Eng Int Syst (2025) 3: 311–320

Engineering
Intelligent Systems

Optimization Strategy for Teacher Performance Management in Higher Vocational Colleges Based on Deep Learning

Shengpeng Zang*

Wuxi Institute of Technology Wuxi 214121, Jiangsu, China

Economic and educational factors have become increasingly important for the development of modern society. Also, the economy provides strong material support for the development of education and affects educational reform and the speed of education development. When higher education is optimized during the transformation of modern society, a series of problems arise that affect the overall quality of education, the most obvious one being the performance management of teachers in higher vocational colleges. Based on a deep learning algorithm, this paper uses scientific intelligence to study the influencing factors and optimization strategies of teacher performance management in higher vocational colleges. Firstly, the deep learning network is used to extract the relevant factors affecting the performance appraisal and evaluation of teachers in higher vocational colleges. Then, a network relationship graph is established according to the interrelationship between the impact factors and other factors. By means of a questionnaire, this study explores the main problems in the performance appraisal and management of teachers in higher vocational colleges. Secondly, the researcher designs the preliminary structure of the management model based on the current standards and implementation plans for the performance management of teachers in such colleges. The optimization path of performance management is analysed by using deep learning and a Bayesian network algorithm. Finally, the factors affecting teacher performance management and performance management optimization strategies are experimentally verified and applied to establish a scientific and effective performance evaluation system, so as to make the assessment and performance management results accurate and objective. The experimental results show that deep learning algorithms can be used effectively to process dynamic data and address optimization path problems. The scientific basis and accuracy of performance management also affect teachers' attitudes to their work tasks and the future development of the education sector.

Keywords: deep learning; higher vocational colleges; performance management; optimization; Bayesian algorithm

1. INTRODUCTION

Higher vocational colleges are the centre of talent training, and college teachers have the important responsibility of educating students and guiding students' learning [1]. When teaching, teachers should not only monitor students' performance and level of learning; they should reflect on and assess their own performance as educators. Teachers' performance and assessment can directly affect their own enthusiasm and work initiative. In order to build a team of high-quality teachers in higher vocational colleges, it is necessary to start with performance management [2]. We need to make full use of talents, improve the overall quality of teachers in the school environment with the vision of promoting the development of excellence, and help colleges and universities effectively improve the quality of education. Performance management is the main road map for motivating college teachers to engage in teaching with enthusiasm, and it also plays a guiding role in the long-term professional development of teachers [3]. Overall, performance management for vocational college teachers emphasizes high-quality and comprehensive development. Overall, performance management for vocational

*Email of corresponding author: zangsp@wxit.edu.cn

college teachers emphasizes high-quality and comprehensive development. Performance management and optimization have shown strong characteristics of integrity, complexity and dynamics [4, 5].

Teachers in higher vocational colleges are the navigators of moral cultivation and the gatekeepers of students' growth. The comprehensive quality of teachers refers to their comprehensive performance in knowledge, ability, morality, attitude, and other aspects, which directly affects their educational quality and student development [6]. Most higher vocational colleges require teachers to have strong professionalism; that is, teachers need to have a strong grasp of knowledge related to their respective professional fields, reflected in their ability to transmit this knowledge in a way that meets national standards. Moreover, it is necessary for teachers to steer students in the right ideological and moral direction, and guide their thought processes [7]. However, the performance management process of college teachers includes not only effective communication and student guidance; it also needs to combine teaching plans, assessment procedures and results, and other elements of successful teaching [8]. According to the comprehensiveness of performance appraisal and evaluation results, whether teachers can participate in the teaching management process is determined, and from the perspective of the current ability level and vertical development of university teachers, the optimization and improvement process of performance management is jointly promoted [9].

From a formal perspective, the performance management of teachers in higher vocational colleges needs to start from the position of teacher and run through the evaluation of awards, professional title promotion, educational skills testing, etc. [10]. Teachers in higher vocational colleges need to undergo professional induction training before teaching, in which the current ability level is preliminarily tested. At the same time, this stage also indicates the ability of teachers and enables them to understand the specific work of performance management in universities. After that, these teachers also need to engage in training activities related to the two core tasks of teaching and scientific research [11]. At this stage, the performance level of teachers showed a spiral upward trend of volatility. Therefore, dynamic evaluation of performance management and the overall result is the most appropriate [12]. Thus, it can be seen that teacher performance management in higher vocational colleges is a complex, dynamic and diversified task mode, and we need to use scientific and intelligent means to explore the optimization path of its management [13]. Based on a deep learning algorithm, this study explores the impact factors and optimization strategies of teachers' performance management in higher vocational colleges and strives to integrate performance assessment and management effects into the whole teaching process to improve teachers' overall competence.

