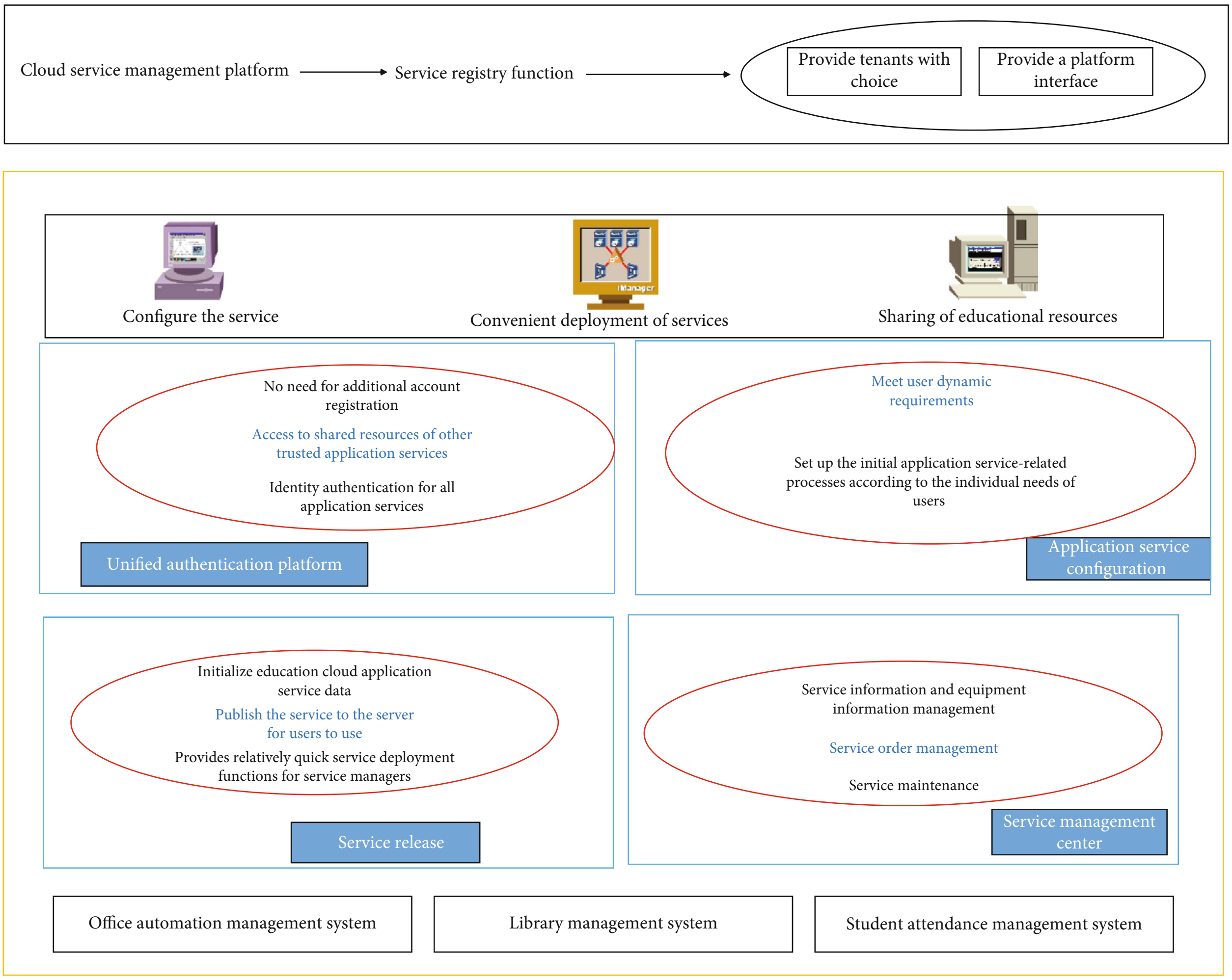

Figure 2: Education cloud platform application service architecture functional architecture.

and released by the service center in a unified manner, users can configure the functional flow of the service, and mutually trusted services can be free to log in through a unified identity authentication platform to realize cloud application service resource sharing. We elaborated based on the entire implementation phase of application services, and the implementation process based on the education cloud platform application service architecture is shown in Figure 3.

