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Retraction

Retracted: An Evaluation Model of Urban-Rural Exchange Teachers in Elementary School Based on Optimal Control Neural Network

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/ participant consent to participate, and/or agreement to publish patient/ participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] K. Chen, "An Evaluation Model of Urban-Rural Exchange Teachers in Elementary School Based on Optimal Control Neural Network," *Mathematical Problems in Engineering*, vol. 2022, Article ID 7808127, 13 pages, 2022.

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Research Article

An Evaluation Model of Urban-Rural Exchange Teachers in Elementary School Based on Optimal Control Neural Network

Ke Chen

School of Education, Ankang University, Ankang, Shaanxi 725000, China

Correspondence should be addressed to Ke Chen; 2011990001@aku.edu.cn

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In this paper, an optimal control neural network algorithm is used to conduct an in-depth study and analysis of the evaluation of elementary school urban-rural exchange teachers, and an optimal control neural network evaluation model is designed and applied to the actual elementary school urban-rural exchange process. A tracking controller is designed to track the target trajectory for a typical second-order nonlinear system where the system model is partially unknown and the internal state of the system is unpredictable. The neural network observer is first designed using the input and output information of the system to approximate the drift dynamics of the system on the one hand and estimate the internal state information of the system on the other hand; then, based on the estimated system state, the sliding mode tracking controller is designed to achieve tracking of the established target trajectory. It is found that the policy implementation is not in place, teachers are not motivated to exchange and most of them aim at position promotion, their sense of responsibility is weak, and they cannot treat the matter of exchange seriously and correctly, thus cannot play their role in the exchange school. The ways to prevent and alleviate the conflict of interest among policy subjects are mainly divided into subjective and objective aspects: first, from the subjective level to arouse the value recognition of multiple interest subjects, including the government, should play the function of policy guidance and exhortation and clarify the value orientation of the policy; schools should cultivate the moral quality and professionalism of teachers and strengthen ideological mobilization; and teachers should improve their ideological awareness and consciously change their willingness to exchange. Establishing teachers' status as civil servants, paying attention to teachers' professional development and safeguarding the interests of rotating teachers to increase teachers' motivation to exchange and rotate, creating a good social opinion environment, providing a good inflow school support environment for rotating teachers, and building a cloud platform for sharing high-quality educational resources create a good policy implementation environment to ensure that the teacher exchange and rotation policy is effectively implemented to achieve its goals of balancing teacher deployment. Although gradient-based methods can achieve high training accuracy, the performance of the backpropagation algorithm may be unsatisfactory when applied to test data, that is, if the size of the training data is not large enough.

1. Introduction

The dual structure system of urban and rural areas has created a significant gap between urban and rural education. At the beginning of the founding of New China, to break the international blockade and accelerate the establishment of an independent and complete industrial system, the Party shifted its focus from the countryside to the cities, giving priority to the development of heavy industry [1]. The modernized and large industrial economy in the cities developed rapidly, and urban residents enjoyed high-income levels, developed infrastructure, welfare protection, and numerous subsidies for employment, medical care, pensions, and housing. In contrast, the rural areas are dominated by small farming economies, and the "scissors difference" between industrial and agricultural products imposed by the state to increase funds for the development of heavy industry has led to slow development of the agricultural economy and low incomes for farmers. Among all these elements, the reform of mathematics classroom teaching style is the most difficult, the most difficult bone to chew, but also the most critical element [2]. Deepening self-understanding of roles and enriching individual's practice of roles are crucial for teachers to adapt to the various roles in teaching-research interaction. In the process of education development, achieving a balanced development of education is the fundamental goal. The unbalanced development of education is still very prominent between urban and rural areas, with urban areas having a huge advantage in access to educational resources, while rural areas still have a very prominent problem of low level of educational development due to the limitations of the conditions. Therefore, optimizing rural elementary school mathematics classrooms and exploring classroom teaching methods adapted to rural reality are conducive to shortening the gap between urban and rural education, improving the quality of rural classroom teaching, maintaining social stability, improving national quality, promoting balanced and coordinated linkage development of education, and providing educational support to win the battle against poverty [3].

At this stage, there are a lot of research results on the teaching methods of elementary school mathematics classrooms at home and abroad, but there are relatively few studies on the teaching methods of urban and rural elementary school mathematics classrooms by way of comparison. Therefore, strengthening this aspect of analysis can provide a good theoretical reference for the optimization of the teaching methods of urban and rural elementary school mathematics classrooms. In addition, studying the differences between urban and rural elementary school mathematics classroom teaching styles is conducive to the general strategies and approaches to improve the efficiency of rural elementary school mathematics classroom teaching to promote the common development of teachers and students, to provide a basis for education departments or schools to develop more reasonable solution strategies in the future and to provide some practical suggestions or ideas to narrow the gap between urban and rural education, and eventually narrow the gap between urban and rural education [4]. In addition, through classroom field observation and recording the real teaching situation in classrooms, we can compare the advantages and disadvantages of urban and rural education in terms of classroom introduction, teaching process, and teaching summary and learn the strengths of teaching in urban schools, to provide theoretical support and realistic basis for abandoning the old teaching concepts and updating teaching behaviors in rural areas, which are conducive to the realization of equitable educational development [5].

Transcendental dynamic optimization methods have the advantages of fast speed and hardware implementation ability when dealing with optimization problems. In recent years, neural dynamic optimization methods have received a lot of attention from scholars. However, most of the research is on convex optimization problems or pseudoconvex optimization problems, and not much research has been conducted on general nonconvex optimization problems. The general neural dynamic optimization methods usually can only find a local optimum when facing a nonconvex optimization problem with multiple minima, and even less when discussing nonintegrable problems. Therefore, further research on neural dynamic optimization methods to solve more nonconvex and nonintegrable optimization problems is of research value. The theoretical basis of approximate optimal control based on neural networks is optimal control theory. The adjustment of the internal state is inseparable from the cooperation of the three interactive subjects of teaching and research staff, urban teachers, and rural teachers and pays attention to the personal characteristics, expectations, emotions, and interpersonal relationships among the teaching and research subjects. Optimal control refers to solving the optimal control strategy of a dynamic system by optimizing a given performance index function to achieve the desired control effect. The traditional optimal control theory has been developed and matured. Based on the optimal state control pairs generated in research method II, a deep neural network is used to fit the nonlinear relationship between the given state and the optimal action, and after sufficient training, it is verified whether it can be used for real-time optimal control.