2. THE DEVELOPMENT STATUS OF DEEP LEARNING ALGORITHMS IN VARIOUS COUNTRIES

Deep learning algorithms are a research hotspot and main development direction in the field of artificial intelligence, and deep learning is also a mathematical model comprising multiple computing layers [14]. For deep learning, the machine learning technology in which multiple abstract data are represented together has been widely used in various fields. In the continuous progress and optimization of artificial neural networks and deep learning algorithms, various network models with neural unit properties and complex levels continue to emerge, such as convolutional neural networks, generative adversarial networks, recurrent neural networks, etc. [15]. At the same time, compared with ordinary machine learning technology, the deep learning technology of neural network parameters can be divided into three types: supervised, unsupervised and enhanced. In supervised network model parameters, standard training data is used to complete data iteration calculation tasks, while unsupervised deep learning is used to determine relevant data that does not need to be labelled, and its calculation process is simpler [16]. In contrast, enhanced deep learning uses specific scoring strategies to evaluate and predict network results. The structure and application fields of these three neural network algorithms are different, and they can be applied to many tasks such as computer vision learning, natural language processing, and scientific computing [17].

When examining the application of deep learning algorithms in various countries, we found that the United States had the earliest development and use of deep learning algorithms. They were also among the first to apply supervised deep learning to perceptrons [18]. Multiple techniques such as the convolutional neural network (CNN) and recurrent neural network (RNN) are used to optimize the multi-layer perceptron. Compared with the performance of traditional neural networks, CNN and RNN improve the calculation result of perceptron and apply it to artificial intelligence design. Experimental results show that artificial intelligence machines provided by deep learning training data have positive effects on human-computer interaction, multitasking and other aspects [19]. In addition, Japan applies deep learning algorithms in image processing, using deep learning to extract, calculate and analyse dynamic data, and optimize computer vision communication performance. The image segmentation that meets the region requirements helps the plane image to be quickly established in the 3D spatial model. Researchers used deep learning algorithms to form an image conversion system in three-dimensional space and combined it with animated vision, which increased the rate of development of the animation industry in the world [20].

Although deep learning has achieved breakthrough research results in computer vision, natural language processing and other technologies, with the further development of this theory, this technology itself has a series of bottleneck problems, which has become the main obstacle to the progress of deep learning. China started late in the research of deep learning algorithms, but with the continuous development and optimization of new and more sophisticated technologies such as computers in recent years, they have also made breakthroughs in deep learning algorithms [21]. Some scholars have adopted various complex network structures, such as the Bayes algorithm, to further improve the computational accuracy and reliability of deep learning models. This complex network structure can realize the

optimization calculation of gradient in Bayesian algorithm prediction.

3. RESEARCH ON THE INFLUENCE OF TEACHER PERFORMANCE APPRAISAL AND MANAGEMENT OPTIMIZATION STRATEGIES IN HIGHER VOCATIONAL COLLEGES BASED ON DEEP LEARNING

3.1 Analysis and Research on Influencing Factors of Teacher Performance Appraisal in Higher Vocational Colleges Based on Deep Learning

Teachers play an indispensable role in the training of high-quality talents in higher vocational colleges. It has become an important priority of higher education institutions to strengthen teachers' work enthusiasm and improve their overall quality. The main aim of the construction, development and quality improvement of higher vocational colleges is to comprehensively strengthen the performance management of teachers. At present, there are still some significant problems in the performance appraisal and management of these teachers, which are mainly manifested in unclear performance appraisal objectives, complex assessment subjects, simple assessment methods, unreasonable management of performance appraisal results and evaluation management. In the face of this situation, higher vocational colleges should combine scientific computing ability and computer algorithms to improve the effectiveness of performance management strategies and optimize and analyse them. This paper examines several existing in the evaluation system of teachers in higher vocational colleges. First of all, the purpose of performance evaluation is vague, and the teacher performance evaluation system goal setting is constructed without a clear goal. The teacher's professional development needs are not taken into account, their understanding of the assessment process is vague, and the assessment method has shortcomings. The normal performance assessment and management, not only emphasizes the learning and investigation of teachers' professional skills, but also guides teachers to recognize the problems in their own work, correct them in time, and improve the overall teaching quality. Some schools regard performance appraisal management as being only a normal management task and fail to recognize the real value of performance appraisal. Secondly, the management of performance appraisal is unscientific, and the actual teaching appraisal of higher vocational colleges ignores the specific performance of teachers, which has certain limitations in regard to the relevant assessment indicators. Most colleges and universities require the management of teachers to be more prominent, without taking into account the individual differences of different teachers and their professional development needs. Finally, performance appraisal is a systematic task. Although a large number of dynamic and complex data appear in the appraisal process, some higher vocational colleges still have limitations and biases in the management and construction of performance appraisal, and their poor grasp of data processing leads to inconsistencies in the appraisal results.