The overall implementation process of the application service architecture is as follows: First, the application service information is released to the service management center, and then, the user orders the cloud application service. The service management center reviews the cloud application service order and deploys the service on the cloud platform. The user initiates a request to the application service through the Internet, and the unified identity authentication part verifies the validity of the user's identity. After the verification is completed, the user can share other application service resources through the identity authentication platform without login, thereby realizing the education cloud application service software resources shared.

4. BP Neural Network Weight Optimization Hybrid Model Based on Improved Quantum Evolution Method

4.1. Improved Quantum Evolution Algorithm. IQEA uses the quantum revolving door update strategy to complete the update operation of the population. The value of the rotation angle θ_i is

$$\theta_i = \Delta\lambda_{i-1} \cdot S(\alpha_{i-1}, \beta_{i-1}). \quad (1)$$

Among them, $S(\alpha_{i-1}, \beta_{i-1})$ and $\Delta\lambda_{i-1}$ are the rotation direction and angular step of the rotation angle, respectively. Delta is a coefficient related to the convergence speed of the algorithm, and the value must be reasonable. Combined with the idea of dynamically adjusting the rotation angle of the quantum gate, we propose a specific implementation form of delta:

$$\text{delta} = 0.02\pi - \frac{(n-1)\cdot k}{\text{MAXGEN-1}}. \quad (2)$$

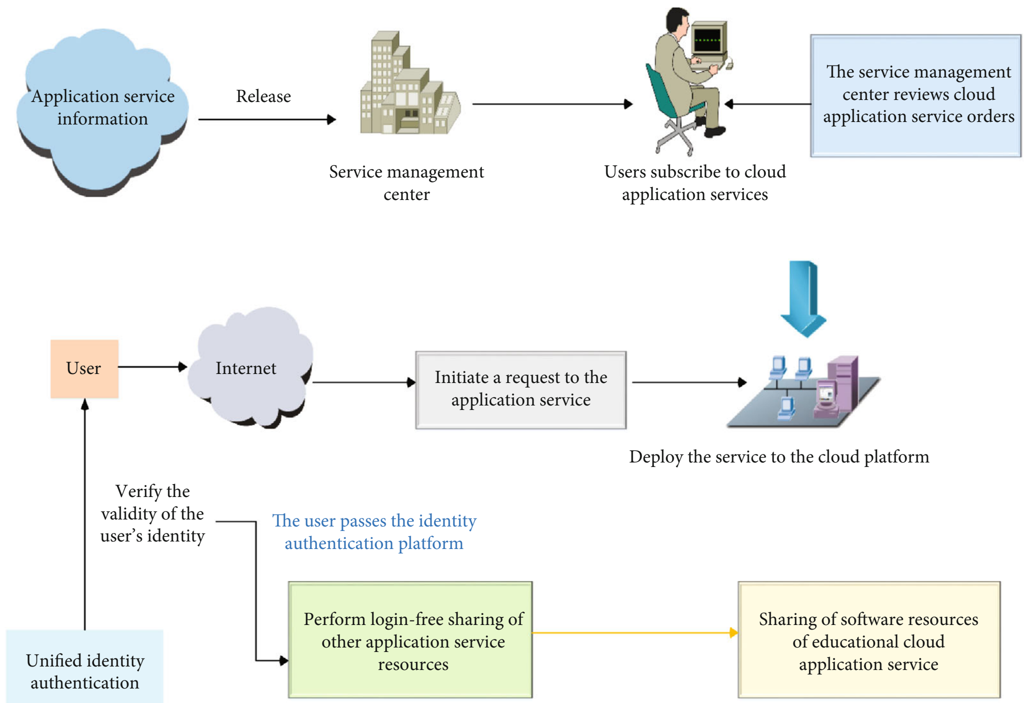

Figure 3: The implementation process of education cloud platform application services.

