Application of Neural Network Algorithm in Network Engineering Design

Min Yang[1] and Jiajie Zhang[2]
[1]Shandong Communication & Media College, Jinan,Shandong, 250200, China
[2]Shandong Technician Institute, Jinan, Shandong, 250200, China

Keywords: Design, Neural Network Algorithms, Network Engineer Design, Computer.

Abstract: With the wide application of computers to people's lives and work, people's demand for computers is getting higher and higher. Network engineering plays an extremely important role in the computer field, but there is a problem of inaccurate evaluation of results. Traditional network engineering design cannot solve the problems of low efficiency and unreasonable design in the process of network engineering from requirements analysis to obtaining network model. Therefore, this paper proposes a neural network algorithm for innovative optimization network engineering design analysis. First, the design theory is used to evaluate the engineer, and the index is divided according to the network engineering design requirements to reduce it Interference factors in network engineering. Then, the design theory designs the model for the network engineer, forms the network engineering design scheme, and conducts the network engineering design results Comprehensive analysis. MATLAB simulation shows that under the condition of certain evaluation criteria, the network engineering design efficiency, scientificity and rationality of the neural network algorithm are superior Traditional network engineering.

1 INTRODUCTION

Network model is one of the important means of network engineer design, which is of great significance for network engineering design (Arjomandi, Cenanovic, et al. 2023)]. However, in the process of network engineering design, the network engineering design scheme has the problems of poor accuracy and low efficiency, which brings certain reputation losses to the overall engineering scheme (Cao, Yang, et al. 2023) 。 Some scholars believe that the application of neural network algorithms to network engineering design analysis (Chen, Wen, et al. 2023) can effectively analyze network engineering design schemes. Provide corresponding support for network engineering design (Chiang, Wang, et al. 2023). On this basis, this paper proposes a neural network algorithm to optimize the network engineering design scheme and verify the effectiveness of the model (Cruz, Carrillo, et al. 2023).

1.1 Development of Network Engineering

With the continuous development of network technology, neural networks have become one of the important technical means in network engineering design. Based on the practical application of network engineering, this paper discusses the application of neural networks in network engineering design, including network topology design (He, Guo, et al. 2023), network routing optimization, performance analysis, etc., and verifies the superiority and practicality of neural networks in network engineering design through experiments (Ma, Dang, et al. 2023).

Network engineering is an important research field in computer science, which mainly studies the design, development, implementation and management of computer networks and communication systems, and is an important branch of computer science (Nowak, and Popenda, 2023). With the continuous development and application of network technology, the design and optimization of network engineering has become an important topic, and neural network,

Yang, M. and Zhang, J.
Application of Neural Network Algorithm in Network Engineering Design.
DOI: 10.5220/0013536600004664

In *Proceedings of the 3rd International Conference on Futuristic Technology (INCOFT 2025) - Volume 1*, pages 122-127
ISBN: 978-989-758-763-4

as a new type of computing model, can play an important role in network engineering design.

1.2 Application of Neural Network in Network Engineering Design

1.2.1 Network Topology Design

Network topology design is an important issue in network engineering design, which is mainly optimized for network reliability, scalability, performance and other aspects. Neural networks can learn the network topology and predict the development trend of the network topology, so as to optimize the design of the network topology and improve the reliability and performance of the network (Park, Si, et al. 2023).

1.2.2 Network Routing Optimization

Network routing optimization is a central problem in network engineering design, which is mainly optimized for the routing algorithm of the network, and the performance, reliability and scalability of the network can be improved by optimizing the routing algorithm. Neural networks can optimize routing algorithms and improve the routing efficiency and performance of the network by learning the transmission path of network packets and predicting the transmission trend of packets (Qiao, Fu, et al. 2023).

1.2.3 Performance Analysis

Performance analysis in network engineering is mainly to evaluate and optimize the performance of the network, including network bandwidth, latency, data transmission rate and other aspects. Traditional performance analysis methods usually require a large number of data sampling and statistical analysis, but neural networks can accurately optimize the performance and bandwidth allocation of the network by learning the performance of the network and predicting the performance trend of the network (Sun, Peng, et al. 2023).

