

Retraction

Retracted: Construction Technology and Quality Control of Power and Electrical Engineering Based on Convolutional Neural Network

Security and Communication Networks

Received 26 December 2023; Accepted 26 December 2023; Published 29 December 2023

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret 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 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] L. Xiao, "Construction Technology and Quality Control of Power and Electrical Engineering Based on Convolutional Neural Network," *Security and Communication Networks*, vol. 2021, Article ID 8964532, 15 pages, 2021.

Review Article

Construction Technology and Quality Control of Power and Electrical Engineering Based on Convolutional Neural Network

Lei Xiao 

The 17th Project Department, Installation Engineering Company, Weifang Changda Construction Group Co., Ltd., Weifang 261000, Shandong, China

Correspondence should be addressed to Lei Xiao; xiaolei_edu@126.com

Received 29 October 2021; Revised 23 November 2021; Accepted 2 December 2021; Published 17 December 2021

Academic Editor: Jian Su

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In the context of the Internet era, more and more parties have begun to store, process, and analyze data, but the accompanying question is whether people are reasonable about the data under the impact of massive data, effective and efficient analysis, especially the problems faced in this project. This article aims to study the quality control problems faced by electric power and electrical engineering in the construction process through the use of convolutional neural networks. Under this idea, this article proposes a multilayer convolution method. The experimental results show that the use of the improved multilayer convolution method for the convolution method of the convolutional neural network can effectively improve the multiple analysis problems of small datasets in the construction of electric power and electrical engineering; in this way, the relevant data are analyzed; by controlling the quality of construction, the quality problem has been greatly improved. After comparison, it is concluded that the overall construction quality has increased by 35%.

1. Introduction

Living in the Internet age, there are all kinds of data around me every day. The data age advocates higher requirements for processing large amounts of data. Deep learning is a machine learning algorithm that appears in the Internet environment. Due to the leap in computing performance and the huge data services brought by the Internet, deep learning is in an explosive period. Convolutional neural network is a deep learning network model based on biological perception information, which can greatly reduce the parameters of the deep network model and reduce its complexity. It is widely used in image, natural language processing, and other fields, to this day. The successfully folded neural network is the mainstream direction of learning machinery, which further promotes the enthusiasm for data research.

Convolutional neural network is an improved version of neural network. It uses forward propagation to calculate output and backpropagation to adjust weights and thresholds. The processing stack is stacked. The main advantage is

that each neuron in the convolutional layer is locally connected to the feature map of the upper layer. While maintaining the adjacent relationship and spatial locality of the input, the local information is integrated into the upper layer to obtain all the global neurons in the feature map with the same information and share a set of weight parameters. This special structure is closer to the actual biological neural network and can be used more appropriately in engineering data analysis. Convolutional neural networks are widely used in more and more engineering data analysis to allow images of multidimensional input vectors as input to avoid the complexity of data reconstruction in the process of feature extraction and classification.

Based on the current state of data applications and industrial needs, it is very important for the theoretical and application research of neural networks convolved in small datasets. Tajbakhsh N believes that training a deep convolutional neural network (CNN) from scratch is difficult because it requires a lot of labeled training data and a lot of expertise to ensure correct convergence. A promising alternative is to pretrain natural images that have been used,

