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Research Article

Establishment of Performance Evaluation Model of Highway Environmental Protection Based on Deep Learning

Tao Zhu [1] and Shuaizhen Zhu [2]

[1] *Transportation Development Strategy Research Center, Henan College of Transportation, Zhengzhou, 450000 Henan, China*
[2] *College of Automotive, Henan College of Transportation, Zhengzhou, 450000 Henan, China*

Correspondence should be addressed to Tao Zhu; zhutao@hncc.edu.cn

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As the foundation of the social economic system, public transportation roads play an important role in the development of the national economy. At the same time, the opposition between public transportation roads and the natural environment, ecological environment, and natural resources is becoming more and more obvious. This paper is aimed at studying the performance evaluation model of highway environmental protection based on deep learning. For this reason, related methods such as environmental protection, performance evaluation, and deep learning algorithms are proposed in the article, and corresponding experiments are also carried out in the article. The experimental results show that the highway environmental protection performance evaluation model based on deep learning can quickly help environmental supervisors to inspect the work of relevant highway environmental protection agencies and also accurately mention the environmental protection performance detection to 80%.

1. Introduction

Increasingly serious environmental problems have attracted public attention and at the same time have hindered economic growth and social development. The current domestic environmental protection management system is imperfect, and the government's environmental protection efficiency and effectiveness are low, and environmental protection problems are even more prominent. In particular, the domestic highway network is developed, and the protection of the highway environment is very important. However, the current performance evaluation of highway environmental protection cannot quickly adapt to the needs of economic growth and social development, as well as the public's desire to improve the ecological environment. In addition, the current research and exploration of government environmental protection performance evaluation in various provinces in China are based on specific regions and specific tasks. It lacks scientific, systematic, and objective local experience or directly copied the experience of foreign governments. Without a standard experience, it cannot be used nationwide. Improving the performance evaluation of domestic existing highway environmental protection and improving the efficiency and effectiveness of government environmental protection have become an important issue from the central government to the local government.

With the rapid economic development, the public's attention to environmental issues has gradually increased, coupled with the deterioration of the environment and the consumption of resources; the ecological carrying capacity has reached its limit; and the government is facing a huge challenge in environmental protection work. Faced with the emergence of environmental problems, relevant units need to take corresponding measures to deal with it. This is the government's responsibility and obligation. It needs the government to improve the coordination ability of environmental protection work, carry out good integration and use of various resources, promote the open and transparent use of environmental protection special funds, and improve the efficiency of use so that environmental protection work can achieve the expected goals. China's national highway chiefs rank in the forefront of the world, and the performance assessment of highway environmental protection is helpful for government agencies to timely discover the problems exposed in the implementation of environmental protection policies and administrative work by highway construction and maintenance units at all levels, finding out the real reasons and weaknesses to improve the management level of environmental protection work and the efficiency and effectiveness of work. At the same time, strengthening the evaluation of highway environmental protection performance can find some measures that are more conducive to highway environmental protection, so as to provide some reference examples for the domestic highway environmental protection agencies to formulate environmental protection plans.

The innovation of this article lies in applying deep learning to the performance evaluation of highway environmental protection, constructing an evaluation model, using evaluation indicators as samples, training the neural network in deep learning, and using the trained network for instance evaluation. At the same time, with the help of neural network's self-learning, self-adaptive ability, and strong fault tolerance, this paper establishes a more objective comprehensive evaluation system of highway environmental protection performance, and the evaluation results are more objective and accurate. It provides an important reference basis for relevant environmental protection agencies to formulate policies. In this article, an experiment was conducted on the performance evaluation model of highway environmental protection based on deep learning, and the function and importance of the performance evaluation model based on deep learning were tested.

2. Related Work

Deep learning is a technology based on artificial neural networks. In recent years, it has become a powerful tool for machine learning and is expected to reshape the future of artificial intelligence. To this end, a large number of researchers have conducted research on it. Ravi et al. gave a comprehensive and up-to-date review of research on the use of deep learning in health informatics. They critically analyzed the relative advantages, potential flaws, and future prospects of this technology [1]. Deep learning algorithms, especially convolutional networks, have quickly become the preferred method for analyzing medical images. In his research, Litjens et al. reviewed the main deep learning concepts related to medical image analysis, summarized more than 300 contributions in this field, and discussed open challenges and directions for future research [2]. The latest advances in machine learning, especially advances in deep learning, are helping to identify, classify, and quantify patterns in medical images. Deep learning is rapidly becoming the most advanced technology, thereby improving the performance of various medical applications. Shen et al.'s research introduced the basics of deep learning methods and reviewed their success in image registration, anatomy, and cell structure detection [3]. The research direction of Oshea and Hoydis is different from that of Litjens et al. and Shen et al. Oshea and Hoydis mainly introduced and discussed several new applications of deep learning at the physical layer. By interpreting the communication system as an autoencoder, Oshea and Hoydis have developed a basic new method that treats the communication system design as an end-to-end reconstruction task, aiming to jointly optimize the transmitter and receiver components in a single process [4]. Deep learning methods use multiple processing layers to learn hierarchical representations of data and have produced the most advanced results in many fields. In Young et al.'s related research, they reviewed important deep learning-related models and methods that have been used in many NLP tasks and provided a detailed understanding of the past, present, and future of deep learning in NLP [5]. Grassmann et al. used the deep learning algorithm in the AREDS study to reveal that weighted κ is better than human scorers and is suitable for using individuals older than 55 years of age to classify AMD fundus images in other datasets [6]. In order to verify the role of deep learning in channel estimation in millimeter wave communications, He et al. provide an analysis framework on the asymptotic performance of the channel estimator to conduct related experiments [7]. These researchers have conducted a lot of research on the related content of deep learning from various aspects. Some researchers have discussed and studied some of the problems encountered so far, but most of their research did not propose some specific and feasible solutions to the problem.