2. Related Jobs

The most crucial step before policy implementation is to formulate a reasonable, perfect, and well-defined policy. Fan Caixia and He Bian analyzed 21 provincial-level policy texts on teacher exchange and rotation across China and found that the policies have vague goal setting, insufficient content relevance, various safeguards but poor implementation effect, and a lack of clear monitoring and assessment programs [6]. The teacher exchange and rotation policy in China is formulated by government departments to solve problems such as educational balance and equity and is implemented by the government as an administrative subject through administrative means, which is compulsory, and the commanding tools make the policy implementation efficient and wide coverage [7]. However, scholars such as Salvati and Carlucci argue that the mandatory teacher exchange and rotation policy does not conform to the law of upward mobility and violates the natural law of "survival of the fittest"; it also reduces the stability of the teaching profession, which in turn reduces the attractiveness of the teaching profession and causes many outstanding talents to leave the education field [8]. In addition, other scholars have studied China's teacher exchange and rotation policy from the perspectives of legalism, ethics, and economics. Therefore, it is more prominent in stimulating students' interest in inquiry. Amaral researches the legality of the policy, pointing out that the implementation subjects of the current teacher exchange and rotation policies in various places are not legal, some policy contents contradict the existing laws, and the legality of the policy procedures is insufficient [9]. Chen analyzes the history of the evolution of China's education policy ethics and finds its general characteristic of "gradually reverting to publicness" while pointing out that the county teacher exchange and rotation policy has problems such as the policy goal emphasizing balance rather than efficiency and the policy means emphasizing coercion rather than flexibility [10]. The policy ethics of fairness and justice and limited flexibility should be maintained throughout the process.

Werbos first used the idea of reinforcement learning for optimal control theory, and later scholars developed it continuously, and the learning process of optimal reinforcement learning algorithms developed to a higher level, where its learning objective is not the dynamics of the system but the optimal performance index of the closed-loop system to reach optimality [11]. The reinforcement learning algorithms at this stage are mainly applied to solve the optimal calming problem, the tracking problem, and the H-control problem when the system model is completely known. Reference [12] solves the infinite-time optimal control problem for parametric stochastic nonlinear systems using neural network approximation techniques based on reinforcement learning ideas. In Reference [13], a simultaneous reinforcement learning algorithm is proposed, the weights of the behavior and evaluation networks are updated synchronously, and an optimal controller is designed to make the closed-loop system stable and satisfy the optimal performance index function. Based on the multi-intelligent system control model, a dynamic game model with multiple distributed energy storage units and loads in islanded operation mode is studied, the load demand response generated by the flexible power tariff is considered, and a tariff bidding decision is established based on a reinforcement learning algorithm to achieve economic optimization of the microgrid. Reference [14] proposed a cooperative control framework for multiple microgrids based on multi-intelligent body systems, which aims to encourage resource sharing among different microgrids and solve the resource imbalance problem through coalitions among microgrids and proposed a hierarchical cooperative control framework and corresponding negotiation algorithms to model the coordination behavior of microgrids. Especially in urban primary schools, the utilization rate of multimedia equipment is relatively high, and the attention and practicality of information technology are relatively high.

Strengthening the exchange between urban and rural teachers can compensate for the shortcomings of short-term excellent teacher supplementation that cannot steadily and comprehensively help rural teachers efficiently improve their competence. Regular linked teaching and research activities between urban and rural schools in the county are an important means of exchange between urban and rural teachers at present. Urban teachers and rural teachers use various specific problems faced by teachers during curriculum implementation as objects to solve practical teaching problems through cooperative learning and exchange and discussion and to gain teaching experience and improve teaching theories, to eventually achieve teachers' professional growth. In the formal teaching and research activities, urban and rural teachers interact around specific problems in an atmosphere of equal communication and cooperate to solve problems, and finally, the teaching researchers and master teachers make in-depth analyses of the problems and summarize the teaching and research results; after the urban-rural joint teaching and research, rural teachers interact and exchange with urban teachers through teaching and research contents on new educational concepts, subject curriculum understanding, subject teaching problems, subject teaching methods, teaching management problems, etc., and gain. After returning to school, they transformed their knowledge into actual teaching through their understanding. The unique teaching environment of rural schools also broadens the horizons of urban teachers from another perspective, helping them to master how to teach in different teaching objects and teaching environments, which is more conducive to the professional growth of urban teachers.

3. Optimal Control Neural Network Algorithm Design

The optimal control theory approach is an important part of the composition of modern control theory. These two techniques have greatly enriched and improved the optimal control theory and promoted the development of analytical methods for solving optimal control problems [15]. Moreover, at that time, when humankind first started to explore space, the techniques based on optimal control theory were well integrated with practical engineering, for example, in spacecraft trajectory design and Kalman filter, where quite successful research results were achieved.

As the optimal control problems encountered in engineering become increasingly complex, it makes the analytical method to find the optimal problem solution increasingly impossible. But fortunately, due to the gradual maturity of computing technology and the rapid development of hardware devices, we can use it to achieve numerical solutions, for example, the neighborhood extremum method, the simplex method, and the gradient method are common numerical methods. In the past half-century, optimal control theory has been widely used in many fields such as aerospace engineering, chemical engineering, economics, communication, and automotive engineering. Allow students to actively participate in the exploration and communication of problems in this environment. Students are assigned to groups in the classroom, and each member of the group can be paid attention to in the interaction between students. Computational optimal control techniques have also attracted increased attention as the core of implementing optimal control theory in practice.

According to the basic components of the optimal control problem, the general description of the optimal control problem is first outlined, that is, the system equation of state, that is, the dynamics model, is derived from the analysis of the dynamics, or the realization of the system from the input-output relationship and has the following form of expression under the given initial conditions:

$$\begin{aligned} \dot{s} &= f\left(s(t), u(t), t^2\right), \\ s\left(t_0^2\right) &= s_0, \end{aligned} \tag{1}$$

where $s \in Rn$, $u \in R_m$ and the function $f(s(t))$ and $u(t)$ is a kinetic model in the form of differential equations obtained in advance, which is a continuous vector function. The objective of optimal control is to find an optimal control function $u^*(t)$ such that the minimum or maximum of is satisfied during the transfer of the system from the known initial state so to the target end-state $s(tr)$.

$$J = \phi\left(s\left(t_f\right), t_f\right) - \int_{t_0}^{t_f} L\left(s(t), u\left(t^2\right)\right)\mathrm{d}t, \tag{2}$$

where $L(s(t))$, $u(t)$ contains the path constraint in the trajectory planning problem and $P(s(t))$ contains the end-state constraint. While taking the extreme value of the above equation and satisfying the edge value constraint of the solution process, the above equation constitutes the continuous Bolza problem of optimal control. That is, the nonlinear expression ability is not enough, which directly leads to the slow convergence speed of the neural network and even underfitting, which means that the neural network cannot achieve high prediction accuracy for the training data set within a given time. Distilling the above equation into a standard form:

$$s.t. = \begin{cases} \dfrac{ds(t)}{dt} = f(s(t), u(t), t), \\ C(s(t), u(t)) \geq 0, \\ B\left(s\left(t_f\right), u\left(t_f\right)\right) = 0, \\ t \in \left[t_0, t_f\right], \end{cases} \tag{3}$$

where $C(s(t))$, $u(t)$ contains the inequality constraint terms such as path constraints and fetch range constraints and $B(s(t))$, $u(t)$ is the equation constraint term that contains the boundary value constraints. Corresponding to our AGV trajectory planning problem, we require time-optimal control and need to satisfy the obstacle avoidance requirements during the AGV motion, so we can specify the standard continuous Bolza problem with optimal control as follows:

$$J = \varphi\left(s\left(t_f\right), t_f^2\right) - \int_{t_0}^{t_f} L\left(s(t), u^2\left(t_i^2\right)\right)\mathrm{d}t. \tag{4}$$