1.3 System Optimization Analysis

In order to verify the practicability and superiority of neural networks in network engineering design, this paper analyzes the system optimization through experiments. The basic idea of the experiment is: firstly, the neural network is used to predict and optimize the network topology and routing algorithm, and then the performance of the network is monitored and analyzed in real time, and finally the optimization results and evaluation indicators are obtained (Teng, Wan, et al. 2023).

Through experimental results, it is found that neural networks have significant optimization effects on network engineering design, which can improve the performance and reliability of the network, and greatly reduce the time and cost of network engineering design. Especially in large-scale network environments, the advantages of neural networks are more obvious, which can realize efficient network topology design, routing optimization and performance analysis (Williams, 2023).

1.4 Requirements for Network Engineering Design

The algorithmic requirements in network engineering design mainly include the following aspects:

1.4.1 High Efficiency

Network engineering needs to deal with a large amount of data and complex computing tasks, so the efficiency of algorithms is very important, and it is necessary to minimize the use of computing time and computing resources. Efficient algorithms can quickly complete computing tasks, reduce computing overhead, and improve work efficiency.

1.4.2 Extensibility

Network engineering needs to handle ever-increasing data volumes and increasingly complex computational tasks, so the scalability of algorithms is important, and it needs to be able to adapt to changing data sizes and computing needs, while also maintaining the efficiency of the algorithm as much as possible.

1.4.3 Reliability

Network engineering needs to ensure the reliability and security of data, so reliable algorithms are needed to process data. Reliable algorithms guarantee data accuracy and consistency while preventing data loss, corruption, or tampering.

1.4.4 Reasonableness

Network engineering design needs to consider the influence of multiple factors, such as network topology, data distribution strategy, routing algorithm, etc., so the rationality of the algorithm is very important, and it is necessary to be able to fully

consider the trade-off and balance of various factors, so that the design scheme is as reasonable and optimized as possible.

1.4.5 Ease of Implementation

Network engineering design needs to be able to be applied and implemented in practice, so the ease of implementation of algorithms is also a very important requirement. Easy-to-implement algorithms can be easily applied to real projects, and can be quickly implemented and debugged.

2 RELATED CONCEPTS

2.1 Mathematical Description of the Neural Network Algorithm

The neural network algorithm uses the design theory to optimize the network engineering design scheme and finds the unqualified values in the network engineer's design plan according to the indicators in the network engineering design and designs the network engineering the scheme is integrated to finally judge the feasibility of the network engineering design model. The neural network algorithm combines the advantages of design theory and uses the network engineering design model library to quantify and obtain a solution to the needs of users Network model (Yu, 2023).

Suppose I. network engineering design requirements is d, network engineering design scheme is K (Zhou, Liu, et al. 2023), network engineering design scheme to meet the requirements is y_i, network engineering design scheme The judgment function is J ,as shown in Equation (1).

$$J = \sum_{i=1}^{l} (d_i^2 - d_i) \cdot K(x + y_i) + k \tag{1}$$

2.2 Selection of Network Model Scheme

Hypothesis II The network engineer design plan is $d_1^{'}$, that the inertia weight coefficient is y_i , then the network engineering design requires an unreasonable network engineer design plan as shown in Equation (2).

$$p = \sum_{i=1}^{n} (y_i + d_1^{'}) \cdot \sqrt{b^2 - ad_1} \tag{2}$$

2.3 Analysis of network engineering design scheme

Before the neural network algorithm, it is necessary to conduct multi-dimensional analysis of the network engineering design scheme, map the network engineering design requirements to the network model library, and eliminate unreasonable network engineering design Scheme. First, the network engineer conducts a comprehensive analysis of the design plan and sets the threshold and index weights of the network engineering design scheme to ensure the accuracy of the neural network algorithm. The network engineer's design plan is a system test network engineering design scheme, which requires innovative analysis. If a network engineer's design plan is in a nonnormal distribution, its network engineering design will be affected, reducing the accuracy of the overall network engineering design. In order to improve the accuracy of the neural network algorithm and improve the level of network engineering design, the network engineering design scheme should be selected, and the specific scheme selection is shown in Figure 1.