3. Environmental Protection and Performance Evaluation

3.1. Environmental Protection. Environmental protection is mainly to solve current or potential social environmental problems and adjust the relationship between human society and the ecological environment [8]. The overall methods and specific countermeasures of environmental protection include engineering technology, administrative management, publicity, and education. The content of environmental protection is extensive and comprehensive. In addition to many fields such as natural sciences and social sciences, it also has very special research categories and objects.

Protecting and improving the environment and promoting the coordinated development of road traffic and the environment are the basic content of the road construction and operation process [9]. Roads must not only withstand sufficient traffic but also coordinate with the surrounding environment to ensure the stability of the road's ecological environment. This requires various feasible countermeasures to reduce the damage to the environment in the process of road construction and operation. Starting from the design, construction, and subsequent use of roads, through the process of road environmental protection, the environmental problems in road construction are controlled to a minimum [10]. Figure 1 shows the most common environmental pollution problems in highways:

3.1.1. Water Pollution. According to the causes of water pollution, water pollution can be divided into man-made pollution and natural pollution [11]. Water pollution in the

Air Pollution | Solid waste pollution | Noise pollution | Ecological destruction

Figure 1: Environmental problems in highways.

Table 1: Common indicators and content of domestic sewage during construction.

Serial number	Index	Abbreviation	Concentration
1	Total solids	TS	1200
2	Suspended matter	SS	360
3	Biochemical oxygen demand	BOD5	410
4	Cod	COD	1000
5	Total organic carbon	TOC	280
6	Ammonia	N	62
7	Total phosphorus	P	13

highway environment is mainly divided into the pollution of domestic sewage during the construction period and the pollution of waste water during the construction and maintenance of the road. The canteens and toilets in the living office area are the main sources of domestic sewage; the waste water during the construction and maintenance period is mainly caused by the wastes discharged during the construction and road maintenance processes polluting the water sources [12, 13]. During the passage of the road, waste water generated by houses around the road, vehicle leakage, and sewage generated by mobile vendors will aggravate the pollution of the water environment around the road. Table 1 shows the common indicators and content of domestic sewage during road construction.

3.1.2. Noise Pollution. Highway noise pollution mainly includes the noise produced during road construction and the noise produced by vehicles passing through the road [14]. The noise sources during the construction period mainly come from construction machinery, such as bulldozers, excavators, loaders, rock drills, and road rollers used in roadbed construction. The noise during road traffic mainly comes from the whistle sound of passing vehicles and the sound produced by vehicles moving at high speed. Table 2 shows the noise generated by various construction machineries within a solid distance.

Table 2: Noise generated by different construction machineries.

Rank	Name	A sound extreme	Average value
1	Drop hammer piling	95~115	105
2	Bulldozer	80~96	88
3	Road breaker	85~87	86
4	Truck	80~91	85
5	Road roller	75~91	83
6	Loader	81~82	81

3.1.3. Noise Pollution. The prevention and control methods of noise pollution are mainly divided into two categories. On the one hand, prevention and control are carried out from the road construction side, and on the other hand, prevention and control are carried out by passing vehicles [15]. In terms of road construction, it is mainly to reduce the noise of mechanical equipment and adopt advanced low-noise equipment for construction; equipment should be guaranteed and maintained regularly, and louder equipment should be replaced with quieter or silent equipment. In terms of traffic, vehicles should be properly restricted from whistling in downtown areas, and annual inspections should be conducted on time to eliminate old vehicles. Noise pollution has great damage to human hearing. If people work in a noisy environment for a long time and produce auditory fatigue, the auditory organs will cause irreparable disease. Figure 2 shows some common noise prevention measures.

The sound insulation board is installed on the road, which can solve the noise pollution caused by the vehicles on the road and block the transmission of noise, so as to achieve the effect of sound insulation and noise reduction. Installing road sound insulation cotton on the road can effectively absorb the noise generated by passing vehicles, thereby effectively preventing the spread of noise.

3.1.4. Solid Waste Pollution. Solid waste is the material that is lost in use and is discarded in production, life, and other activities. Road engineering construction is associated with a wide range of construction projects and a large number of them, so a large amount of waste that loses its use value will be generated. There are two major sources of waste generated during road construction: domestic waste and construction waste. A lot of domestic waste will be generated in the living office area, and a lot of construction waste will be generated during the specific construction process. When the highway is put into use, the main source of solid waste is garbage generated by passing vehicles and pedestrians.

Figure 2: Noise control measures.