In order to improve the judgment accuracy of the factors related to teacher performance management, we first analyse the concept of performance. It is the feedback on the behaviour performance and final results that can be achieved in the stage of work, not only referring to the number of tasks but also including the work efficiency and quality of the work. Some scholars pointed out that the evaluation and management of performance should not only focus on the results but should focus more on the activity itself, that is, the way that teachers actually teach. Figure 1 depicts the performance management process and the components of performance appraisal.

As can be seen from Figure 1, performance management has multiple components. In addition to analysing and applying performance results, targeted communication is also required for each teacher. In terms of assessment, attention is paid to ideology and politics, workload, scientific research and other work. According to different evaluation contents, it is determined whether the teacher can meet the performance standards. At the same time, there are obvious differences between performance management and performance appraisal. We summarize the differences between the two in Table 1:

As can be seen from Table 1, first of all, the difference in purpose is reflected in performance objectives and job decisions. Second, performance management and performance appraisal have different objectives; one is more concerned with individual performance, and the other is more concerned with overall performance. Finally, it has its own characteristics in terms of content, cycle and connection. Performance management information database for vocational college teachers: including data on teachers' workload (such as teaching hours, research projects), teaching quality (student evaluation, peer review), research achievements (papers, patents), etc. We use the deep learning algorithm to statistical part of the database of vocational college teacher performance management information and determine the relevant impact factors according to the results of data training. These results indicated that the relevant factors affecting the performance management of teachers in higher vocational colleges include unclear performance appraisal plans, unscientific appraisal methods, teachers' lack of understanding of performance appraisal, and significant errors in performance appraisal results. Based on the above survey results, we illustrate the performance appraisal management process and the correlation between relevant factors:

As can be seen from Figure 2, the performance management process needs to comprise the initial assessment plan formulation, the organization of implementation results, the evaluation of evaluation results, and the announcement of performance results. The main problems affecting performance management are also reflected in the correlation of relevant factors. After the preliminary analysis, we further improve performance management with the support of deep learning algorithms.

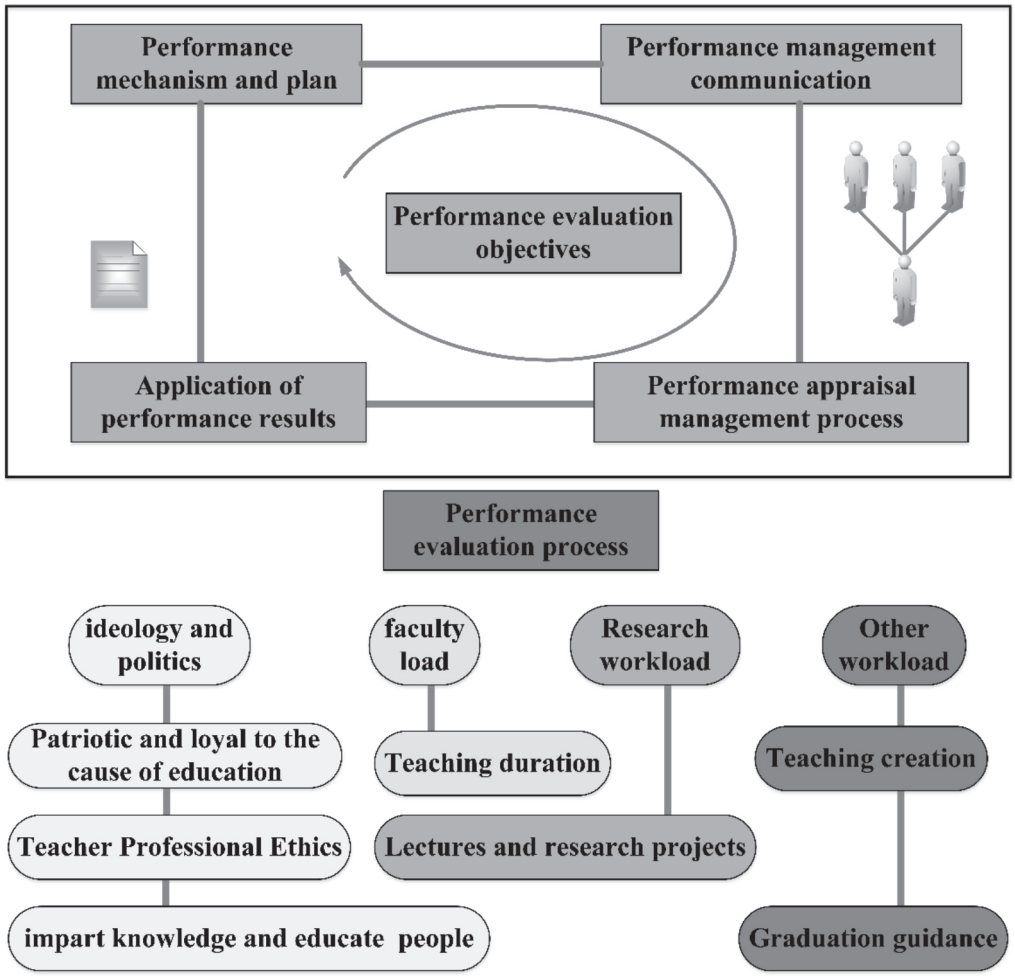

Figure 1 Performance management diagram and performance evaluation-related content.