for example, a large number of labeled CNN for fine-tuning. Therefore, they studied the performance of deep CNN trained from scratch and fine-tuned pretrained CNN in a hierarchical manner [1]. The idea of continuously accumulating relevant professional knowledge in the learning process of convolutional neural networks is also applicable to their thesis writing process. Pereira S proposed that, among brain tumors, gliomas is the most common and aggressive, resulting in a very short life expectancy at the highest level. Therefore, they proposed an automatic segmentation method based on convolutional neural network (CNN) to explore small 3×3 kernels [2]. It can be seen from this film that the convolutional neural network also has more important application feasibility in brain tumors. Shafiee A is trying to design accelerators for popular machine learning algorithms, such as those involving convolutions and deep neural networks. This algorithm explores the storage input weight of the cross matrix and also simulates the implementation of the dot product algorithm, which greatly promotes the accelerated optimization of the algorithm [3]. From this, we can learn about the research on the acceleration of machine learning algorithms, and the research on machine learning algorithm accelerators can promote the advancement of machine learning. Moeskops PMR believes that automatic segmentation in brain images is very important for quantitative analysis in large-scale studies of images obtained at all ages. He proposed a method to automatically segment MR brain images into multiple tissue categories using convolutional neural networks. Through experimental analysis, the improved efficiency of clinical medicine has increased by 21.2%, which is a great improvement [4]. It can be seen that the convolutional neural network has a great effect on the automatic segmentation of brain images. Chen Y proposed a regularized deep feature extraction (FE) method using convolutional neural network (CNN) for hyperspectral image (HSI) classification. The method he proposed uses several convolutional layers and pooling layers to extract depth features from HSI, which are nonlinear, discriminable, and invariant. These features are useful for image classification and target detection. Finally, in order to further improve the performance, a virtual sample enhancement method is proposed [5]. However, there is no detailed description of the enhancement method of the virtual sample, which is lacking. Roth HR believes that automatic computer-aided testing (CADe) has become an important tool in clinical practice and research. They designed a two-layer cascading frame from course to fine. By using the existing CADe system, the coordinates of the region or volume of interest (ROI or VOI) can be generated and used as the input of the second layer. This is the focus of their research [6]. This technology has extremely high reference value in actual use. Kiranyaz S proposes a fast and accurate patient-specific electrocardiogram (ECG) classification and monitoring system. Method: the adaptive implementation of a one-dimensional convolutional neural network (CNN) is inherently used to fuse the two main modules of ECG classification into a single learning body: feature extraction and classification [7]. The problem of electrocardiogram can be solved very well through the

application of convolutional neural network. Hu C proposed that the current mainstream low-dose CT methods include vendor-specific sinusogram domain filtering and iterative reconstruction, but they require access to the original raw data whose format is opaque to most users. Inspired by the idea of deep learning, they combined the autoencoder, deconvolutional network, and shortcut connection into the residual encoder-decoder convolutional neural network (RED-CNN) here for low-dose CT imaging [8]. The abovementioned literature is also worth learning about the use of related technologies, but most of the articles lack the design of related experiments, and most of them still stay on the theoretical level, which leads to the overall practicability of the related literature.

The novelty of this article is shown in the following. (1) The use of the network is the same as the improved multilayer convolution method. The small dataset is researched and analyzed many times, and the construction data are professionally analyzed and used to ensure that the construction process can effectively guarantee the construction QC. (2) In the current process of power and electrical engineering construction, it is difficult to process and analyze engineering data, and it is difficult to guarantee the quality control of engineering construction.

2. Quality Control Related Methods

2.1. Construction Project Quality Management Objectives

2.1.1. *Quality Management Objectives of Construction Projects.* The quality management objectives of the construction project must meet the following three requirements. First, leaders and excellent management departments must meet the quality objectives of the enterprise, and quality supervision and quality inspection must comply with relevant laws and regulations. They have quality requirements for related construction projects. Second, the project manager will lead all team members to perform project management activities to achieve a complete process and comprehensive dynamic management. Third, quality management activities are effective means to achieve quality goals. For example, quality “self-inspection, mutual inspection, and delivery inspection”, regular and irregular quality inspections, quality benchmark training, quality inspection report analysis meetings, etc. [9]. The formulation of quality objectives must be based on domestic laws, regulations, engineering construction standards, construction contracts, construction organization design, construction environment, etc., to meet the needs of owners and customers. Quality goals also need to be scientific, reasonable, sustainable, and achievable. The quality management objectives of the construction project need to cover 9 projects; the specific content is shown in Figure 1.

It can be seen from the structure in Figure 1 that the quality management objectives are divided into 9 categories. They are shown with specific pictures and examples. Each category is interrelated and restricts each other. The quality management objectives of a construction project include design, construction plan, construction technology, space,