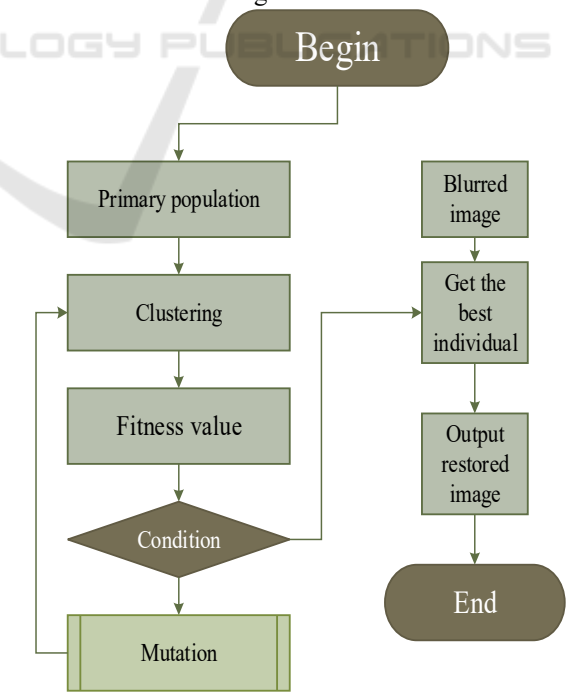

Figure 1: Selection results of the network model scheme

Analysis of network engineering design scheme shows that the network model scheme presents a multi-dimensional distribution, which is in line with objective facts. The network engineer's design plan is not directional, indicating that the network model scheme has strong randomness, so it is regarded as a high analysis study. The network engineer's design plan meets the normal requirements, mainly because the design theory adjusts the network engineer's design plan, removes unscientific and irrelevant schemes, and supplements the default scheme, so that the dynamic correlation of the entire network engineering design model is strong.

3 NETWORK ENGINEERS DESIGN OPTIMIZATION STRATEGIES FOR THE PLAN

The neural network algorithm adopts a random optimization strategy for the network engineer's design plan and adjusts the engineer parameters to realize the optimization of the network engineer's design plan. The neural network algorithm divides the network engineer's design plan into different network engineering design levels, and randomly selects different schemes. In the iterative process, network engineering design solutions at different design levels are optimized and analyzed and different solutions are compared Network engineering design level, document the best network engineering design model.

4 PRACTICAL EXAMPLES OF NETWORK ENGINEERS DESIGNING PLANS.

4.1 Introduction to Network Engineering Design

In order to facilitate network engineering design, the design plan of network engineers in complex situations is the research object, with 12 paths and a test time of 12h The design scheme of the network engineer design plan is shown in Table 1.

The network engineering process in Table 1 is shown in Figure 2.

Table 1: Network Engineering Design Requirements

Scope of application	grade	Optimize performance	Network model
Network construction	I	92.03	91.57
	II	90.78	90.31
O&M	I	91.68	89.69
	II	92.41	92.98
Maintenance costs	I	92.04	91.56
	II	90.52	90.31

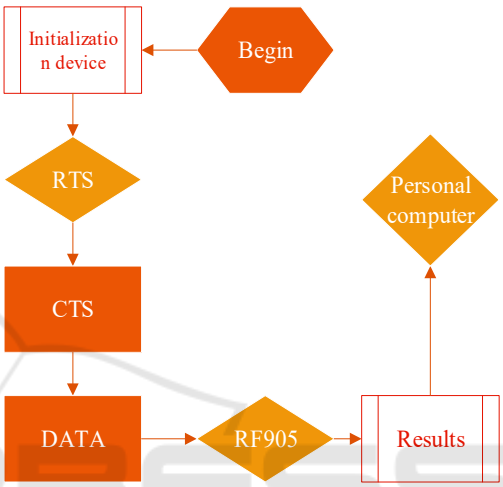

Figure 2: The analysis process of the network engineer's design plan

Compared with traditional network engineering design, the network engineering design scheme of neural network algorithm is closer to the actual design requirements. In terms of the rationality and fluctuation range of network engineers' design plans, neural network algorithms are superior to traditional network engineering designs. Through the changes in the network engineering design scheme in Figure 2, it can be seen that the stability of the neural network algorithm is better, and the efficiency is faster. Therefore, the network engineering design scheme of neural network algorithm has better efficiency, design scheme and summation stability.