3.2. Deep Learning. The concept of deep learning comes from the study of neural networks, which can be said to be a kind of deep neural network [16]. The structure of deep learning is a combination of multilayer nonlinear operation units, with powerful feature learning capabilities. A neural network (NN) is a parallel network with a wide range of interconnected neurons established by humans. Its organization can simulate the structure and function of the human brain to carry out dynamic interactive behaviors. Deep training is an extension method of neural network, which has the structure and functional characteristics of neural network.

The basic characteristics of NN are as follows: (1) due to the parallelism of the NN structure, the information storage of the neural network adopts a decentralized method, so the neural network has a high degree of parallel processing and storage functions, which improves fault tolerance and robustness; (2) through NN monitoring or nonmonitoring learning, it can change your performance to adapt to the new environment. Therefore, it has excellent self-learning ability and self-adaptive ability. NN has associative storage and processing functions, which can process part of uncertain information.

Of course, neural networks currently have some shortcomings. The most well-known one is the "black box" nature of neural networks (that is, we do not know how and why neural networks produce certain outputs).

3.2.1. Several Common Deep Learning Basic Models. Deep Belief Network (DBN) is a randomly generated model, which can be regarded as a composite model composed of multiple simple learning models, which is a composite model composed of multiple RBM stacks [17]. Figure 3 shows the classic DBN structure diagram:

DBN contains multiple hidden layers, and the layers are fully connected, but there is no connection between the neurons in the layer. Figure 3 shows a two-layer RBM DBN model. First, use the greedy supervision strategy to train the parameters of each layer of the RBM network from bottom to top to ensure that the input data can maintain as much useful functional information as possible under the action of multilayer RBM. The last layer of conventional DBN usually sets up a BP network, which accepts the new functional data output by the last layer of RBM as input data, and uses the BP algorithm or other algorithms to monitor and fine-tune the network [18].

Convolutional neural network is a deep neural network model composed of input layer, convolution layer, downsampling layer, fully connected layer, and output layer. This structure is suitable for the two-dimensional structure of the input data. Therefore, compared with other deep learning models, CNN has shown very good results in applications such as image and language. CNN obtains new feature expressions through one or more convolutional layers and downsampling layers alternately. The fully connected layer and the output layer constitute the top classifier. Then, the network is trained according to the error back propagation between the network output value and the expected output value.

3.2.2. Restricted Boltzmann Machine (RBM)

(1) RBM Structure. The structure of RBM is composed of two layers of visible layer and nondisplay layer, which is a special kind of BM (Boltzmann machine). The connection between RBM neurons has the following characteristics: there is no intralayer connection, but each layer is completely connected. In-layer no connection means that the visual layer or the hidden layer between neurons is not connected, and the complete connection means that the visible layer neuron k and the hidden layer neuron y are connected to each other. Figure 4 shows the structure diagram of the RBM network.

(2) RBM Algorithm Formula. RBM is an "energy-based model," which is a system (k, y) composed of a visible layer and a hidden layer. Its energy is

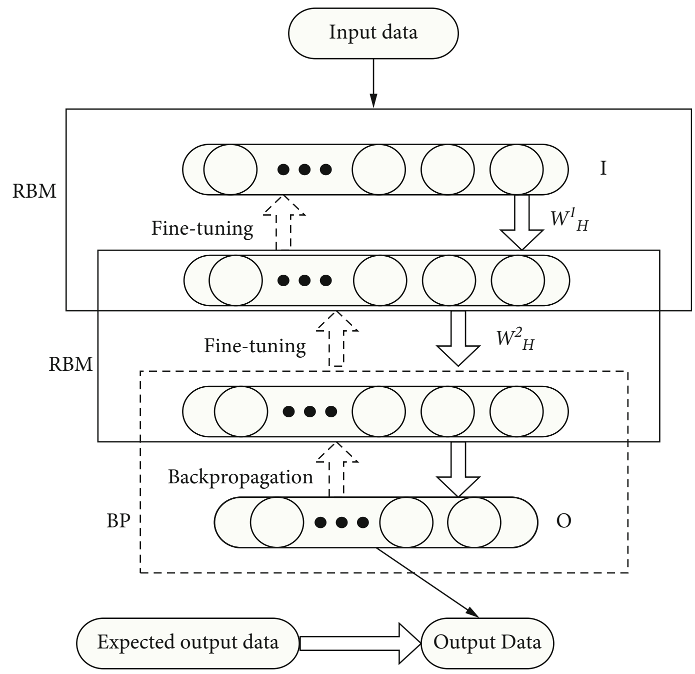

Figure 3: DBN structure diagram.