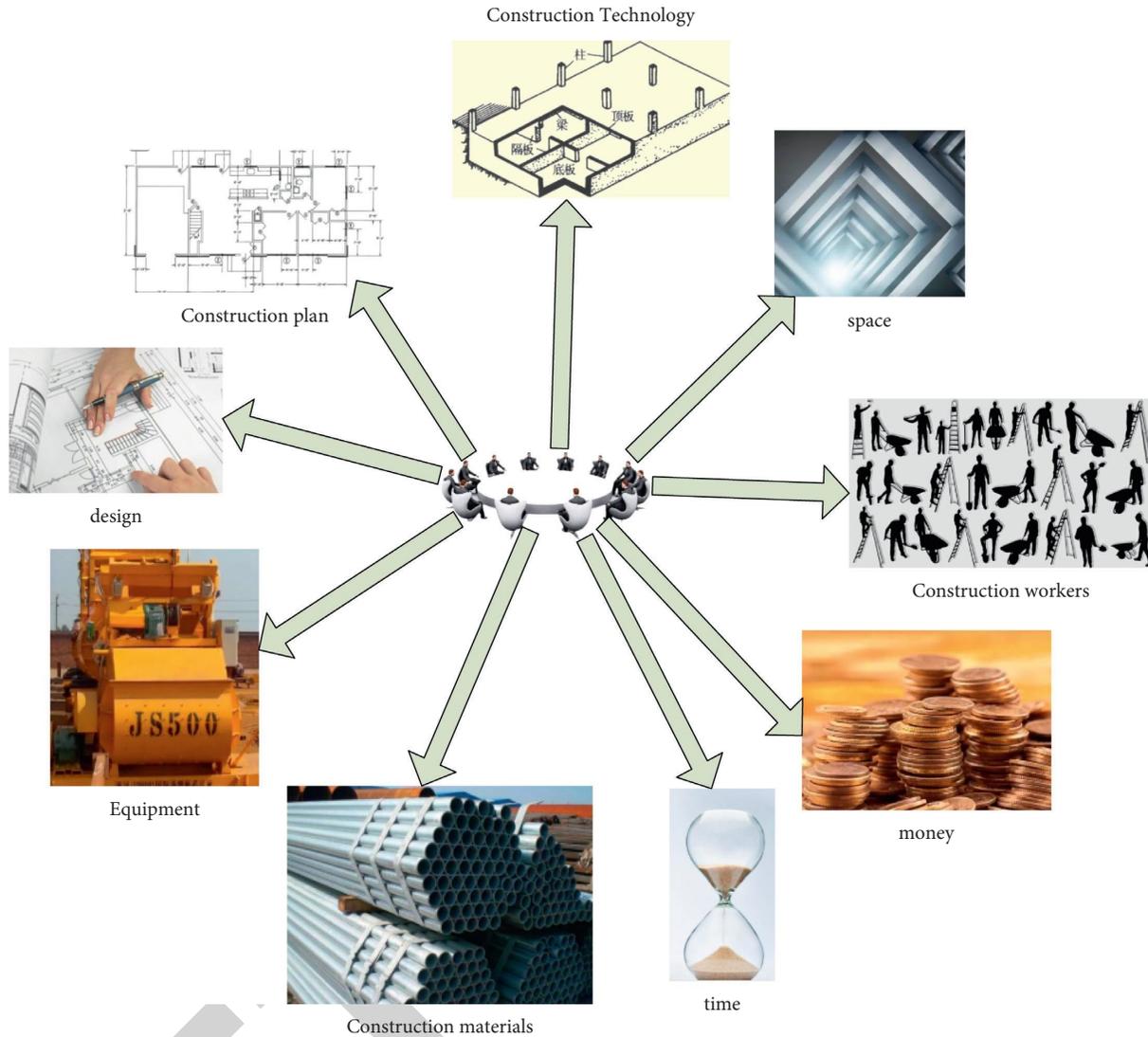


FIGURE 1: Nine items of construction project quality management objectives.

time, capital, labor, construction materials, equipment, and machinery. Quality management objectives exist in all stages of the entire construction process, including quality management and control stages such as design, construction plan and construction technology, construction site, schedule, and cost. The setting of quality management goals points out the direction for the development of quality management activities and provides a basis for quality control activities. The quality goal is one of the project goals, and the realization of the quality goal will add value to the project [10].