Among them, n is the current evolutionary algebra, MAXGEN is the terminating algebra, and k is a constant between [0,1]. At the beginning of the algorithm operation, the search grid is larger, which increases the convergence speed of the algorithm. At the end of the algorithm operation, the search grid is smaller, so as to achieve precise search and to help find the optimal solution.

The search capability of EA has been greatly improved through crossover operations. The quantum crossover operation introduced by IQEA makes full use of the interference of quantum states to make full use of all chromosomal information to generate more new patterns, greatly improving the search ability of the algorithm, and can effectively solve optimization problems with little correlation between genes. This paper proposes a specific implementation process of quantum crossover: randomly sort all individuals in the population; cyclically shift the i-th position of all individuals after sorting by $i-1$ times to obtain a new population after the crossover operation.

IQEA uses quantum mutation operations to prevent the algorithm from falling into a local optimal solution. Due to the entanglement nature of quantum states, single-point mutation can effectively prevent premature maturity during quantum mutation. Therefore, this article adopts a single-point mutation quantum mutation operation.

4.2. Artificial Neural Network and BP Algorithm. A neural network system is a complex network system that is widely interconnected by a large number of simple processing units (neurons), which has certain learning, memory, and calculation capabilities. Neural networks have some notable features, such as nonlinear mapping capabilities, no need for precise mathematical models, and easy implementation of software and hardware.

A multilayer perceptron (MLP) network is one of the common neural network models. This type of neural network can have multiple hidden layers, the basis function $u(\cdot)$ takes a linear function, and the activation function $f(\cdot)$ can take many forms. When the activation functions of all computing nodes take the hard limit function, it is called a multilayer discrete perceptron: when the hidden layer nodes take the sigmoidal function, it is a well-known BP neural network.

A BP neural network has a high degree of nonlinear mapping ability. It has been proven that a 3-layer BP network can approximate a continuous function with arbitrary precision. The activation function of hidden nodes of the BP network is a sigmoidal function, so the BP network is also called an activation function as the sigmoidal multilayer perceptron. The activation function of the output node varies depending on the purpose. When the network is used for classification, the output node activation function generally uses a sigmoidal function or a hard limit function; if it is used for function approximation, the output node activation function generally uses a linear function.

Suppose that the first hidden layer has n neurons and the second hidden layer has n neurons. The corresponding weight vectors are w, w', and w'', and the input vectors are x, x', and x''. Suppose for$P$learning sample vectors, the goal of learning is to minimize the following mean square error:

$$E(W) = 0.5 \cdot \prod_{p=0}^{P-1} \prod_{i=0}^{N_M-1} [y(l,p) - d(l,p)]^2. \quad (3)$$

Among them, $d(l, p)$ and $y(l, p)$, respectively, represent the target output of the p-th training mode corresponding to the l-th sample and the actual output of the network, and NM is the number of neurons in the output layer. For simplicity, the offset threshold θ is also incorporated into the weight vector. The error is propagated back, and the weights of each layer are corrected in turn. The output layer is

$$w''_{kl}(t+1) = w''_{kl}(t+1) - (1-\eta) \cdot \prod_{p=0}^{P-1} [x \cdot \delta(kl, p)], \\ \delta(kl, p) = y(l, p) \cdot [1 - y(l, p)] \cdot [d(l, p) - y(l, p)]. \quad (4)$$

Among them, $\eta > 0$ is called the learning rate and t is the number of iterations. The middle hidden layer is

$$w'_{jk}(t+1) = w'_{jk}(t-1) + \eta \bullet \prod_{p=0}^{P-1} x' \cdot \delta(jk, p). \quad (5)$$

Among them,

$$\delta(jk, p) = \prod_{l=1}^{N_M} \delta(kl, p) \cdot x(k, p) \cdot [1 - x(k, p)]. \quad (6)$$

The BP algorithm solves the learning problem of multilayer perceptrons and makes the research of neural networks enter a new stage. Of course, the BP algorithm has some shortcomings while achieving success, the most important of which is that the algorithm tends to fall into local extremes. From a mathematical point of view, BP is a gradient descent algorithm, which is very sensitive to the selection of initial values and step lengths. Since the training error surface is usually multipeak, the BP algorithm easily falls into the local optimum, and the generalization ability of the network is not strong when the network structure is determined.