Table 1 Statistics for the differences between performance management and performance appraisal.

	Performance management	**Performance appraisal**
Objective	Performance goals	Work decision-making
Object	Individual performance	Overall performance
Content	Performance standards	Standard design
	Supervision and control	Assessment activities
Cycle	Short cycle	Long cycle
Contact	Consistent goals and performance evaluation standards	Following performance management objectives

3.2 Research on Optimization Strategy Design of Teacher Performance Management Based on Deep Learning and Bayesian Algorithm

Deep learning algorithms are a component of machine learning that allows machines to process data and analyse text in the same way that humans engage in cognitive learning to solve a range of complex problems. The core idea is to also use function calculation to combine the difference between minimization and ideal function in real data to obtain relevant calculation results and improve the accuracy of analysis results. A deep learning and neural network structure can imitate the logical stratification of the human brain, mining the deep meaning of data information through data analysis and computational iterative optimization. Deep learning algorithms have facilitated certain achievements in the development of various countries. Figure 3 shows the statistics for the number of studies and the development of various countries:

As can be seen from Figure 3, the development fields of deep learning algorithms in various countries are divided into five categories: computer vision, natural language processing, text image processing, simulation training, and mechanical manufacturing. In these five categories, the United States has the highest number of research applications of deep learning algorithms, and Japan ranks second. China has also made some progress in the research achievements of deep learning algorithms in recent years, ranking third. The key to deep learning algorithms is to use multi-layer pre-training

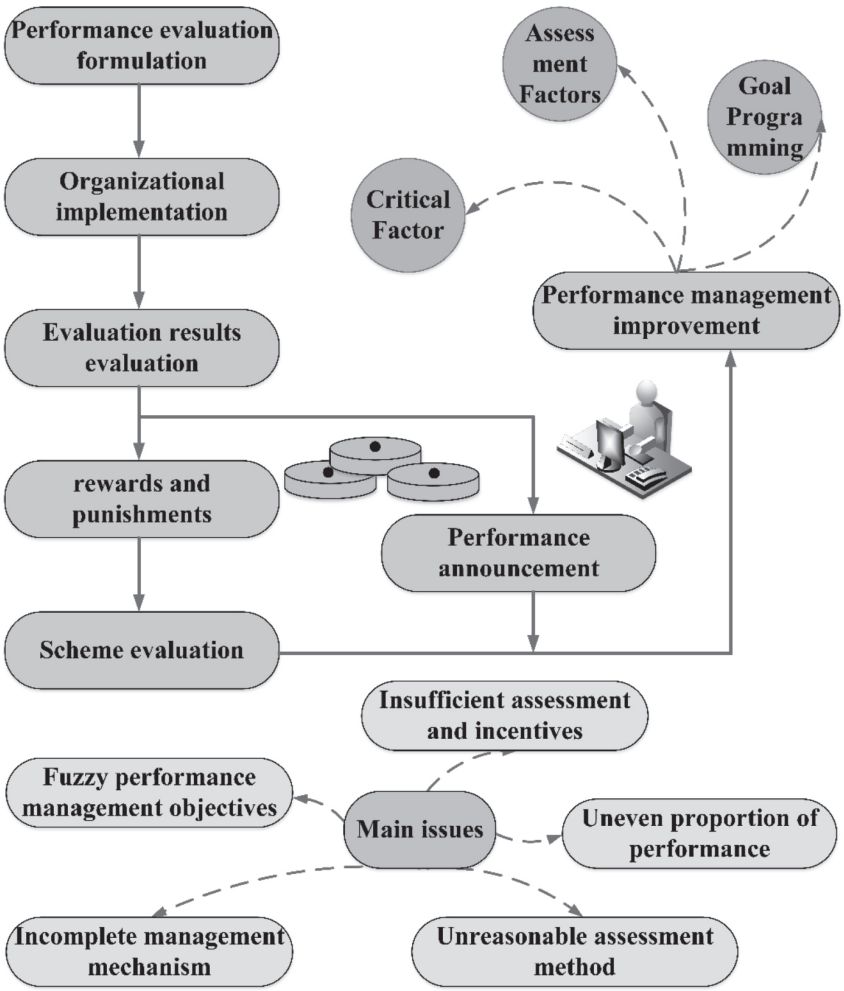

Figure 2 Performance appraisal management process and related factors correlation.