2.2. Convolutional Neural Network. Convolutional neural network can be understood as based on the original BP neural network [11], by adding a convolutional behavior, so that the convolutional neural network can be closer to the human visual system than the BP neural network. One of the biggest advantages of convolutional neural networks is that they can increase work efficiency and maximize resource utilization. It is more in line with human vision. In addition,

it can enhance transmission efficiency through mutual communication between networks. Compared with the BP neural network, the improvements of the convolutional neural network are mainly reflected in the following points:

2.2.1. Local Connection. In the cognition of modern biology, the brain mainly develops from the local to the global in the process of perceiving the image seen by the human eye. In an image, the closer the pixels are, the stronger the connection between them, and vice versa. Therefore, each neuron only needs to be connected to the local area of the image and does not need to be fully connected to the function of the upper layer. In convolutional neural networks, local connection refers to the connection of each neuron in the current layer to several neurons in the previous layer. This connection method can greatly reduce the number of parameters that need to be learned [12]. Because the larger the number of network parameters, the more difficult it is to train the network, so the local connection method is an important

basis for the evolution of shallow BP neural networks to deep neural networks. The global connection and local connection are shown in Figure 2:

According to the picture, the full connection method will be more comprehensive and the effect will be more obvious, and the partial connection will be more advantageous separately.

2.2.2. Weight Sharing. Compared with all connections, partial connections can reduce the number of network parameters to a certain extent. However, when the number of features is relatively large, even if the local connection method is adopted, the amount of network parameters is still large. Convolution is the process of extracting features from an image. However, feature extraction should be independent of location. That is to say, using a convolution kernel to extract features from an image should extract the same feature, which is weight sharing [13].

2.2.3. Pooling. After the feature extraction of the convolutional layer, some feature maps of the original image can be generated, but the dimensions of these features are still relatively large, and they are not suitable for direct classification. Because the correlation between adjacent pixels in the image is large, the features are downsampled, and the adjacent pixels are replaced with the same pixel, and too much information will not be lost. By sampling the feature map using the abovementioned method, a new feature map is formed. This process is called pooling [14]. Pooling can also enhance the robustness of the network to the translation and deformation of the target, and it can also prevent the network from overfitting to a certain extent.

2.2.4. Multiple Convolutional Layers. Experiments have proved that the deeper the number of layers of the network, the more reasonable the features of the image finally extracted by the network, so by designing multiple convolutional layers to extract image features, the better the fitting effect of the network will be. The structure of the convolutional neural network is shown in Figure 3:

2.3. Calculation Method for Crack Prevention of Large-Volume Power and Electrical Construction. The suppression of the overload suppression problem in power and electrical construction troubles the construction workers. Similarly, in this exploration of the construction technology of power and electrical engineering, they also face this problem [15]. In the structure of the hybrid active power filter, the load is connected in parallel with the passive power filter in series. The active part is controlled as a controlled voltage source U_c according to

$$U_c = K \cdot I_{we}, \quad (1)$$

where U_c is the output voltage of the active filter part, I_{sh} is the harmonic component of the grid-side current, and K is a

real constant greater than 0. From this, an equation describing the filtering effect of the filter can be derived:

$$I_{we} = \frac{U_{we}}{Z_{we} + Z_{pq} + K} + \frac{Z_{pq}}{Z_{we} + Z_{pq} + K} I_{ty}. \quad (2)$$

It can be derived from equation (2) that the compensation current I_{pq} of the hybrid active power filter is

$$I_{pq} = I_{we} - I_{ty} = \frac{U_{we}}{Z_{we} + Z_{pq} + K} + \frac{Z_{we} + K}{Z_{we} + Z_{pq} + K} I_{ty}. \quad (3)$$

In the formula, only K is controllable for each quantity. When K is large, formula (3) can be approximated as

$$I_{pq} \approx -I_{ty}. \quad (4)$$

That is, almost all the harmonic current of the load flows into the filter. If the harmonic current of the load exceeds the rated compensation capacity of the filter, it will cause an overload. The only way at this time is to reduce K , but even if K is reduced to 0, there is still

$$I_{pq} = I_{we} - I_{ty} = \frac{U_{we}}{Z_{we} + Z_{pq}} + \frac{Z_{we}}{Z_{we} + Z_{pq}} I_{ty}. \quad (5)$$