Training error and prediction error (test error) are two important indicators to measure the performance of neural networks. In particular, the prediction error, which characterizes the generalization ability of the trained neural network, is a key indicator that determines whether a network can be applied. Generally speaking, the generalization ability of a neural network is determined by the topological structure and network weights. The topology design of the neural network has a lot to do with the specific form of the problem to be solved.

4.3. Weight Optimization Model Based on IQEA-BP Neural Network. Aiming at the problem that the BP algorithm easily falls into the local minimum, this paper proposes the IQEA-BP neural network training method. The neural network training process can be regarded as an optimization problem. By finding a set of optimal real number weight combinations, the error between the output result and the expected result under this weight is minimized. Quantum evolutionary algorithm is a better way to find this optimal weight combination.

The main idea of using the improved quantum genetic algorithm to optimize the weights of the BP neural network is as follows: First, use the quantum genetic algorithm to optimize the initial weight distribution and find a better search space in the solution space. In this search space, there are$\sigma (\sigma \geq 1)$which set the optimal initial weight combination to overcome the shortcomings of the BP algorithm wherein it is easy to fall into the local optimum and is more sensitive to the initial value setting; then, use the BP algorithm gradient descent principle to further "fine-tune" the weights; the optimal solution is searched out in this smaller solution space, which is the true global optimal point. Using the improved quantum genetic algorithm to optimize the weights of the neural network can better prevent the search from falling into the local minimum.

For the optimal solution obtained, the weights and thresholds of the σ group neural network with the smallest error are used as the initial weights of the neural network for training. If the accuracy requirements cannot be met, the neural network training can be performed again. The convergence speed of the algorithm is accelerated by introducing a mechanism for dynamically adjusting the rotation angle of the quantum gate. By adopting quantum crossover and quantum mutation operations, the interference and entanglement characteristics of quantum states are fully utilized, so the algorithm has better optimization performance and can effectively prevent premature maturity.

Because it has gone through the global search of the improved quantum evolution algorithm, it is unlikely that it will fall into a local minimum again. The training is repeated until a set of neural network weights and thresholds that meet the accuracy requirements are obtained. The schematic diagram of the entire algorithm is shown in Figure 4.

5. Experimental Results and Analysis

5.1. Forward and Standardization of Reverse Indicators. In order to protect school information, all school names involved in this article use virtual names. The evaluation index data of some schools is shown in Figure 5.

Before using analytical methods to comprehensively evaluate multiple indicators, it is necessary to judge whether the original indicator variables have reverse indicators. If there is a reverse index, it needs to be normalized so that all the evaluation indexes tend to the same direction. Analyzing the data characteristics of the index variables found that they are all positive index data, so there is no need to carry out the normalization process.

5.2. Calculate the Covariance Matrix. The covariance matrix of the standardized data eliminates the influence of the variance of a single indicator variable and retains the correlation between the indicator variables. The index with strong correlation and a large number of related indexes in the covariance matrix is used as the principal component. This principal component has a large overlap with other indexes and contains more information about the original data. The covariance matrix of the standardized experimental data is shown in Table 1.