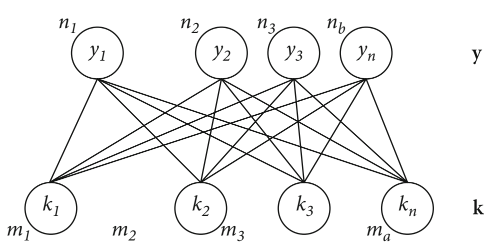

Figure 4: RBM network structure diagram.

$$L(k, y) = -\sum_{i=1}^{a} n_i y_i - \sum_{j=1}^{b} m_j k_j - \sum_{j=1}^{a}\sum_{i=1}^{b} y_i w_{ij} k_j. \quad (1)$$

Write the formula into the following matrix form:

$$L(k, y) = -n^R y - m^R k - k^R W y. \quad (2)$$

Based on the energy function of Formula (1), the energy model is transformed into a probabilistic production model, and the joint probability distribution of the state (k, y) corresponding to the RBM is given:

$$G(k, y) = \frac{1}{X} e^{-L(k,y)}, \quad (3)$$

where X is the normalization factor; that is, the states of all visible and hidden layers are accumulated:

$$X = \sum_{k,y} e^{-L(k,y)}. \quad (4)$$

For a practical problem, the focus is on the probability distribution $G(k)$ of the input data k, which is the marginal distribution of $G(k, y)$, specifically

$$G(k) = \sum_y G(k, y) = \sum_y \frac{1}{X} e^{-L(k,y)}. \quad (5)$$

Because the neurons between the visible layer and the hidden layer are cut off, the neurons are independent of each other, so there are

$$G(k|y) = \prod_{i=1}^{a} G(k_i|y),$$
$$G(y|k) = \prod_{j=1}^{b} G(y_i|k). \quad (6)$$

When the state of the visible layer k is given, the probability of the hidden layer neuron $y_j = 1$ is obtained:

$$G\left(y_j = 1|k\right) = \delta\left(n_j + \sum_{i=1}^{a} k_i w_{ji}\right). \quad (7)$$

When the state of the hidden layer y is given, the probability of $k_i = 1$ of the visible layer neuron is obtained:

$$G(k_i = 1|y) = \delta\left(m_i + \sum_{j=1}^{b} y_j w_{ij}\right), \quad (8)$$

where $\delta(x)$ is the sigmoid function.

The goal of RBM is to generate a marginal distribution of the RBM that best fits the training sample, so that the input training sample is similar to the sample data reconstructed from the hidden layer [19]. According to the Product of Experts (PoE) model to fit complex high-dimensional data, PoE uses KL deviation and Gibbs sampling to obtain an ideal probability distribution when processing high-dimensional data models. Therefore, the goal of training RBM is transformed into maximizing the following likelihood function:

$$V(F,\Theta)=\prod_{i=1}^{A}G\left(k^{(i)}\right). \tag{9}$$

Among them,

$$F=\left\{k^{(1)},k^{(2)},k^{(3)},\cdots,k^{(i)}\right\}. \tag{10}$$

$k^{(i)}$ represents the ith training sample, and A is the number of samples.

It is more difficult to deal with the continuous multiplication in Formula (10). Consider that the function ln$a$is strictly monotonically increasing, and maximizing$V(F,\Theta)$ and maximizingln $V(F,\Theta)$are equivalent. Therefore, the goal of training RBM becomes to maximize the following log-likelihood function:

$$\ln V(F,\Theta)=\sum_{i=1}^{A}\ln G\left(k^{i}\right). \tag{11}$$

The commonly used method to maximize Formula (11) is the gradient ascent method, which updates the parameters through an iterative method:

$$\Theta \coloneqq \Theta+\delta\frac{\alpha \ln V(F,\Theta)}{\alpha\Theta}. \tag{12}$$

In the formula, $\alpha>0$ is the learning rate.

For the training sample$F$, it is calculated by derivation:

$$\frac{\alpha \ln V(F,\Theta)}{\alpha\Theta}=\sum_{i=1}^{A}\left(-\left\langle\frac{\alpha L\left(k^{i},y\right)}{\alpha\Theta}\right\rangle_{G\left(y|k^{i}\right)}+\left\langle\frac{\alpha L(k,y)}{\alpha\Theta}\right\rangle_{G(k,y)}\right), \tag{13}$$

where $\langle\cdot\rangle_{G(y|k^{i})}$ represents the mathematical expectation based on training samples and $\langle\cdot\rangle_{G(k,y)}$ represents the mathematical expectation based on model reconstruction data.

(3) Contrast Divergence Algorithm. The basic idea of the Contrastive Divergence (CD) algorithm also comes from the expert product system model. The main idea of the CD algorithm is to take input sample data as the initial input state, use Gibbs sampling, and after sufficient number of state transitions ensure that the collected sample data conforms to the RBM distribution. Then, use the last transferred visual layer state as the reconstructed sample data to estimate M [20].

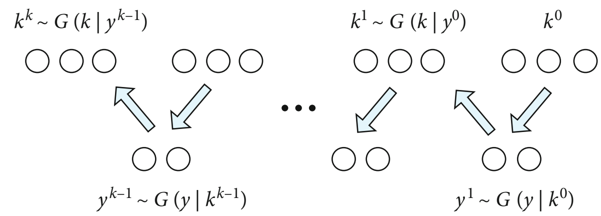

Figure 5: Schematic diagram of Gibbs sampling.

$$M=\left(\frac{\alpha L(k,y)}{\alpha\Theta}\right)_{G(k,y)}. \tag{14}$$

Based on the symmetric structure of the RBM model and the conditional independence of nodes in the visible and hidden layers, the k-step CD algorithm is a learning algorithm that uses k-step Gibbs sampling to obtain sample data that obeys the RBM distribution. Figure 5 shows a schematic diagram of Gibbs sampling in RBM.