While detecting the grid input loop current, the filter loop current is detected and the conventional control method is changed to

$$U_a = K_b \cdot I_{we} + K_2 \cdot I_{pq}, \quad (6)$$

$$I_{we} = \frac{U_{we}}{Z_{we} + Z_{pq} + K_1 + K_2} + \frac{Z_{we} + K_2}{Z_{we} + Z_{pq} + K_1 + K_2} I_{ty}, \quad (7)$$

$$I_{pq} = I_{we} - I_{ty} = \frac{U_{we}}{Z_{we} + Z_{pq} + K_1 + K_2} + \frac{Z_{we} + K_1}{Z_{we} + Z_{pq} + K_1 + K_2} I_{ty}. \quad (8)$$

When K_1 is large, equation (8) can be approximated as

$$I_{pq} \approx \frac{U_{we}}{K_1 + K_2} - \frac{K_1}{K_1 + K_2} I_{ty}. \quad (9)$$

At the same time, due to the high mixing ratio of cement in electric power and electrical engineering [16], the hydrothermalization must be high, which easily leads to poor work performance and performance index detection. Therefore, in the construction process of power and electrical engineering, the corresponding concrete pouring body temperature and crack prevention settlement should be carried out. Therefore, the design, adaptation, and verification of the mix ratio, as well as the calculation of the pouring body temperature and crack prevention, are all related calculations based on climatic conditions. The suppression of overload in electrical and electrical construction troubles construction workers.

2.3.1. Temperature and Anticracking Calculation. Calculation of cement hydration heat:

$$Q_0 = \frac{4}{7/Q_7 \cdot 3/Q_3}, \quad (10)$$

where Q represents the value of temperature. It is known that the cumulative heat of hydration $Q_3 = 287$ kJ/kg when the cement age is 3 days, and the cumulative heat of hydration $Q_7 = 291$ kJ/kg when the cement age is 7 days

The total heat of hydration of cement $Q_0 = 317$ kJ/kg. According to the mixing ratio of mineral admixtures, the adjustment coefficient of heat of hydration $k=0.85$ is selected, and the total heat of hydration of the cementitious material $Q = kQ_0 = 317 \cdot 0.85 = 269.45$ kJ/kg.

Adiabatic temperature rise of concrete $T(t)$:

$$T(t) = \frac{OQ}{Cp} (1 - e^{-mt}), \quad (11)$$

where $T(t)$, when the age is t , is the adiabatic temperature rise of concrete °C, O is the amount of cementitious material of unilateral concrete kg/m³, Q is the total heat of hydration of cementitious material kJ/kg, C is concrete specific heat capacity, which is 1.0 kJ/(kg.K), p is the bulk density of concrete, which is 2478 kg/m³ and m is taken as 0.40.

Calculation of elastic modulus of concrete:

$$E(t) = \beta E_0 (1 - e^{-\phi t}), \quad (12)$$

where $E(t)$ is the modulus of elasticity when concrete age is t N/mm², E_0 is concrete elastic modulus, taken as 3.25×10^4 N/mm², and ϕ is the coefficient, which is taken as 0.09.

When the age is t , the actual maximum temperature of the concrete center is calculated:

$$T_m(t) = T_0 + T(t) \cdot \xi, \quad (13)$$

where $T_m(t)$ is the actual maximum temperature inside the concrete of each age, °C, T_0 is concrete pouring temperature (28°C), and ξ is the cooling coefficient.

2.3.2. Equivalent Temperature of Concrete Shrinkage Deformation Value.

$$T_y(t) = \frac{\varepsilon_y(t)}{\alpha}, \quad (14)$$

$$\varepsilon_y(t) = \varepsilon_y^0 (1 - e^{-0.01t}) \cdot M_1 \cdot M_2 \cdot M_3 \cdot \dots \cdot M_{11}.$$

Insulation thickness calculation:

$$\delta = \frac{0.5h\lambda_i(T_b - T_q)}{\lambda_0(T_{\max} - T_b)} K, \quad (15)$$

where δ is the thickness of the insulation layer on the surface of the concrete, m, λ_0 is concrete thermal conductivity W/(m.K), λ_i is the thermal conductivity of the i th layer of insulation material W/(m.K), T_b is surface temperature of concrete pouring body, °C, T_q is the average temperature of the atmosphere when the concrete reaches the maximum temperature, °C, T_{\max} is maximum temperature inside the concrete pouring body, °C, h is the actual thickness of the

concrete pouring body, which is taken as 4.0 m, and K_b is the correction value of the heat transfer coefficient, which is 1.5.