The traditional optimal control problem is based on the classical variational method, which derives the necessary conditions for its optimal solution under the condition that the generalized variational takes extreme values [16]. For the given problem, the transformation of the generalized conditional extreme value problem into an unconditional generalized extreme value problem can be carried out by introducing two independent Lagrange multiplier vectors $g_k(t) \in R$ with $\lambda(t) = R_r$.

$$\max J = t_f - \rho \int_{t_0}^{t_f} \sum_{k=1}^{M} \lim_{e \longrightarrow 0} G_k\left(g_k(t), e^2\right)\mathrm{d}t. \tag{5}$$

The initial values of the state and covariate variables are empirically given first. Based on the guessed values and the known initial conditions, the original difficult-to-solve two-point boundary value problem is transformed into an initial value search problem for the system of differential equations. Activation functions with high-order differentiability, nonlinearity, monotonicity, and other characteristics in neural networks also have an important impact on deep neural networks. After the final values of the states, covariates, and control quantities are obtained gradually by numerical integration, they are compared with the given end-state constraints to determine whether they are within the given error tolerance, and if not, the initial values are corrected by linear interpolation and the initial value search problem is repeated.

The policy iteration technique is one of the basic methods for solving the optimal policy in dynamic programming, which is the process of solving the optimal control sequence one by one with the help of dynamic programming iterative equations. The most used PI technique is the on-policy iterative method, which requires the complete or partial information of the system model in the process of solving the optimal control policy, and the off-policy iterative method has been developed and widely used in recent years to solve the optimal control policy when the system model is completely unknown. The specific implementation process of the two iterative techniques is described below, as shown in Figure 1.

The direct method starts by discretizing the continuous problem (either by discretizing only the states or by discretizing both the states and the control quantities) and then solves the control quantities numerically to optimize the given performance index. LR = 0.001 is an ideal choice because it is a trade-off between training accuracy and stability on the training and validation sets. As mentioned in the previous subsection, the indirect method is often more difficult and, in some cases, impossible to solve for specific problems with function variables. For problems with complex path constraints or highly nonlinear dynamical constraints, the indirect method appears to struggle, and solving two-point marginal problems by numerical methods is also often difficult, mainly due to problems such as the highly nonlinear nature of the system, but also because of the analytical method to determine. The main reason is not only the highly nonlinear nature of the system but also the difficulty of determining the cross-sectional conditions by the analytical method. Due to the small convergence radius, the indirect method requires a more accurate initial guess for the covariates, but the covariates themselves do not have an intuitive physical meaning as a basis for guessing, and it is difficult to give a good guess for the initial value of the covariates directly to ensure the convergence of the algorithm. On the contrary, the direct method is less sensitive to the initial value, has a large convergence radius, and does not require the derivation of the first-order necessary conditions, so it is more widely used in the solution of optimal control problems.

Least squares are a mathematical optimization technique that finds the best functional match of data by minimizing the sum of squares of the errors [17]. The use of least squares makes it easy to find unknown data and to minimize the sum of squares of the errors between these found data and the actual data. This section focuses on the evaluation of the

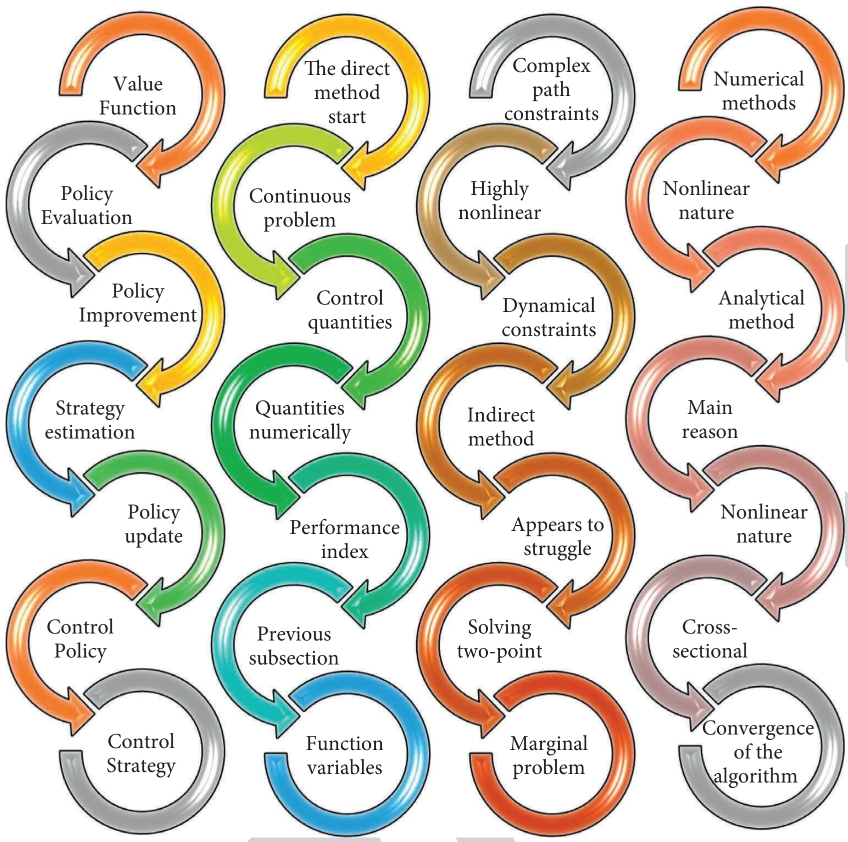

Figure 1: On-policy iterative technology.

network approximation of the performance indicator function as an example to illustrate the specific implementation of the least-squares principle.

To study the tracking problem when the internal state of the system is not directly available and the system drift dynamics $f(x)$ is not known, it is necessary to design a neural network observer to observe the state $x(t)$ of the system. In this section, the form of the neural network observer and the adaptive update law of the neural network weights are given first, and the stability of the neural network observer system is analyzed.

$$H = \begin{cases} \dot{x}(t) = Ax(t) - b\left[f(x) - g\left(x^2\right)u\right], \\ y(t) = C_x\left(t^2\right). \end{cases} \tag{6}$$

We have carried out a time-domain transformation of the original optimal control problem, and the next step is the solution to the problem. 39.09% of teachers believe that it is fully fulfilled, 46.36% of teachers believe that it is basically fulfilled, 11.82% of teachers believe that it is rarely fulfilled, and 2.73% of teachers believe that it has not been fulfilled at all. Pseudospectral methods belong to the class of direct configuration methods, in which the states can be parameterized and controlled by using global polynomials and juxtaposed differential algebra, while converting the original optimal control problem into a nonlinear programming problem, with the equations using the roots of Gaussian orthogonal polynomials as the nodes.