In practical applications, when training samples are used to initialize k^0, only a small number of sampling steps (or even one step) are required to obtain a good approximation. That is, k^0 can be used to fit the sample data of the RBM marginal distribution. Therefore, using the CD-k algorithm to estimate Formula (13), for a training sample k^0, the parameter update formula is obtained:

$$\begin{aligned}\frac{\alpha L(k,\Theta)}{\alpha w_{ji}} &\approx G\left(y_j=1\middle|k^0\right)k_i^0-G\left(y_j=1\middle|k^k\right)k_i^k,\\ \frac{\alpha L(k,\Theta)}{\alpha m_i} &\approx k_i^0-k_i^k,\\ \frac{\alpha L(k,\Theta)}{\alpha \mathrm{n}_j} &\approx G\left(y_j=1\mid k^0\right)-G\left(y_j=1\mid k^k\right).\end{aligned} \tag{15}$$

3.2.3. Recurrent Neural Network. Whether it is a convolutional neural network or other artificial neural networks, the signal between each layer of neuron nodes can only propagate to the next layer, and there is no correlation between the previous sample and the next sample [21]. RNN is a neural network model for modeling this sequence, and its core is to make the network have a memory function like a human [22]. In RNN, the nodes between hidden layers are connected to each other. At the same time, the input of the hidden layer includes not only the output of the input layer but also the output of the hidden layer at the previous moment. Figure 6 is a schematic diagram of the results of the recurrent neural network.

RNN is a sequence-to-sequence model, and its output is determined by the input and memory at the current moment. It can be expressed as

$$H_i=f(B*Y_i+Q*S_{i-1}), \tag{16}$$

where H_i is the memory at time i and Y_i is the input at time i . B and Q are weight parameters. The softmax function is

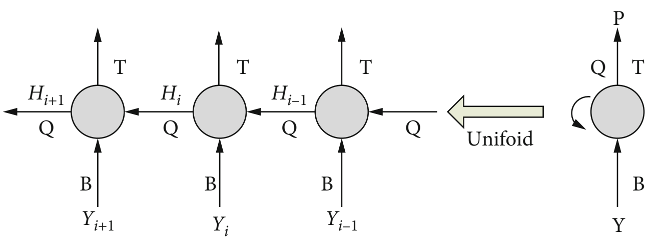

Figure 6: The calculation process of cyclic neural network.

usually used to predict the output of the memory at time i. The output P_i at time i is

$$P_i = \text{soft max}\,(TH_i) \tag{17}$$

With the development of RNNs, two-way recurrent neural networks and long- and short-term memory neural networks appeared later. These networks can simultaneously use past and future information.

3.3. Performance Evaluation

3.3.1. Performance. Performance refers to the amount of tasks an organization, team, or individual completes under specific resources, conditions, and environments. This is about the measurement and feedback of goal achievement degree and goal achievement efficiency [23].

3.3.2. Performance Evaluation. The financial statistics evaluation department gave a specific concept of performance evaluation: "Based on mathematical statistics such as operational research, and in accordance with established consistency standards and evaluation procedures, a unified indicator system is used for comprehensive evaluation." From the perspective of human resources, performance evaluation uses quantitative and quality systems to evaluate employees' codes of conduct, which is a relatively complex process. From the perspective of business managers, performance evaluation is a process of comment and judgment. The purpose of performance evaluation is to evaluate whether the effectiveness of the project has reached the expected goals set in the previous stage [24]. Compared with project evaluation, performance evaluation pays more attention to the rationality, comprehensiveness, consistency, and dynamic evaluation of the entire project process [25, 26].

3.3.3. Construction Elements of Performance Evaluation. Performance evaluation contains many construction elements, mainly evaluation objectives, evaluation subjects, etc. [27]. Figure 7 shows the construction elements of the performance evaluation system:

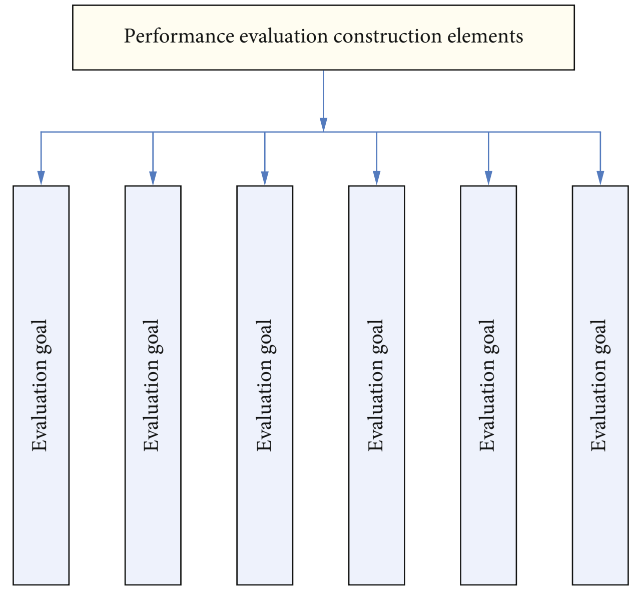

Figure 7: Construction elements of performance evaluation.