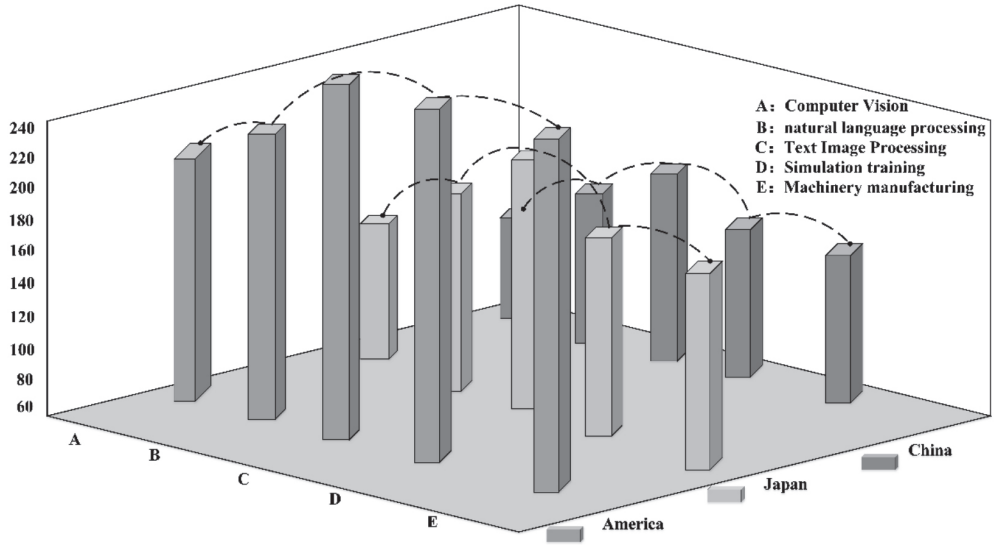

Figure 3 Development situation of countries in different fields.

and supervised and unsupervised learning to establish the relationship between data output and input. The deep neural network structure is depicted in Figure 4:

As can be seen from Figure 4, we characterized the three processes of data input, hiding and output of the neural network structure. At the same time, the convolutional neural network is taken as an example to show the data processing method. Deep learning algorithms can process the features of extremely complex data information, and combine and calculate seemingly unrelated content. In the

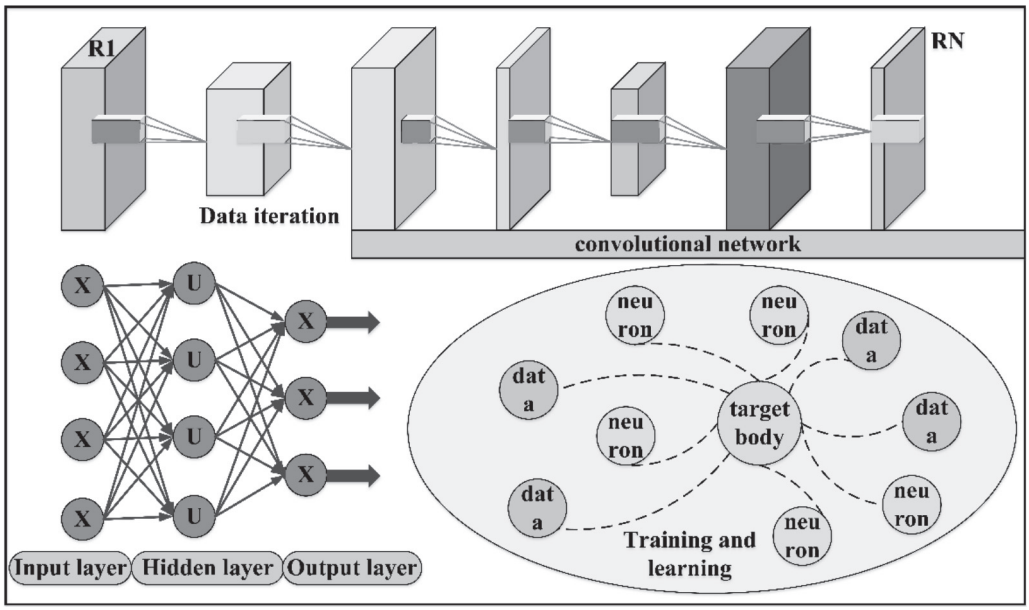

Figure 4 Diagram showing the deep neural network structure.