The Gaussian pseudospectral method does not require the guessing of the initial covariance, and, this method only requires the estimation of the state quantities under the physical concept. In particular, the KKT conditions of the nonlinear programming problem obtained by the Gaussian pseudospectral transformation coincide with the discrete form of the first-order optimal necessary conditions of the original optimal control problem, in other words, we can avoid the proof of the general direct method on whether the optimization objective of the solution is consistent with the original problem after discretization, and it has been shown that the local convergence rate of the Gaussian pseudospectral method increases exponentially, so it is currently a more general solution method.

It uses a label-based supervised learning method to train the neural network by using the error of the output results of the final layer with the label and back-propagating the error in a gradient way to update the neural network weights [18]. Although the gradient approach can achieve high training accuracy, the performance of the backpropagation algorithm may be unsatisfactory when applied to test data, that is, if the size of the training data is not large enough, the neural network will face the problem of overfitting, and because its error backpropagation is based on local gradient information with random initial points, making the algorithm often face the local optimum problem, as shown in Figure 2.

The trigger conditions can be calculated independently by the smart actuator, and the trigger signal is fed back to the

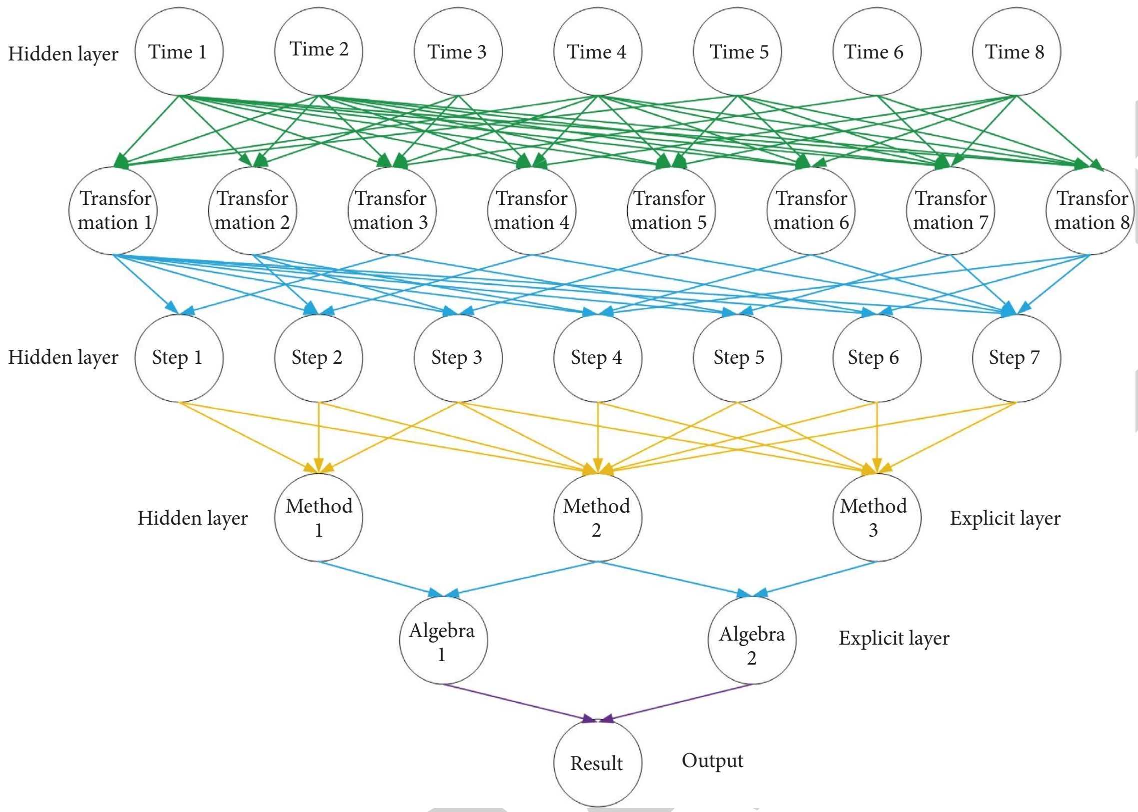

Figure 2: Optimal control neural network algorithm framework.

smart sensor and determines whether a sensor is required for status measurement. Schools that focus on teaching and research ability account for 19.09%, and schools that focus on teaching ability account for 37.27%, which are also a large proportion of the assessment content. This event triggering mechanism does not require continuous measurement by the sensor, which not only reduces the cost of the sampling frequency, control switching, and signal transmission but also effectively reduces the cost of measurement. This is a way to replace the cost of measurement with the computational cost of the controller, which makes sense because computational costs are getting lower with the development of computers, but the cost of continuous measurement of sensors can be high in some real-world production processes.

4. Analysis of the Evaluation Model of Urban-Rural Exchange Teachers in Elementary School

In the urban-rural linkage teaching and research activities, teachers, as members of the special environment of teaching and research, are bound to assume certain roles, participate in teaching, and research activities according to the behavioral norms of their roles and promote their professional growth through the smooth playing of their roles. Roles do not exist independently in the social environment, and individuals who play them do not just assume a certain role [19]. It is difficult to directly give a good guess for the initial value of the co-state to guarantee the convergence of the algorithm. On the contrary, the direct method is not sensitive to the initial value and has a large radius of convergence. Therefore, teachers need to understand the expectations of others, deepen their understanding of roles, and enrich their practice of roles in teaching and research activities to adapt to the multiple roles they play in teaching and research interactions. However, in the actual research, we found that there is a problem of role-playing disorder among the interactive subjects in the teaching and research interaction, which is manifested in the conflict of roles among the teaching and research subjects and the unclear understanding of the role of teaching and research.

Role unclearness refers to the role-players' lack of clarity about the behavioral norms of the roles they play and their lack of knowledge about what they should and should not do and how to behave in their role-group interactions. In the questionnaire survey of urban and rural teachers' joint teaching and research, the teachers who participated in teaching and research had unclear knowledge of the most important roles they played in teaching and research interactions.

The creation of the interactive context of teaching and research is the premise of effective interaction of teaching and research and is the basis and condition of teacher interaction. A good interactive context can provide a platform for equal communication between urban and rural linked teaching and research and provide space for the adjustment of the interactive state of the teaching and research subjects. The interactive context of teaching and research includes both the external scenario of the participation of teaching and research subjects and the interactive state of the interactive group of teaching and research. In the current linked teaching and research of urban and rural teachers, there is not enough attention to the construction of interactive situations, a lack of planning for the construction of teaching and research situations, and a lack of attention to the interactive state of teachers.