Thermal resistance calculation of the insulation layer:

$$R_s = \sum_{i=1}^n \frac{\delta_i}{\lambda_i} + \frac{1}{\beta_\mu}. \quad (16)$$

The total heat transfer coefficient of heat transfer from the surface of the concrete to the insulation medium [17]:

$$\beta_s = \frac{1}{R_s}. \quad (17)$$

The insulation layer is equivalent to the virtual thickness of concrete:

$$X = \frac{\lambda_0}{\beta_s}. \quad (18)$$

2.3.3. Calculation of Surface Temperature of Concrete Structures [18].

$$T_a(t) = \frac{T_b + 4h(H - h)\Delta T(t)}{H^2}. \quad (19)$$

Calculation of temperature difference between inside and outside:

$$\Delta T_q(t) = T_n(t) - T_c(t). \quad (20)$$

Comprehensive temperature drop of the concrete casting body:

$$\Delta T_b(t) = \frac{1}{6} [4T_n(t) + T_{an}(t) + T_{cn}(t)] + T_x(t) - T_r(t). \quad (21)$$

Self-constrained tensile stress calculation:

$$\sigma_x(t) = \frac{w}{2} \times \sum_{i=1}^n \Delta T_{ii}(t) \times E_i(t) \times H_i(t, e). \quad (22)$$

External restraint tensile stress:

$$\sigma_x(t) = \frac{w}{1 - \mu} \sum_{i=1}^n \Delta T_{2i}(t) \times E_i(t) \times H_i(t, e) \times R_i(t). \quad (23)$$

Anticracking index:

$$\sigma_x \leq \frac{\lambda f_{tk}(t)}{K}, \quad (24)$$

$$\sigma_y \leq \frac{\lambda f_{tk}(t)}{K}.$$

The entire concrete pouring process needs to be carried out through the constant temperature, and the calculation idea is to calculate the sum according to the temperature change. According to the above calculation, it can be obtained that the mix ratio basically meets the basic requirements of large-volume concrete construction, and at the same time, the construction unit needs to do well in the insulation measures during and after the concrete pouring [19].

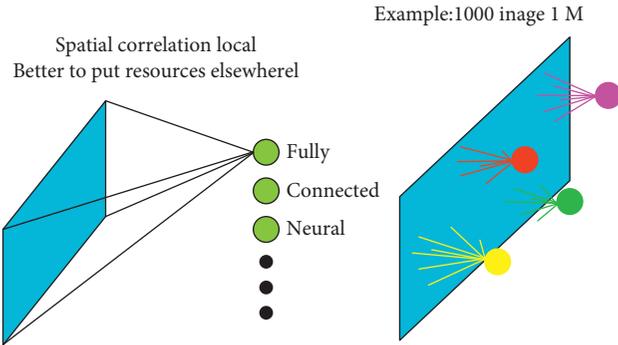


FIGURE 2: Full connection and partial connection.