optimization of teacher performance management, there is a large amount of dynamic data involved, and a teacher's age, professional skill level and attitude towards work will affect the results of performance appraisal. Therefore, the use of deep learning to train the model can significantly improve the performance management strategy. Firstly, from the perspective of deep learning, the discriminant model is used to establish a parameter system, and the current teacher performance management strategy and the future optimized strategy mapping relationship are expressed with (1):

$$h{:}X \to Y, s.t.y = h(x) \tag{1}$$

In addition to the computation iteration between each layer of neural units, the neural network also includes the thinking mapping of some parameters of the model. The hidden state of each neural unit has a corresponding time matrix and weight matrix, and the high-dimensional feature information contained in the matrix is expressed by the formula (2) and (3):

$$h_t = \tanh(W_1 X_1 + W_r h_{t-1} + b_h) \tag{2}$$

$$y = W_0 h_x \tag{3}$$

In the formula, W_0 represents the weight matrix. The optimal path is obtained by gradient accumulation using the offset vector and updated data features. The formula used to determine the gradient from the transmission of the deep learning model loss function is (4):

$$\frac{\partial E_t}{\partial W_R} \tag{4}$$

Then the total gradient of this optimization path is (5).

$$\frac{\partial E_t}{\partial W_R} = \sum_{t=1}^{T} \frac{E_t}{W_R} \tag{5}$$

In the traditional neural network architecture, the data output results depend on the relationship between the hidden layer and the input layer, as shown in (6) and (7):

$$f_t = \sigma(W_f[h_{t-1}, x_t] + b_f) \tag{6}$$

$$y_i = f(c, s_{t-1}, y_{t-1}) \tag{7}$$

The output formula above cannot take into account the relevant factors influencing the optimization of teacher performance management. Therefore, before the final step of concealing the state and output results, the accuracy of the data results must be improved. The weight coefficient after normalization is obtained by the traditional formula (8)–(10):

$$e_t = \tanh(W_{att}[s_{t-1}, h_t] + b_{att}) \tag{8}$$

$$a_{ti} = \frac{\exp(e_{ti})}{\sum_{j=1}^{T} \exp(e_{tj})} \tag{9}$$

$$c_t = \sum_{i=1}^{T} a_{ti} \tag{10}$$

where W_{att} and a_{ti} represents the weight coefficient and error factor. The entropy value of the normalized data is calculated with (11) and (12):

$$e_j \frac{1}{\ln n} \sum_{i=1}^{x} \ln(x_{ij}),\ j = 1, 2, \ldots, \infty \tag{11}$$

$$w_j = d_j / \sum_{j=1}^{x} d_j \tag{12}$$

The data to be optimized is added to the Bayesian model for data training, and the number of neurons in each layer training time and learning rate is divided according to different needs. The internal parameters of the training model are optimized using the gradient descent method. Then the accuracy of the whole neural network model is calculated as (13):

$$x^* = \arg\max_{x \in A} f(x) \tag{13}$$

Among them, x^* represents the optimized parameter vector. Each dimension represents one of the neural unit variables

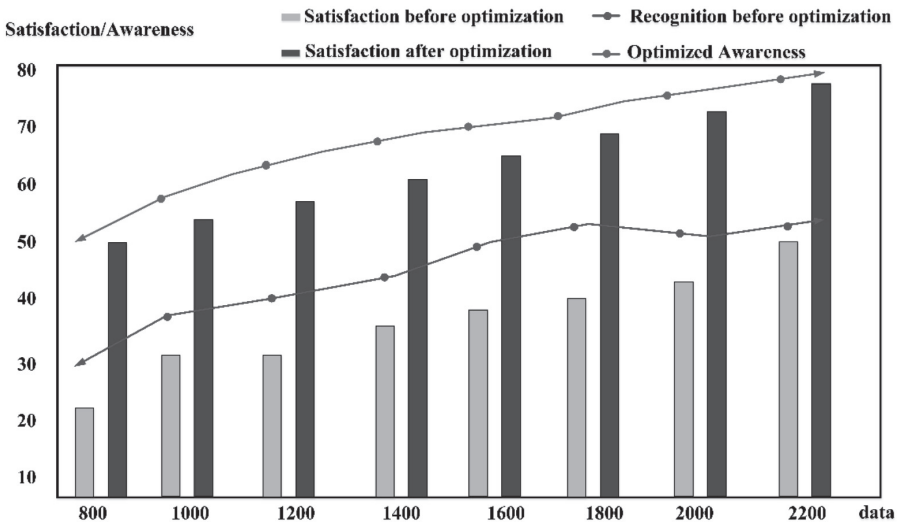

Figure 5 Changes in satisfaction and cognitive level of performance management before and after optimization.

and, according to the optimization goal, Bayesian networks construct a probabilistic model, defining the theorem as (14):

$$P(M|E) \in P(E|M)P(M) \tag{14}$$

After updating the parameters, the distribution results are checked and the final calculation is iterated to find the parameter combination of the optimal path. Set the maximum number of iterations and define the formula for the distribution results as (15):

$$f(x) \sim GP[m(x), k(x, x')] \tag{15}$$

Assuming that the edge distribution of the management optimization path meets the requirements of iterative training, the performance of the performance management model can be improved by directly outputting data information.