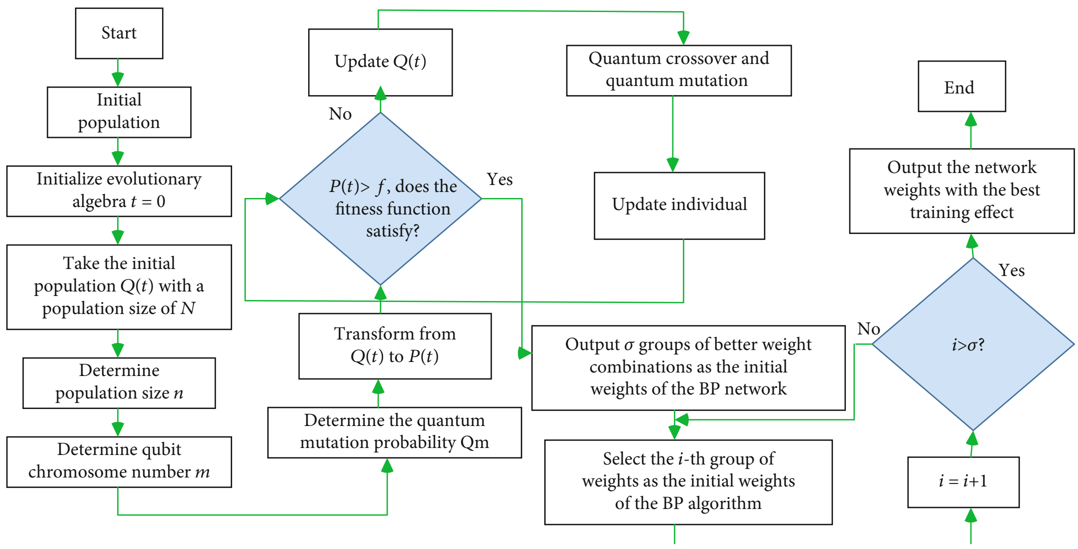

FIGURE 4: Flow chart of IQEA-BP algorithm.

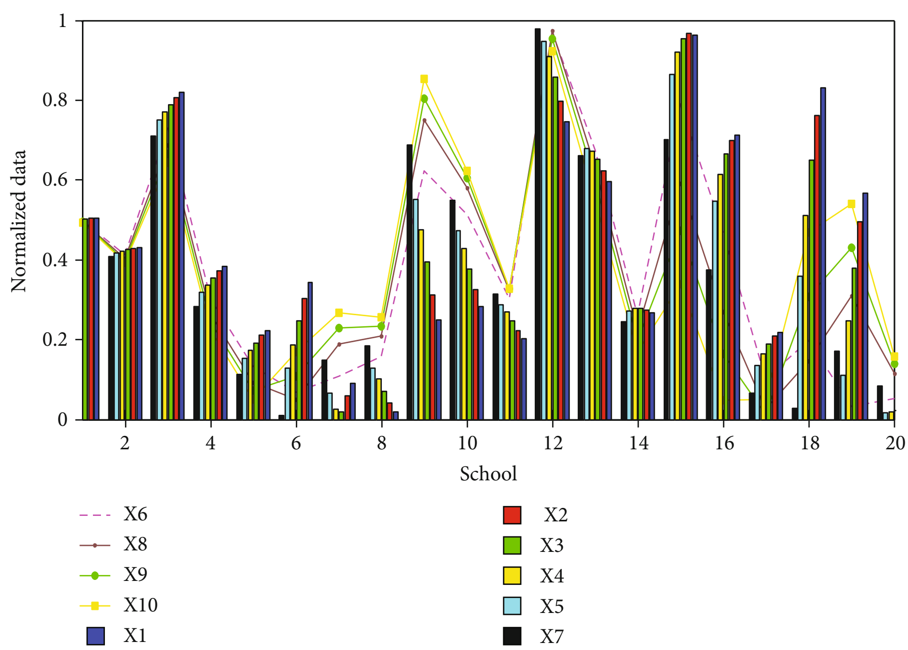

FIGURE 5: Data of some schools in a city.

In Table 1, the matrix of X1-X9 represents the covariance matrix of the old evaluation index, and the matrix of X1-X10 represents the covariance matrix of the new evaluation index. From the data in Table 1, it can be concluded that most of the variables have a high correlation. For example, the total number of students has a high correlation with the other 10 evaluation indicators, which proves that there is overlap of information between the new and old evaluation indicators.