4. Related Experiments on Highway Environmental Protection Based on Deep Learning

4.1. Survey of Highway Environmental Problems in Various Regions. In China, public roads extend in all directions, and there are many traffic arteries between towns and cities. At present, Chinese road environmental problems are mainly concentrated in air pollution, noise pollution, and solid waste pollution, and among the three, air pollution and noise pollution are the most serious. Because there are so many vehicles driving on public roads every day, more and more car exhaust, dust, car whistle, etc. have aggravated the phenomenon of air pollution in the public road environment. In this experiment, the first is to survey and count the main air pollutant PM2.5 on various roads between towns and villages in a certain area. Table 3 shows the data results of this survey experiment.

Table 3: Changes of PM2.5 concentration among different roads (μg/Nm^3).

	The first season	Second quarter	The third quarter	Fourth quarter
Urban expressway	77	72	69	70
Highway	71	52	50	68
State road	81	71	65	73
Provincial road	72	66	68	76

From the data in Table 3, it can be seen that air pollution is relatively serious in the three types of public roads in the region, national highways, urban expressways, and provincial highways, and the value of PM2.5 also changes seasonally. The value of PM2.5 in the first and fourth quarters averaged higher than 70 μg/Nm^3. Figure 8 shows the pollution of different road noises and solid wastes in this area.

According to Figure 8, it can be seen that the solid waste pollution on national and provincial roads is the most serious, with an average of 50 kg and 90 kg of garbage generated each day. Of course, this is also related to the nature of these roads. On highways and urban expressways, general garbage trucks and engineering vehicles are not allowed to enter,

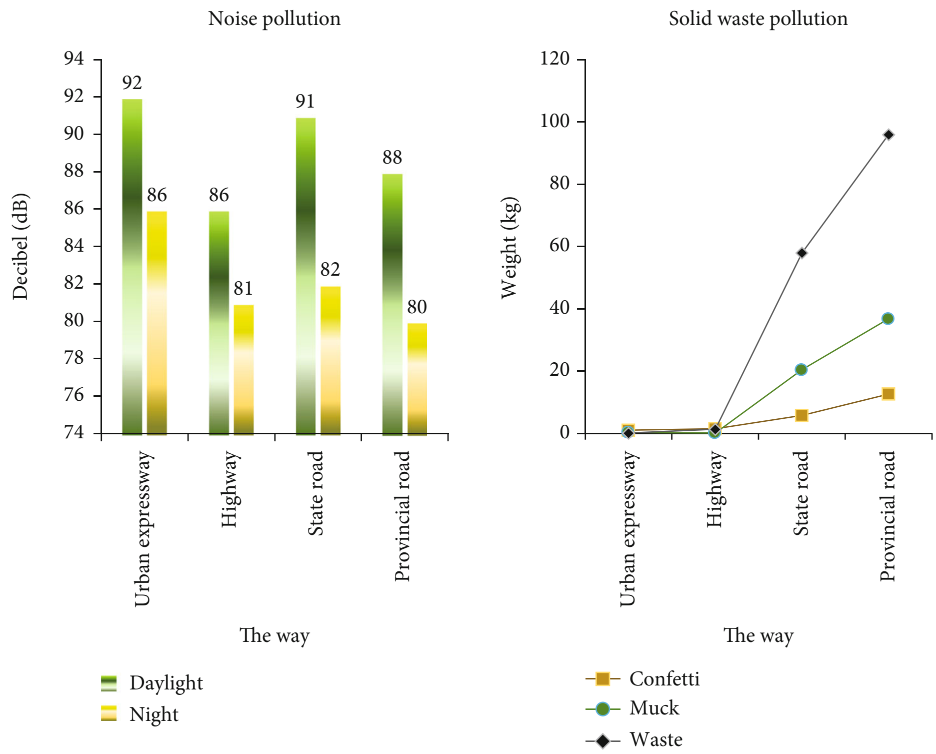

Figure 8: Noise and solid waste pollution.

Table 4: Comprehensive performance evaluation results of environmental protection.

	Comprehensive environmental development index	Road traffic environmental improvement index	Three waste reduction emission index	Comprehensive performance evaluation index
Shaanxi	1.362	1.251	1.128	1.247
Gansu	1.369	1.206	1.032	1.202
Guangxi	1.358	1.025	1.068	1.150
Hainan	1.412	1.369	1.241	1.345

Table 5: Simulation error.

Institution number	Simulation score	Multisample test score	error
1	0.8691	0.8682	0.104%
2	0.6636	0.6647	0.166%
3	0.5962	0.5982	0.335%
4	0.7620	0.7608	0.157%
5	0.7551	0.7425	1.67%
6	0.8696	0.8663	0.380%

which also makes these roads less solid garbage and mud. In addition, these two types of roads are fast, and the roads are far away from residential areas, which is also the reason why the solid waste pollution on these roads is relatively small.