4. ANALYSIS OF THE INFLUENCE OF TEACHER PERFORMANCE APPRAISAL AND MANAGEMENT OPTIMIZATION STRATEGIES IN HIGHER VOCATIONAL COLLEGES BASED ON DEEP LEARNING

4.1 Analysis of Influencing Factors of Teacher Performance Appraisal in Higher Vocational Colleges Based on Deep Learning

In order to verify the results of factors affecting the performance appraisal of teachers in higher vocational colleges and facilitate the subsequent performance management optimization, we randomly selected a college as the evaluation object. The working organization includes the organization department, office and other departments. Administrative agencies include development planning, teaching affairs, human resources, student management and so on. Teaching institutions include professional schools as well as information centres, innovation schools, etc. The traditional performance evaluation ratio includes moral quality, ideological and political education, hard work performance evaluation results, and honest employment. The traditional performance evaluation ratio includes moral quality, ideological and political education, hard work performance evaluation results, and honest employment. This performance appraisal method is non-discriminatory; that is to say, the same performance management method is applied to both the administration personnel and the teachers. Moreover, in the interviews related to the performance management system, it was apparent that most teachers do not fully understand the notions of school management and assessment. Therefore, we apply deep learning information training to the processing of performance influencing factors, so as to reduce the interference of external factors on performance appraisal results. The changes in teachers' satisfaction with current performance management, and their cognitive level before and after deep learning optimization were collected from the same sample data, as shown in Figure 5:

As can be seen from Figure 5, after the deep learning algorithm reduces the interference of impact factors, most teachers have improved their satisfaction with the current performance management strategy and have improved their cognition. Moreover, various factors such as whether teachers are motivated to improve, the investment in higher vocational colleges, the establishment of a better salary structure and the improvement of the performance evaluation mechanism all have an important impact on teacher development.

4.2 Research Result Analysis of Teacher Performance Management Optimization Strategy Design Based on Deep Learning and Bayesian Algorithm

Aiming at the problems of teacher performance management in higher vocational colleges, we find that many factors affect performance appraisal and inadequate or inappropriate management can potentially harm the overall teacher quality.

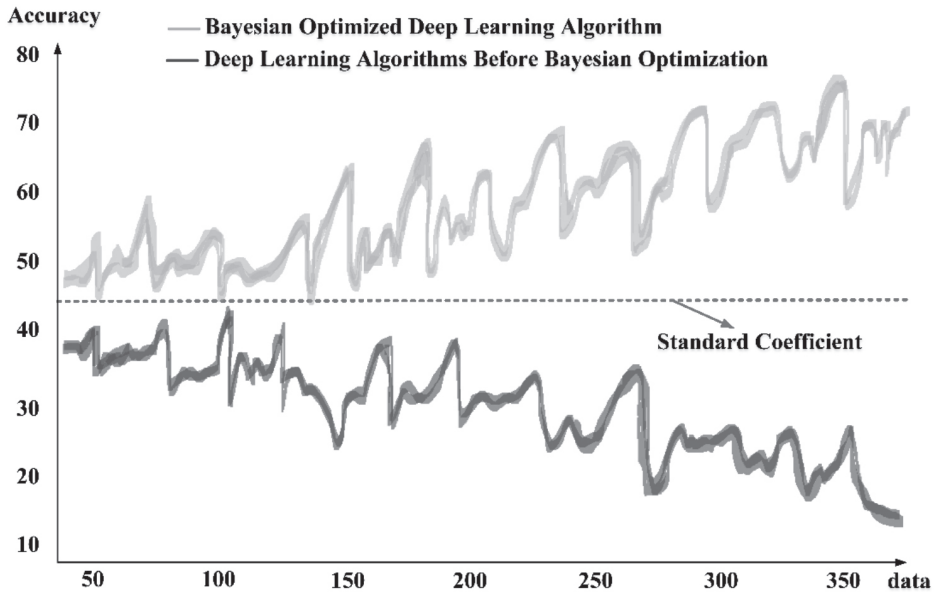

Figure 6 Changes in accuracy before and after optimization.