5.3. Results of Comprehensive Evaluation of Education Quality. Through the positive and negative analysis of the evaluation indicators, it can be known that X1-X10 are all positive indicators, that is, the larger the indicator data, the better. We analyze these evaluation indicators to get a comprehensive ranking of school education quality. The smaller the ranking value, the better the school education quality. Figure 6 shows the distribution of the new evaluation indicators X1-X10 after the school's education quality evaluation ranking. It can be seen from the figure that there are only individual indicator data that do not match the school's ranking results. The change trend of most of the new evaluation indicators X1-X10 is consistent with that of the school's ranking. The school ranking results are consistent, that is, the higher the data of the new evaluation index X1-X10, the better the school education quality and the higher the school ranking; the lower the data of the new evaluation index X1-X10, the worse the school education quality and the higher the school ranking lean back (see Figure 6).

Table 1: Covariance matrix.

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
X1	0.98	0.87	0.82	0.85	0.83	0.87	0.82	0.90	0.76	0.82
X2	0.71	1	0.87	0.82	0.82	0.81	0.97	0.86	0.87	0.89
X3	0.71	0.71	1	0.87	0.82	0.86	0.82	0.87	0.82	0.83
X4	0.83	0.71	0.71	0.99	0.87	0.82	0.89	0.87	0.82	0.85
X5	0.87	0.82	0.89	0.81	0.99	0.87	0.82	0.8	0.71	0.93
X6	0.87	0.82	0.87	0.83	0.75	1	0.87	0.82	0.8	0.91
X7	0.87	0.82	0.84	0.83	0.73	0.76	0.98	0.87	0.82	0.88
X8	0.87	0.82	0.84	0.84	0.87	0.82	0.89	1	0.71	0.77
X9	0.87	0.82	0.86	0.71	0.87	0.82	0.83	0.88	1	0.91
X10	0.87	0.82	0.87	0.82	0.87	0.82	0.84	0.87	0.75	0.99

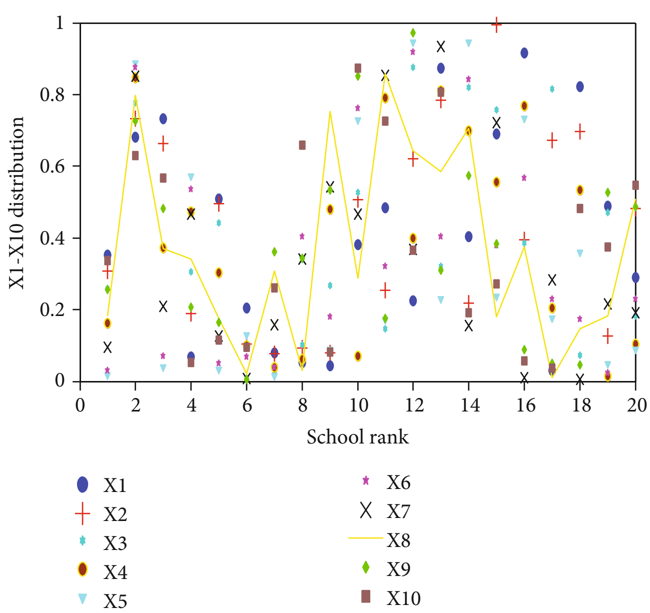

Figure 6: Distribution of X1-X10 after school ranking.

In order to quantitatively compare the evaluation effect of analysis methods, this paper uses the accuracy rate to analyze the evaluation effect of the IQEA-BP neural network. The results of the evaluation index experiment are shown in Figure 7.

It can be seen from Figure 7 that the accuracy of the IQEA-BP neural network is higher than that of the BP neural network. It proves that the evaluation result of the IQEA-BP neural network is closer to the empirical value of school education quality grade gradient. Therefore, this article uses the IQEA-BP neural network as the evaluation method of the school education quality evaluation system. After the evaluation index data X1-X10 are trained by the neural network for 3000 times, the error rate of the training set and the test set is obtained, as shown in Figure 8. It can be seen from Figure 8 that the error rate of the IQEA-BP neural network training set and the test set is very low, and the effect of the school education quality evaluation model of the IQEA-BP neural network can be obtained generally subjectively (see Figure 8).