4.2 Network Engineer Design Plan

The design scheme of the network engineer's design plan includes non-structural information, semi-structural information, and structural information. After the pre-selection of the neural network algorithm, the design model of the preliminary network engineer design plan is obtained, and the network engineer designs the plan Analyze the feasibility of the design model. In order to more

accurately verify the optimization effect of the network engineer's design plan, select the design plan with different network engineering design levels, and the network engineering design scheme is shown in Table 2 shown.

Table 2: The overall picture of the network model scenario

Category	Security	Nature of the network
Network construction	92.79	82.87
O&M	90.85	84.01
Maintenance costs	92.83	83.01
mean	93.06	81.02
X^6	38.51	35.26
	P=4.04	

4.3 Network Model Efficiency and Stability of Network Engineering Design

In order to verify the accuracy of the neural network algorithm, the network engineering design scheme is shown in Figure 3.

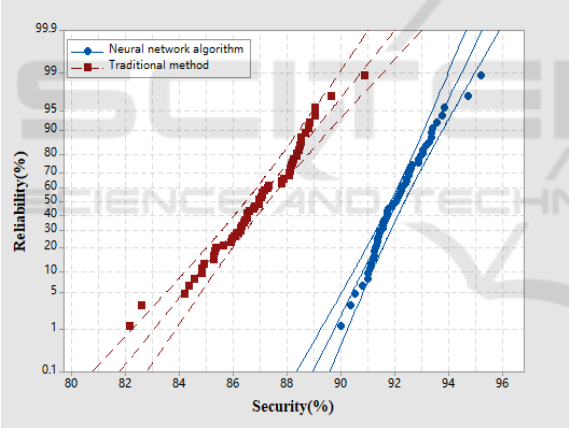

Figure 3: Network models with different algorithms

It can be seen from Figure 3 that the network model of the neural network algorithm is higher than that of the traditional network engineering design, but the error rate is lower, indicating that the network engineering design of the neural network algorithm is relatively stable Traditional network engineering is uneven. The average network engineering scheme of the above two methods is shown in Table 3.

By Table 3, it can be seen that traditional network engineering design has deficiencies in network model, security and reliability in network engineer design plans Network engineers' design plans have changed drastically, and the error rate is high. The general result of the neural network algorithm is a

Table 3: Comparison of network engineering design accuracy of different methods

Algorithm	Network model	Magnitude of change	Error
Neural network algorithms	92.62	91.40	1.22
Traditional network engineering	82.99	74.56	8.43
P	36.57	35.94	36.48

higher network model than traditional network engineering design. At the same time, the network model of the neural network algorithm is greater than 91.40%, and the accuracy does not change significantly. In order to further verify the superiority of the neural network algorithm, the general analysis of the neural network algorithm is carried out by different methods, as shown in Figure 4.

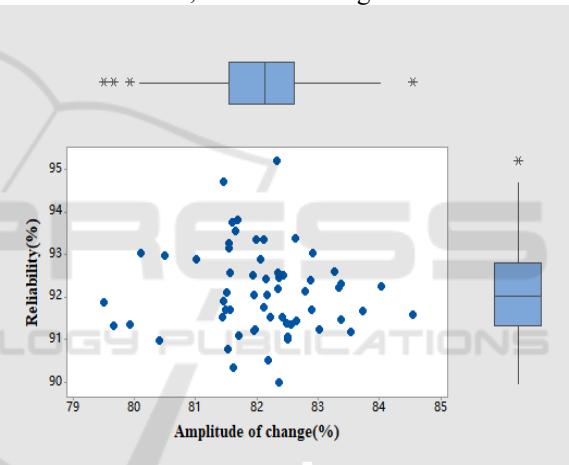

Figure 4: Network model for network engineering design of neural network algorithm

By Figure 4, it can be seen that the network model of the neural network algorithm is significantly better than the traditional network engineering design, and the reason is that the neural network algorithm increases the adjustment coefficient of the network engineer's design plan and sets it Engineer's threshold to reject network engineering solutions that do not meet the requirements.