The main issues with performance management include a lack of professional training for teachers. The main issues with performance management include a lack of professional training for teachers. Assessment standards are not perfect, teachers' performance assessment and management lack guidance, performance management methods are relatively simple, and the feedback on assessment results is not timely. When developing an optimization strategy for teacher performance management in higher vocational colleges, a large amount of dynamic and complex data needs to be processed. In order to improve the effectiveness of the performance management optimization model, we add a deep learning algorithm and use the Bayesian network to further improve the accuracy of the algorithm. To verify the reliability of the deep learning algorithm, we compare the changes in accuracy of this algorithm before and after it is added to the Bayesian network optimization, as shown in Figure 6:

As can be seen from Figure 6, the accuracy of traditional deep learning algorithms in processing performance management optimization data tends to decline. In the face of a large amount of dynamic data, the accuracy of the deep learning algorithm optimized by the Bayes algorithm is also higher than the standard coefficient. In addition, the error of assessment results will also have some impact on the choice of path for teacher performance management, so we compare the assessment error of deep learning algorithms before and after optimization.

As can be seen from Figure 7, for the comparison of error coefficients, we adopt the comparison method of discrete data. Evidently, the error coefficient of the optimized deep learning algorithm is within the controllable range. To sum up, deep learning and optimization algorithms are a reliable means of improving teacher performance management strategies in higher vocational colleges. Therefore, we recommend taking specific improvement measures to optimize the strategy for teacher performance management. First of all, the task of performance appraisal should be clearly defined, the function and value of performance appraisal should be paid special attention to, the improvement of teachers' working ability and overall literacy should be the first priority, and the guiding role of performance management should be emphasized as much as possible. Secondly, the performance management indicators should be established scientifically and stringently, and the performance assessment tasks and evaluation criteria should be appropriately adjusted to meet the assessment needs of different types of teachers. Finally, the main body of performance management should be enriched, and a variety of management methods and assessment methods should be adopted to improve management quality.

5. CONCLUSION

With the rapid development of the social economy and education, higher vocational colleges are also undergoing important education reform. In this process, the optimization of teacher performance management can promote the better development of higher vocational colleges and improve the development potential and competitiveness of schools. Excellent university teacher performance management can improve the overall quality of teachers and provide a solid foundation for training high-quality talents. Based on a deep learning algorithm, this paper studies the impact factors and optimization strategies of performance management of teachers in higher vocational colleges. Firstly, the teacher performance management mechanism and related influencing factors are comprehensively analysed, and the correlation between the influencing factors is established by the deep learning algorithm. Secondly, dynamic data information is trained with the help of deep learning algorithms to improve the speed of finding the optimal path for performance management. Combined with the Bayesian network, the accuracy of the calculation results is optimized, and the normalization and gradient processing are adopted to improve the practical application of the performance management model. Finally, this article conducted targeted result analysis

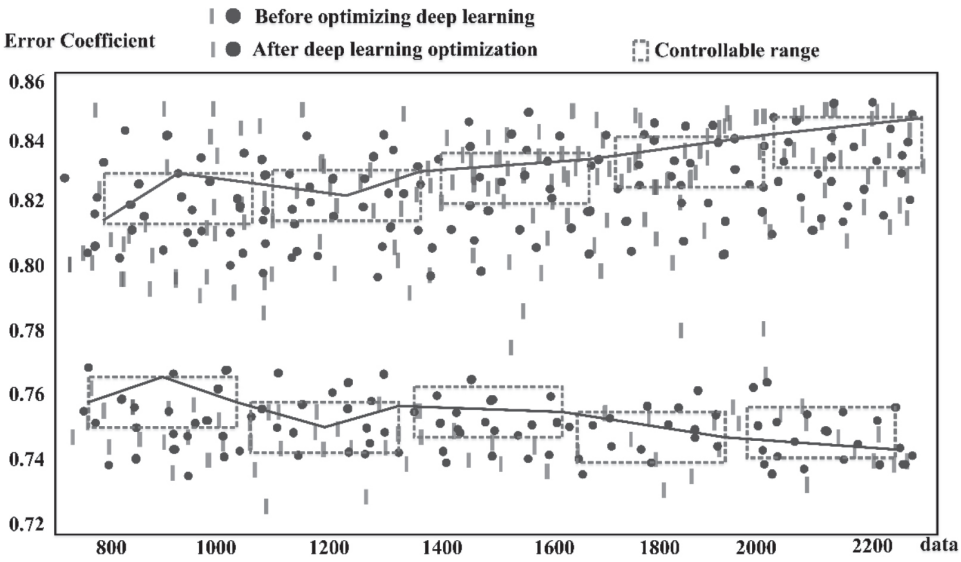

Figure 7 Changes in error coefficient before and after optimization.

on deep learning algorithms, factors influencing performance evaluation of vocational college teachers, and performance management optimization strategies. Finally, this article conducted targeted result analysis on deep learning algorithms, factors influencing performance evaluation of vocational college teachers, and performance management optimization strategies. The research results show that the deep learning algorithm can reliably and effectively process a large amount of dynamic data. At the same time, it can recommend targeted strategies to optimize teacher performance management in higher vocational colleges to enhance the overall quality development of teachers.

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