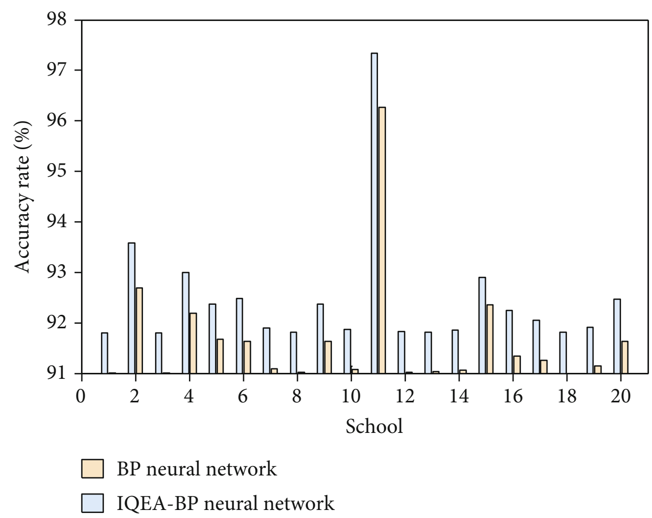

Figure 7: Comparison of experimental results of accuracy evaluation.

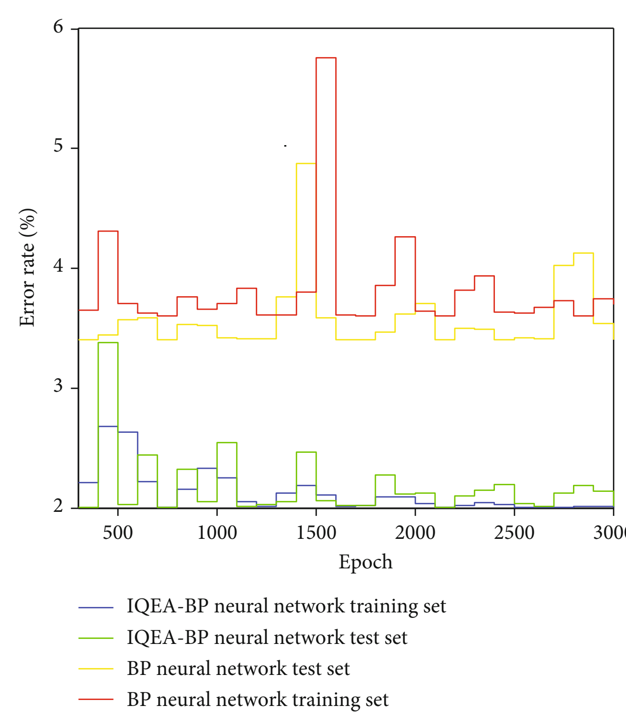

Figure 8: Epoch = 3000 experimental error rates.

In order to clearly and objectively analyze the effect of the neural network evaluation model, the accuracy and recall rate are used to test the evaluation effect of the model. Accuracy refers to the proportion of the number of samples that are truly positive among all predicted positive samples. The recall rate is based on the true value, the proportion of all positive samples that are predicted to be the number of positive samples.

It can be seen from Figure 9 that the time-consuming assessment of the educational quality of 20 schools is concentrated in 2 s to 5 s, and the time required for the IQEA-BP

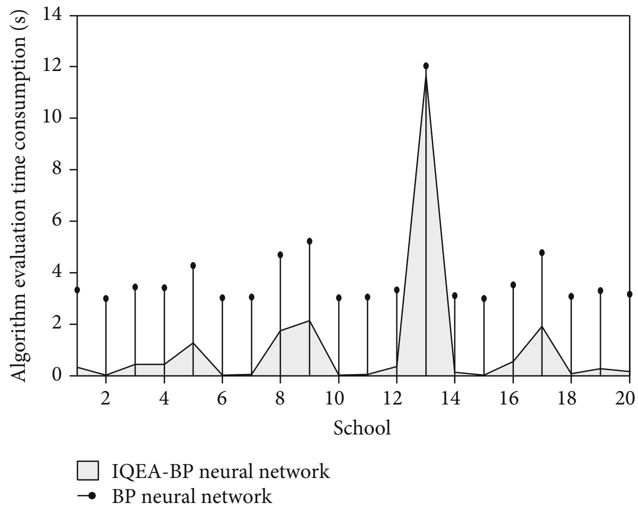

Figure 9: The time-consuming evaluation of education quality in 20 schools.