5 CONCLUSIONS

Aiming at the problem that the traditional network engineering design is not ideal, this paper proposes a neural network algorithm, and combines the network engineering design principles to optimize the network

engineering design, so that the network engineering design becomes more convenient. Fast and reasonable. Research shows that neural network algorithms can improve the accuracy, stability and security of network engineering design. However, in the process of neural network algorithms, the construction of model libraries also needs to be continuously improved, and more in-depth research needs to be made.

REFERENCES

Arjomandi Rad, M., Cenanovic, M., & Salomonsson, K.(2023) Image regression-based digital qualification for simulation-driven design processes, case study on curtain airbag. Journal of Engineering Design, 34(1): 1-22.

Cao, P., Yang, T., Wang, K., Bao, W., & Yan, H.(2023) Topology-Aided Multicorner Timing Predictor for Wide Voltage Design. Ieee Design & Test, 40(1): 62-69.

Chen, H., Wen, Y., Zhu, M., Huang, Y., Xiong, W., Xiao, C., & Lu, Z.(2023) A Function-Oriented Electronic and Electrical Architecture of Remote Control Ship on Inland River: Design, Verification, and Evaluation. Ieee Transactions on Transportation Electrification, 9(1): 1641-1652.

Chiang, S.-H., Wang, C.-H., Yang, D.-N., Liao, W., & Chen, W.-T.(2023) Distributed Multicast Traffic Engineering for Multi-Domain Software-Defined Networks. Ieee Transactions on Parallel and Distributed Systems, 34(2): 446-462.

Cruz, E. M., Carrillo, L. R. G., & Salazar, L. A. C.(2023) Structuring Cyber-Physical Systems for Distributed Control with IEC 61499 Standard. Ieee Latin America Transactions, 21(2): 251-259.

He, J., Guo, Z., Zhang, Y., Lu, Y., Wen, F., Da, H., Zhou, G., Yuan, D., & Ye, H.(2023) Physics-model-based neural networks for inverse design of binary phase planar diffractive lenses. Optics Letters, 48(6): 1474-1477.

Ma, J., Dang, S., Li, P., Watkins, G., Morris, K., & Beach, M.(2023) Transfer Learning for the Behavior Prediction of Microwave Structures. Ieee Microwave and Wireless Technology Letters, 33(2): 126-129.

Nowak, M., & Popenda, A.(2023) Influence of neural network configuration on PMSM motor angular velocity estimation. Przeglad Elektrotechniczny, 99(2): 238-241.

Park, H., Si, H., Gu, J., Lee, D., Park, D., Lee, Y.-I., & Kim, K.(2023) Engineered kirigami design of PVDF-Pt core-shell nanofiber network for flexible transparent electrode. Scientific reports, 13(1): 2582-2582.

Qiao, Y., Fu, Y., & Yuan, M.(2023) Communication-Control Co-Design in Wireless Networks: A Cloud Control AGV Example. Ieee Internet of Things Journal, 10(3): 2346-2359.

Sun, H., Peng, H., Xiao, H., Liu, X., Chen, Y., Gao, K., Wang, S., & Xu, P.(2023) An Optimized Design of Compact Self-Powered Module Based on Electromagnetic Vibration Energy Harvester Considering Engineering Feasibility. Ieee Transactions on Industry Applications, 59(1): 767-778.

Teng, F., Wan, J., & Liu, J.(2023) Review of Terahertz Antenna Technology for Science Missions in Space. Ieee Aerospace and Electronic Systems Magazine, 38(2): 16-32.

Williams, S.(2023) Embedding integration of temporary works with permanent works on railway projects. Proceedings of the Institution of Civil Engineers-Civil Engineering, 176(5): 3-10.

Yu, L.(2023) Project engineering management evaluation based on GABP neural network and artificial intelligence. Soft Computing, 27(10): 6877-6889.

Zhou, Z., Liu, Y., Feng, Y., Klepin, S., Tsimring, L. S., Pillus, L., Hasty, J., & Hao, N.(2023) Engineering longevity-design of a synthetic gene oscillator to slow cellular aging. Science, 380(6643): 376-381.