4.2. Statistics of Comprehensive Performance Evaluation of Environmental Protection. This experiment comprehensively evaluates the comprehensive environmental protection performance of various regions in China from three aspects: the comprehensive environmental development index, the road traffic environmental improvement index, and the three waste reduction emission index. Table 4 shows the comprehensive performance evaluation results of environmental protection in some provinces and cities in this experiment.

From the data in Table 4, it can be seen that the comprehensive environmental protection performance of these provinces and cities counted in this experiment exceeded 1, indicating that these areas have achieved great results in environmental protection.

4.3. Simulation Experiment of Highway Environmental Protection Based on Deep Learning. We use the neural network model to obtain the weights and$p$values after training. After simulating part of the road maintenance data, the environmental protection score of the road maintenance agency is obtained and then compared with the company's score in the sample test. The results are shown in Table 5.

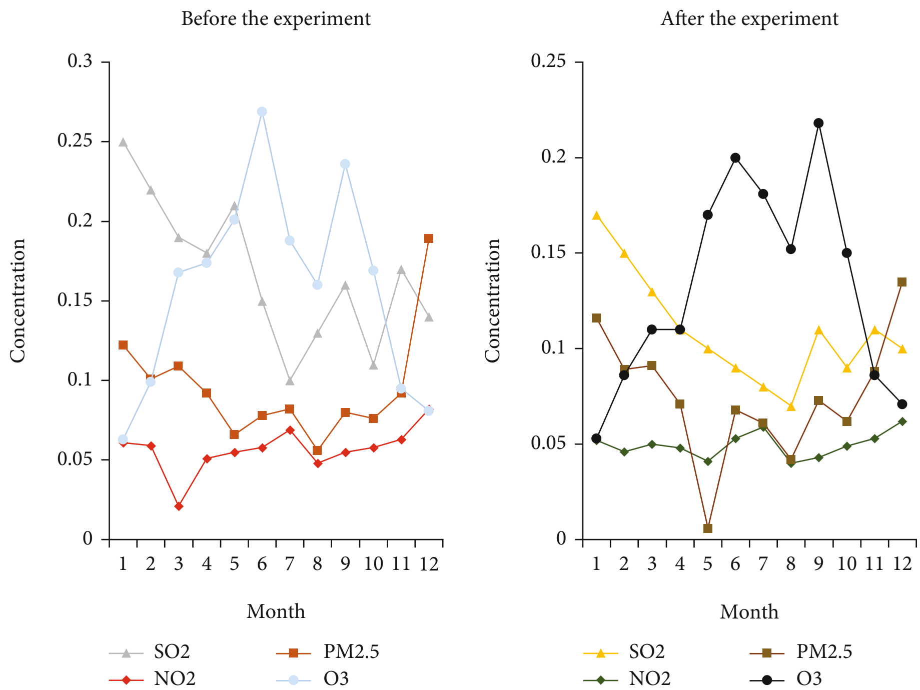

FIGURE 9: Expressway air pollutant concentration changes before and after the experiment.

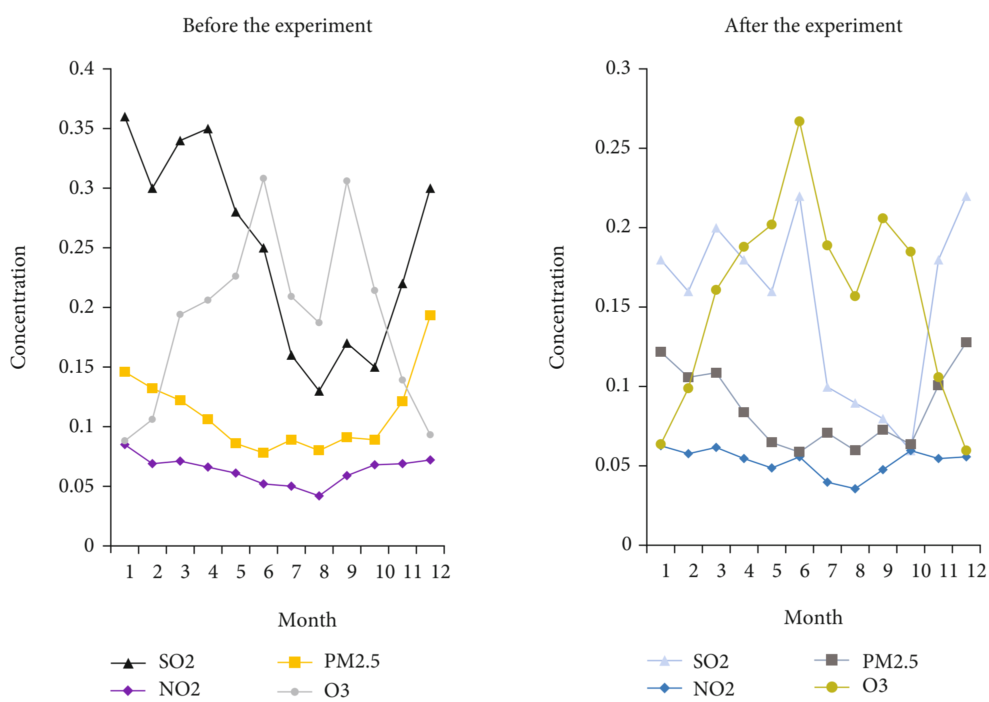

FIGURE 10: Changes in the concentration of air pollutants in urban arterial roads before and after the experiment.