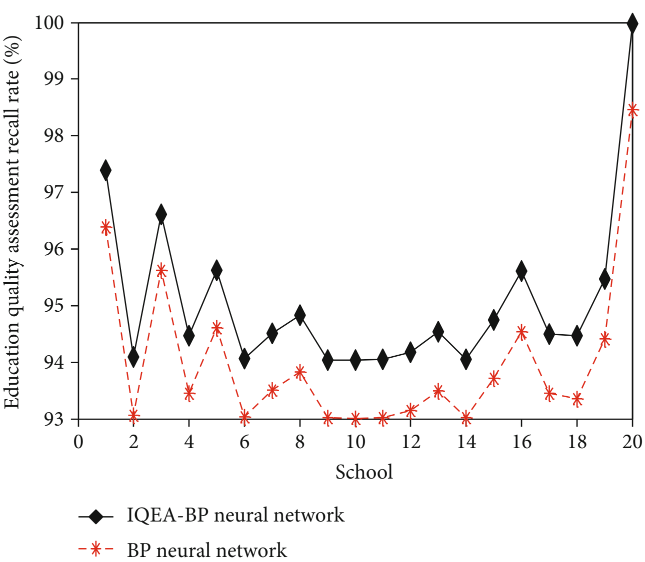

Figure 10: Education quality assessment recall rate of 20 schools.

neural network assessment is lower. It can be seen from Figure 10 that the recall rate of the education quality evaluation of 20 schools is above 93%, which shows that the school education quality evaluation model of the IQEA-BP neural network in this paper is feasible. Therefore, the school education quality evaluation model of the IQEA-BP neural network has achieved a good evaluation effect, and the evaluation effect is more ideal than that of the BP neural network (see Figures 9 and 10.

6. Conclusion

In the context of the education cloud platform, this topic analyzes the uneven distribution of education application service resources, low resource utilization, and repeated development of service tools faced in the process of education informatization and elaborates the construction of a reasonable application service architecture. According to the functional requirements and characteristics of the education cloud platform application service, combined with the use of software and services, an architecture model of the application service based on the education cloud platform is proposed. This paper proposes a BP neural network weight optimization model based on an improved quantum evolution method and studies a method that combines the improved quantum evolution algorithm (IQEA) with the BP algorithm to complete the back propagation neural network training. The algorithm improves the traditional quantum evolution algorithm and then uses the improved quantum evolution algorithm to optimize the network weights as a whole, to overcome the shortcomings of the BP algorithm that easily falls into the local optimum. The BP algorithm is further optimized to improve the training and prediction accuracy of the network. The analysis method is used to comprehensively evaluate the school education quality of the old and new two groups with different evaluation indexes, and the evaluation results are compared and analyzed to determine the selection of evaluation indexes. A school education quality evaluation model based on the BP neural network's compulsory education equilibrium index is established. The evaluation model is a classification problem, and the experimental data is processed with uniform distribution and normalization. The design of the BP neural network evaluation model includes the determination of the network structure, the selection of the appropriate activation function, the determination of the loss function, and the selection of the optimizer. At the same time, we select the appropriate activation function and network structure to solve the BP neural network under-fitting problem, construct a suitable network structure, and use the Dropout idea to solve the BP neural network over-fitting problem.

Data Availability

All information is within the paper.

Conflicts of Interest

No competing interests exist concerning this study.

Acknowledgments

This work is partially supported by the Shaanxi Higher Education Teaching Reform Research Project (19ZY016) and Shaanxi Education Scientific Planning Project in 2016 (SGH16H229).

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