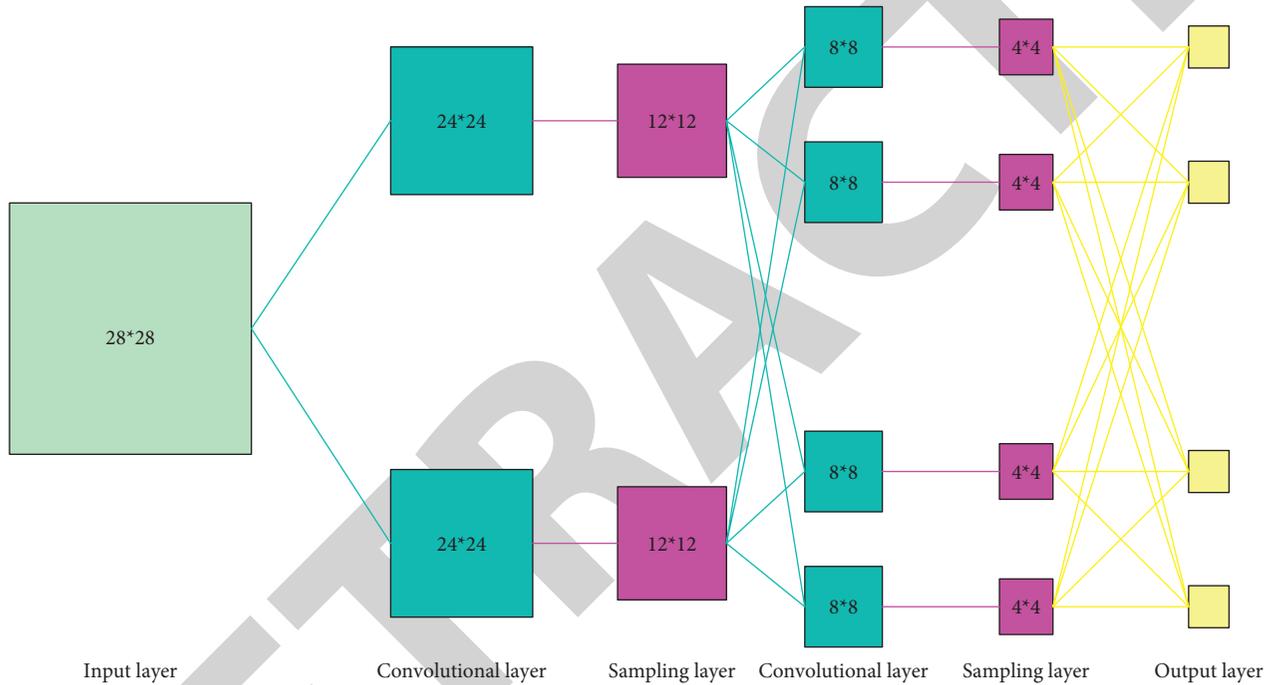


FIGURE 3: Structure of convolutional neural network.

3. Power and Electrical Engineering Experiment

3.1. Dc Power Distribution Experiment. Figure 4 shows the basic principle of DC transmission. The whole section includes two converter stations, CS1, CS2, and DC lines. The converter station is mainly equipped with converters that realize the mutual conversion between AC and DC.

The converter consists of one or more converter bridges connected in series or in parallel. The current DC transmission method uses a three-phase bridge commutation circuit, and each bridge has 6 bridge arms. The bridge arm has a controllable one-way conduction capacity, so it is also called a valve and valve arm. The valve arm is composed of mercury arc valves or sensing elements connected in series [20].

The distribution network is divided into two structures according to different flow directions. Compared with the second, the first structure is more stable and the effect is more obvious. When power is supplied from the AC power system I to system II, the conversion station CS₁ converts the

three-phase AC power of the transmission side system I into a DC current and supplies power to the conversion station CS₂ via the DC power transmission line. CS₂ converts DC into 3 phases. Generally, the conversion from AC to DC is called a rectifier, and the conversion from DC to AC is called a frequency converter. Therefore, CS₁ is also called a rectifier station, and CS₂ is also called a frequency converter station.

When CS₂ operates as an inverter station, the direction of its DC voltage V_{d2} is opposite to the DC voltage V_{d1} and DC current of CS₁ operating as a rectifier station. When $V_{d1} > V_{d2}$, the current will flow in the direction shown in the figure. The current I_D can be adjusted by changing V_{d1} and V_{d2} . According to needs, the current or power supplied can be kept constant by adjusting the supply. When the polarity of V_{d2} does not change, please note that even if it is adjusted to be greater than V_{d1} , CS₂ cannot send reverse current and power to CS₁. This is because the inverter can only be connected in one direction. To change the direction of power transmission, it is necessary to change CS₂ to the operation