The state of teacher interaction refers to the awareness, expectation, emotion, and interpersonal relationship between the teacher's self as the interacting subject and the others played by other teachers in the teaching-research interaction and the interaction pattern formed by combining the personality and behavior characteristics of the interacting subjects. The regulation of the internal state cannot be separated from the collaboration of the three main interacting subjects: the teacher-researcher, the urban teacher, and the rural teacher. It is important to pay attention to teachers' interaction status for the rational arrangement of the teaching and research interaction process and scientific evaluation of teaching and research interaction results. The proportion of schools that occasionally use other methods to replace communication is relatively large, 41.82%, and 21.82% of schools will definitely use other methods to replace communication. Through the author's observation of the teaching-research interaction situation and interviews with relevant teachers in the research process, I believe that there is a problem of poor teacher interaction status and insufficient attention to teacher interaction status in the current urban-rural linked teaching-research, as shown in Figure 3.

In contrast, the most frequent teaching activity carried out by rural elementary school mathematics teachers in the teaching process was mathematical problem training, which accounted for 97% of the total. In addition, we can find from the survey data that urban schools pay more attention to students' cooperative group inquiry, accounting for 85%, which is consistent with the new curriculum standards requiring students' independent inquiry and cooperative communication, and students will learn in such a classroom atmosphere to participate more actively in mathematics learning, thus improving the learning efficiency of the classroom [20].

Comprehensive analysis shows that urban elementary school mathematics teachers are more diverse in their choice of teaching aids and classroom activities than rural elementary school mathematics teachers and are therefore more prominent in stimulating students' interest in the inquiry. Urban elementary schools make relatively high use of multimedia equipment and pay more attention to and use information technology. The most noteworthy difference is that teachers in urban elementary schools pay more attention to the setting of good situations in the mathematics classroom, while teachers in rural elementary schools tend to pay less attention to the setting of situations in the mathematics classroom, which is the main difference between the two.

Based on the theory of interaction teaching, this chapter investigates the interaction mode of mathematics classroom teaching in urban and rural elementary schools [21]. The correction of the value repeated the initial value search problem. The so-called classroom interaction refers to the dynamic process of interaction and interaction in which the teacher makes good information exchange between teachers and students and between students and students through reasonable guidance in the classroom teaching process. In this paper, classroom interaction refers to the interaction between teachers and students, which includes both teacher-student interaction and student-student interaction. The interaction in this paper is not the process of teachers asking questions and students answering them in a narrow sense, but more importantly, classroom interaction can better bring into play teachers' creativity, stimulate students' learning initiative, make the interaction between teachers and students more frequent, and lay the foundation for building a good teacher-student relationship. In the elementary school mathematics classroom, the interaction between teachers and students is an important element reflecting the classroom teaching style, as shown in Figure 4.

In terms of classroom interaction, it contains both effective classroom interaction and ineffective classroom interaction, where effective classroom interaction enables teachers to create a good equally, and free seminar environment for students, in which students can actively participate in the exploration and communication of problems. The classroom will assign students to groups, and in the student-student interaction can pay attention to each member of the group, so that all students can participate in the interactive communication, and everyone has enough opportunities to express their ideas, and finally achieve the common development of teachers and students [22]. Appropriately extend the number of years of urban and rural teacher exchanges, so that exchange teachers can work in their posts steadfastly, design teaching plans suitable for local students according to local conditions, and improve school teaching levels. An ineffective classroom, on the other hand, mainly refers to false interaction, a form of classroom performance where the surface interaction is more biased, but it is more of a process where students passively answer the teacher's questions or passively participate in activities. In this survey, we focus on two aspects of classroom interaction: the form of classroom interaction and the effectiveness of classroom interaction to compare.

5. Analysis of Results

5.1. Optimal Control Neural Network Algorithm Performance Design. The mean-squared deviation is used as the loss function in the experiments, and the training process of neural networks combined with Adam's algorithm is aimed at minimizing the function loss, which can be easily solved by existing deep learning frameworks such as TensorFlow and PyTorch that can implement automatic differentiation.

The number of hidden layers and the units per layer are important hyperparameters that can determine the performance of the designed neural network. Too small a

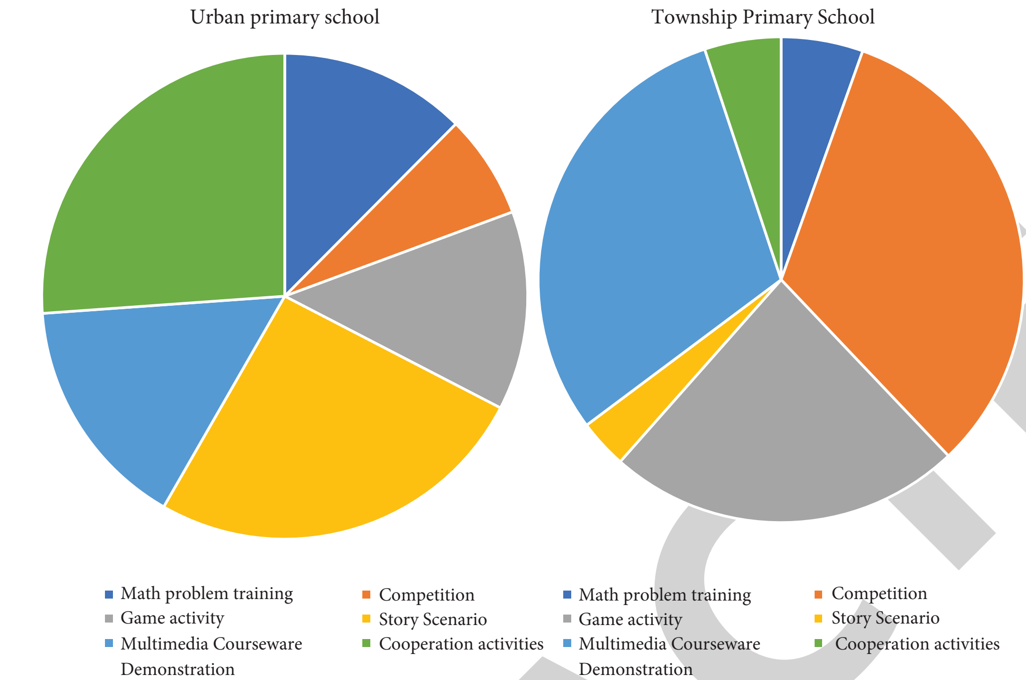

Figure 3: Types of classroom activities for mathematics teachers in urban and rural elementary schools.