It can be seen from Table 5 that the artificial neural network module used in the performance evaluation of the virtual enterprise shows high stability, and the result has a high reference value. Choosing different samples to train the network, the error of the evaluation results is very small, less than 3%.

5. Performance Analysis of Highway Environmental Protection Based on Deep Learning

5.1. Highway Environmental Protection Effect. Highway is an important channel connecting thousands of households and

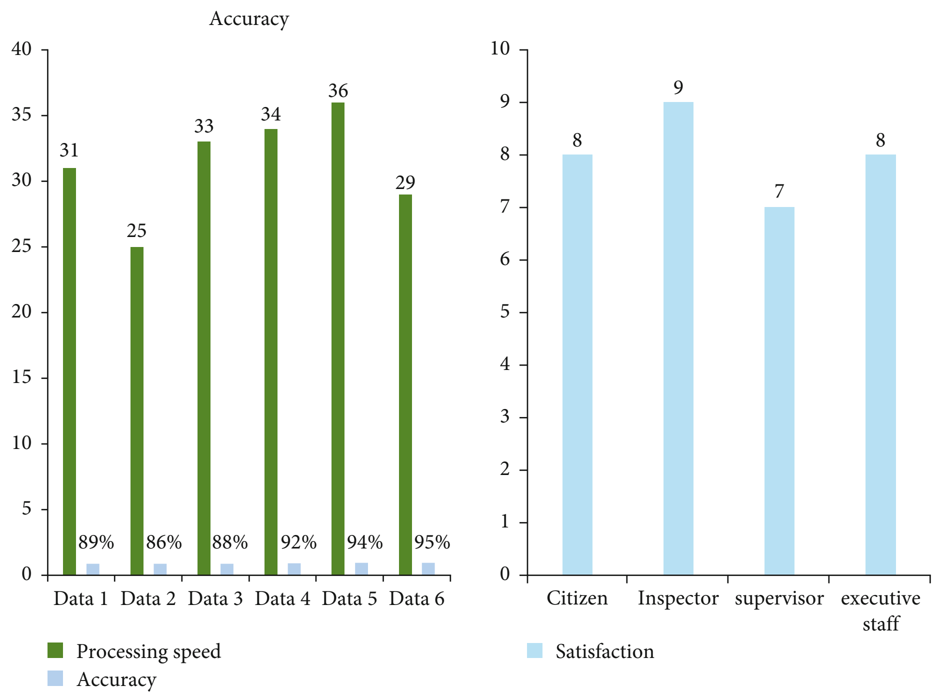

Figure 11: Model test results.

an important foundation for economic development. The protection of the highway environment is also about the life safety of every people. This article mainly studies the protection of the highway environment. Figure 9 shows the changes in the air pollutant concentration in a certain expressway before and after the experiment.

It can be seen from Figure 9 that the concentration of pollutants in the highway air has changed a little before and after the experiment. After environmental protection treatment, the concentration of pollutants in the highway air has dropped, and the concentration of each pollutant has dropped by 0.1%. As the imagination of air pollution in highways is not the most obvious, this article also investigates the changes in the concentration of air pollutants in urban arterial roads in this area. Figure 10 shows the changes in the concentration of air pollutants in the main urban roads before and after the experiment.

It can be seen from Figure 10 that the air pollution in urban arterial roads is more serious. The highest concentration of sulfur dioxide in urban arterial roads alone has reached 0.35 mg/Nm^3, which is double the concentration of sulfur dioxide in expressways. Among the environmental protection measures in the main urban roads, after a series of protection measures, the air pollution index in the main urban roads has been significantly reduced. It shows that the highway environmental protection measures have been effective.

5.2. Performance Evaluation Model of Highway Environmental Protection Based on Deep Learning. The performance evaluation model of highway environmental protection is mainly to test the effectiveness of highway environmental protection work quickly through certain data. This article will use certain experimental data to test the highway environmental protection performance evaluation model based on deep learning, mainly to test the accuracy and processing speed of the model; Figure 11 is the result of this test.

It can be seen from Figure 11 that the highway environmental protection performance evaluation model based on deep learning can effectively analyze and process environmental protection data, with a comprehensive accuracy rate of 86%. This not only saves the staff's assessment time but also greatly improves the work efficiency and accuracy. And through the investigation of different groups of people, this experiment also found that people are quite satisfied with this model.

6. Conclusions

A good natural ecological environment is the foundation for people's survival and development. Adhering to environmental protection is not only to make homes more beautiful but also to achieve sustainable development strategies for human society. The establishment of a sound road environmental performance evaluation mechanism can not only promote the maintenance of road environment by all levels of agencies and improve the enthusiasm of relevant work agencies but also reduce the impact of people's social production activities on the environment, so as to create a more beautiful and harmonious social production and living environment for people.

Due to the long construction period and complicated procedures of road construction, it is difficult to obtain data, and some data are estimates. In addition to the large number of domestic roads, the data collected in the performance evaluation of highway environmental protection is not perfect. Therefore, the accuracy of data collection needs to be further improved in the future.

Data Availability

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

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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