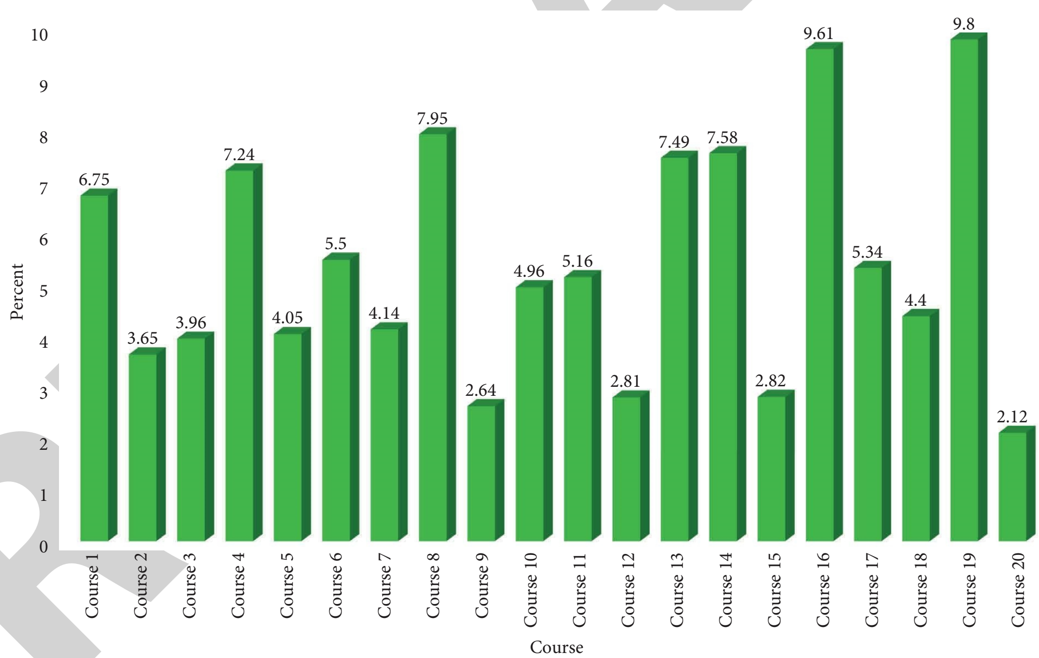

Figure 4: Subjects taught before and after teacher exchange.

selection of the number of hidden layers or hidden layer units, that is, insufficient nonlinear representation, directly leads to the problem of slow convergence or even underfitting of the neural network, which means that the neural network cannot achieve a high prediction accuracy for the training data set in each time. On the contrary, too many hidden layers or units directly lead to the multiplication of the number of network parameters, longer training time consuming possible overfitting problems, which will lead to a large gap in the performance of the neural network between the training and test sets, that is, poor generalization ability, which is unacceptable for our AGV trajectory planning problem because, during the AGV travel, there are bound to be training data sets that do not appear. In Figure 5, we trained the neural network structure with different numbers of layers and cell combinations for 100 epochs. First, arouse the value recognition of multiple stakeholders from the subjective level, including the government should

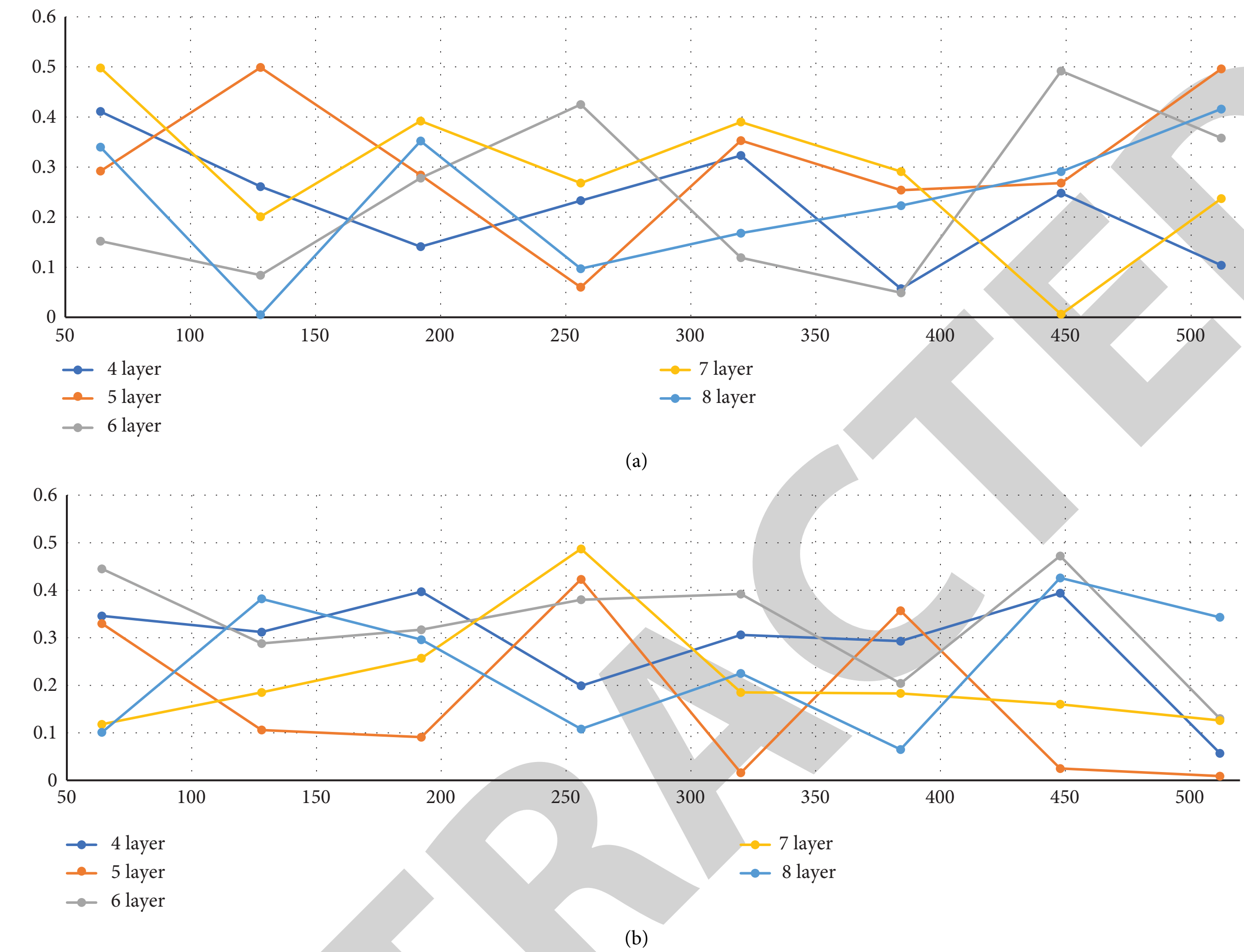

Figure 5: Training error statistics of deep neural networks with different combinations of layers and units.

play the role of policy guidance and exhortation, and clarify the value orientation of the policy; schools should cultivate teachers' moral quality and professional spirit.

The corresponding training and validation losses are analyzed by comparing different combinations of layers and the number of units. Based on the results, it is found that a neural network architecture with 6 layers and 256 cells per layer is optimal. Moreover, using the same network size, relatively deeper layers usually have better performance, which is in line with the mainstream findings in deep learning.

In addition, the activation functions with features such as higher-order differentiability, nonlinearity, and monotonicity in neural networks also have an important impact on deep neural networks. Different activation functions not only bring nonlinear characteristics to the neural network but also bring different sparsity to the network, which affects the convergence speed and training accuracy to some extent. However, the imbalance of education development is still very prominent between urban and rural areas. In our experiments, we use the classical Sigmoid function (0, 1), the SoftPlus function $(0, +\infty)$, and the ReLU function corresponding to $\max(0, x)$ for comparison.

The learning rate, as the step size of the gradient method to update the weights, affects the speed of training convergence during the training of the neural network. Different choices of the learning rate can have different effects on the fitting performance of the neural network. A learning rate that is too small for the desired selection will result in too slow training convergence. Correspondingly, too high a learning rate selection can lead to a decrease in fitting accuracy or even negative effects such as nonconvergence. As can be seen from Figure 6, $LR = 0.001$ is an ideal choice because it is a trade-off between training accuracy and stability of the training and validation sets.

A comparison of the input samples with the optimal control rate predicted by the neural controller for nine static obstacle scenarios is shown in the figure. From the results, the control law output from the neural network trained and converged after sufficient tuning of the parameters is very accurate. Cities have a huge advantage in obtaining educational resources, while rural areas are still very low in educational development due to limited conditions. The neural network controller can still track the ideal optimal control solution well even in the case of sharp changes in angular velocity. In addition, to verify the robustness of the

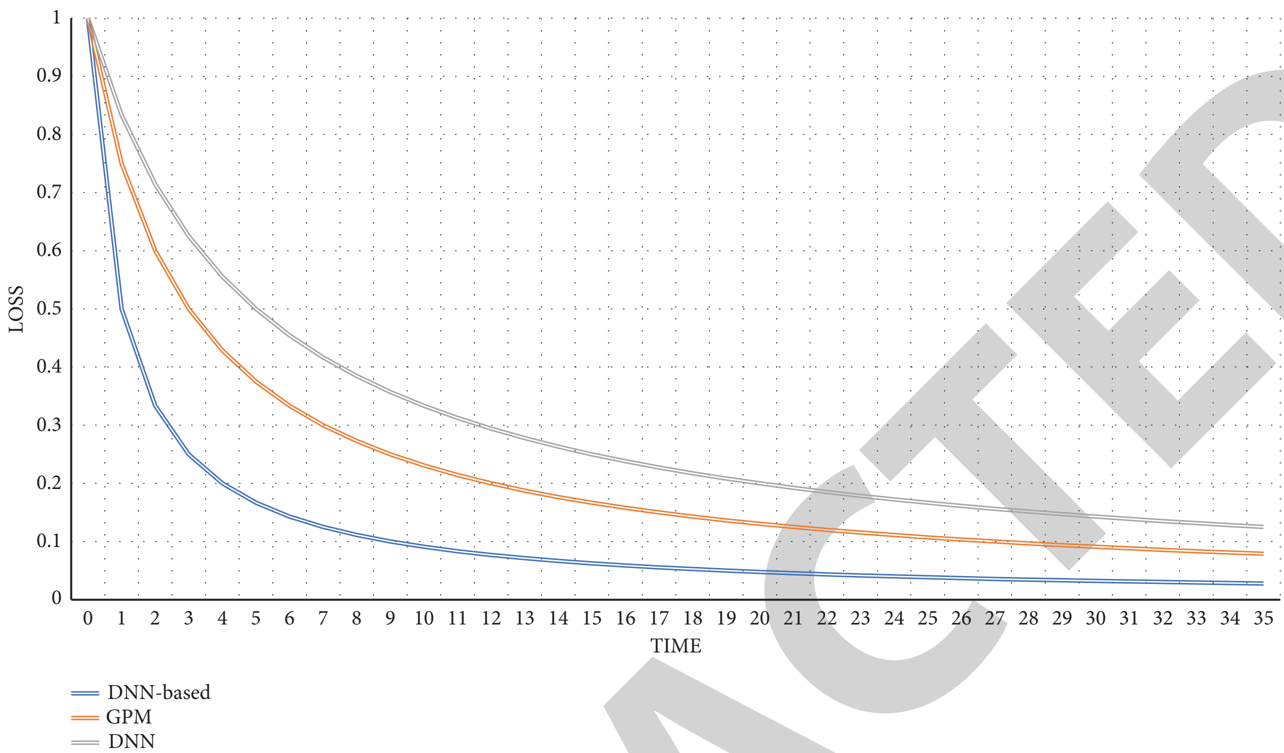

Figure 6: Tracking performance of neural network controller for direct method solution.

initial state, the quantitative analysis of the neural network fitting performance is performed based on the previous pseudospectral method and the statistics of 100 trajectories generated by the offline solution at a random given initial state, and the statistical errors between the sample inputs of 100 trajectories and the corresponding predicted control rates are all within a small range for nine static obstacle scenarios.

5.2. Analysis of the Results of the Evaluation Model of Urban-Rural Exchange Teachers in Elementary School. In the process of exchange teacher selection, 15.45% of teachers considered very transparent, 17.27% considered more transparent, 61.82% considered less transparent, and 5.45% considered the least transparent. On the issue of supervision system and assessment standards, 7.27% of teachers thought the system and assessment standards were very sound, 11.82% thought the system and assessment standards were relatively sound, 32.73% thought they were sound, and 48.18% thought they were not sound, so it seems that most teachers thought the system and assessment standards needed to be more standardized. On the question of whether County Y fulfills its commitments in all aspects of teacher exchange, 39.09% of teachers believe it is fully fulfilled, 46.36% believe it is largely fulfilled, 11.82% believe it is rarely fulfilled, and 2.73% believe it is not fulfilled at all. In terms of the degree of cooperation of the relevant departments in implementing the exchange of teachers between urban and rural areas, only 1.82% of teachers thought that the cooperation was very good, 23.64% thought that the cooperation was good, but 70% thought that the cooperation was poor, and 4.55% thought that the cooperation was not good, which show that most teachers thought that the cooperation of the relevant departments in this aspect of the exchange of teachers between urban and rural areas was low.

The education department organized teachers to participate in discussions, consulted teachers, and obtained evaluation assessment results through a study of frontline teachers, only 3.64% fully agreed with the statement, 29.09% largely agreed, but 61.82% did not agree, and 5.45% did not agree at all. The general strategies and approaches that are conducive to improving the efficiency of mathematics classroom teaching in rural primary schools and promoting the common development of teachers and students provide a basis for the education department or school to formulate more reasonable solutions in the future. The low transparency may be due to the existence of money transactions, the monitoring system and assessment criteria need to be improved, and it is speculated that only summative evaluations of teachers are conducted in the evaluation, and promises appear unfulfilled. It is speculated that the reason for this may be that schools are different and adopt different guidelines and policies and that the cooperation of relevant departments is low. It is speculated that the reason for this may be that society attaches little importance to the relevant departments in formulating policies and assessments " walking around" and not being able to grasp the real situation, as shown in Table 1.

From the above table, we can see that in the exchange process, 4.55% of the schools attach great importance to it, 20% attach more importance to it, 52.73% attach less

Table 1: Statistics on the importance schools attach to the exchange of teachers between urban and rural areas.

Option content	Number	Percent
Very concerned	20	0.053619303
More attention	44	0.117962466
Less attention	20	0.053619303
Completely ignored	57	0.152815013
Discipline building ability	57	0.152815013
Teaching and research ability	50	0.134048257
Teaching ability	34	0.091152815
Teaching achievements	31	0.08310992
Other	60	0.160857909

importance to it, and 22.73% do not attach importance to it at all. In the assessment of the exchange schools, 12.73% of the schools pay attention to subject construction ability, 19.09% pay attention to teaching and research ability, 37.27% pay attention to teaching ability, which is also a relatively large part of the assessment, 20.91% pay attention to teaching achievement, and the remaining 10% pay attention to other aspects of the assessment. The content thus shows that most schools pay less attention to the urban-rural exchange of teachers, there are no uniform regulations on the assessment of exchange teachers, and the evaluation mechanism is not sound.

The ladder construction is also commonly referred to as the mechanism of the old leading the new. From the above chart, very few schools have a relatively sound ladder construction, accounting for only 0.91%, those with a basic soundness account for 10%, those with less soundness account for a relatively large proportion, 74.55%, and those with a poorness account for 14.55%. Most schools have poorly constructed echelons, reflecting the side that most schools have unsound management mechanisms and low utilization of teacher resources. A phenomenon was also found that some schools, to prevent their education quality from declining, falsified the exchange process of teachers between urban and rural areas, as shown in Figure 7. The general neural dynamic optimization method can only find a local optimal point when facing the nonconvex optimization problem with multiminimum points, and even less discusses the nondifferentiable problem.

From this figure, in order not to affect the quality of teaching in our school, 10.91% of schools will not use other ways instead of exchange in the process of teacher exchange, and 25.45% will not use other ways instead of exchange, 41.82% of schools will occasionally use other ways instead of exchange, and 21.82% of schools will use other ways instead of exchange. Due to the gradual maturity of computing technology and the rapid development of hardware equipment, we can use it to achieve numerical solutions. From here, we can find that most schools do not have a positive attitude toward urban-rural teacher exchange and have many concerns.

It is found that the same urban and rural teachers exchange, but the answers to the question of whether it can promote the equity of educational resources and improve the level and quality of education in township schools are

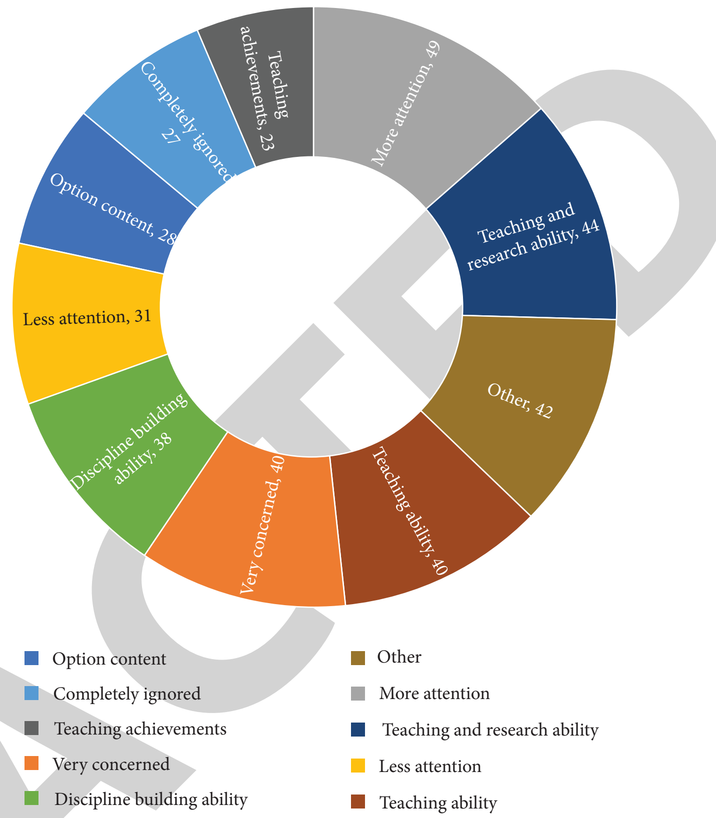

Figure 7: Authenticity of school communication survey map.

very different, guessing that the reason is the deep-rooted influence of "key schools," which leads to the unfair distribution of educational resources and the difficulty of policy implementation, thus failing to coordinate the quality of educational resources within the county. The survey found that 47.27% of the respondents were not satisfied with the quality of educational resources and the overall improvement of township schools. For example, the adjacent extreme value method, the simplex method, and the gradient method are all common numerical methods. The survey found that 47.27% of teachers believe that teachers can be attracted to teach in rural schools through title promotion and better study opportunities in rural areas, and 80.91% of teachers believe that the best way to promote the balanced development of educational resources and optimize the construction of the teaching force is to help each other and establish school alliances.

6. Conclusion

The optimization genetic algorithm is referred to like the system and the algorithm is improved for the teaching evaluation system of universities. Combining the ideas of genetic algorithms to optimize the selection of weights in the neural network algorithm, the search range is narrowed to achieve the purpose of fast and efficient data analysis and global optimization. After the final value of the state, costate, and control variable is gradually obtained by the means of numerical integration, it is compared with the given final state constraint to judge whether it is within the given error tolerance range, otherwise, the initial value is carried out by the means of linear interpolation. The optimized BP neural network algorithm model not only has the traditional self-learning advantages of the neural network but also has the global search for merit function of genetic algorithm, which greatly improves the automatic acquisition, accumulation of query information, and adaptive control of search function, and the final data analysis condition makes the accuracy of teaching quality evaluation analysis results fully improved. The frequency of teaching and research is increased, and various teacher skill evaluation competitions are carried out to improve teachers' enthusiasm and initiative in learning and accepting new things, so that teachers, an educational resource, become a pool of living water and promote urban-rural exchange. We should also extend the number of years of exchange between urban and rural teachers so that the exchange teachers can practically work in their posts, design teaching programs that are suitable for local students' learning, improve the teaching level of schools, and do their best to promote school development. At the practical level, the conflict between realistic conditions and development needs has blocked the rapid development of urban-rural linkage teaching and research. The severe shortage of teaching and research staff in the competent departments and the difficulty in hiring them affect the development of the teaching and research evaluation and management system and the organization and conduct of teaching and research activities.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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