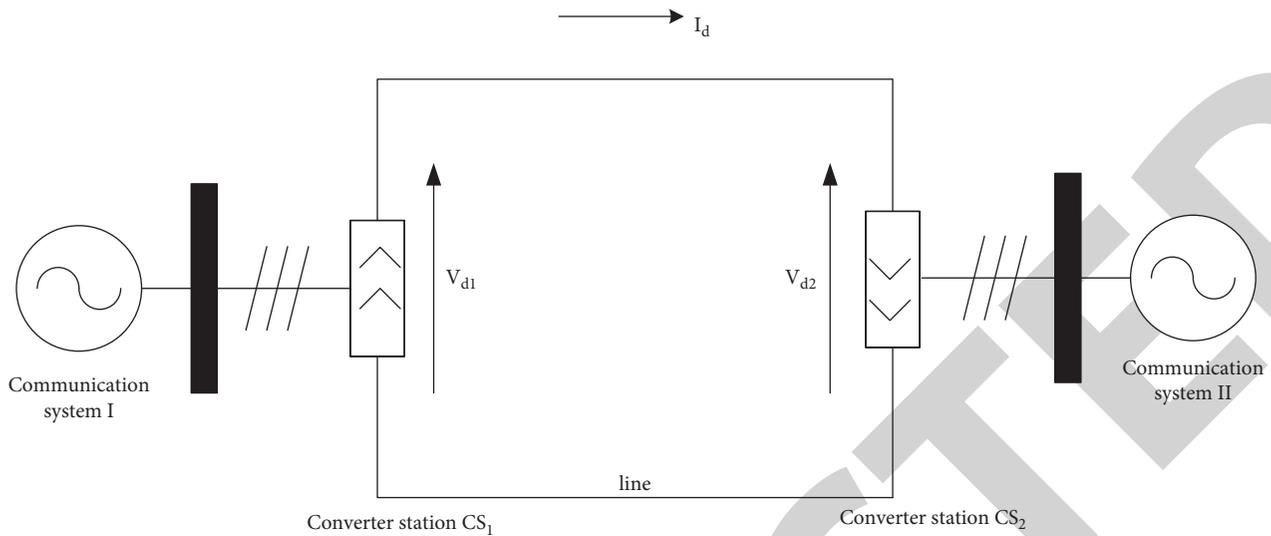


FIGURE 4: Schematic diagram of DC transmission.

of the rectifier while changing CS_1 to the operation of the inverter station [21]. The structure of the DC distribution network is shown in Figure 5:

At the same time, the topological structure of the power distribution system is mainly considered from two parts: the rated voltage and the network plan. In this paper, the length of the transmission line and the transmission power are mainly used to define the function of the cross-sectional area of the conductor. The research shows that the topological structure of the DC distribution network should have the following characteristics:

- (1) It must be able to be used with the large power grid at the same time, and in order to be able to transfer the energy transmitted by the DG to the network, the DC power grid needs to be able to realize the two-way flow of power
- (2) It must be able to provide a relatively stable DC voltage to the load
- (3) Safe, reliable, and economical

According to the requirements put forward above, we have screened out three more practical DC distribution networks: ring power distribution system, radial power distribution system, and two-end power distribution system [22]. Their naming is based on their specific topological structure, as shown in Figure 6.

According to the topological structure diagram, the basic components of the DC distribution network are distributed power sources, AC power grids, energy storage devices, AC and DC loads, and medium and low voltage distribution networks. In order to meet the needs of different loads, distributed power sources, AC power grids, energy storage devices, and AC and DC loads must pass through different adapters to connect to specific DC distribution networks [23]. When the distributed voltage is connected, it needs to be converted by a voltage source converter and an AC/DC DC/DC converter to provide the corresponding AC and DC

power to the AC/DC load. Generally, the converters used in large AC power grids can achieve two-wire flow of energy so that the balance relationship between the AC power grid and the DC power distribution network can be ensured. In addition, since the DC/DC converter in the power grid is directly connected to the energy storage device, charging and discharging are required, so the two-way flow of energy must also be realized.

Different from traditional multiterminal DC transmission technology, DC home access is the primary consideration for DC power distribution technology. However, multilevel power distribution technology requires higher technical means to operate, which also reflects the superb and high efficiency of this technology. Therefore, in the specific grid structure design, it is necessary to consider the realization of multilevel DC distribution and the performance of the grid. Only through the pressure reducing device can it be delivered to different users.

3.2. Quality Control Experiment of Construction Project Based on Convolutional Neural Network. The application of convolutional neural network technology requires not only the operation of simple tools and software but also the guarantee and support of supporting systems such as various departments and positions of the enterprise, the process of enterprise operation, and the cultivation of talents. Therefore, construction companies want to introduce convolutional neural network technology to control the construction quality of construction projects. It is not a matter of purchasing a few sets of software. Only by combining convolutional neural network technology with construction projects can it be truly applied and its greatness can be fully utilized. Value requires a professional convolutional neural network team to establish a quality control system for construction projects based on convolutional neural network technology based on the convolutional neural network center of the construction enterprise and combined with its own situation.

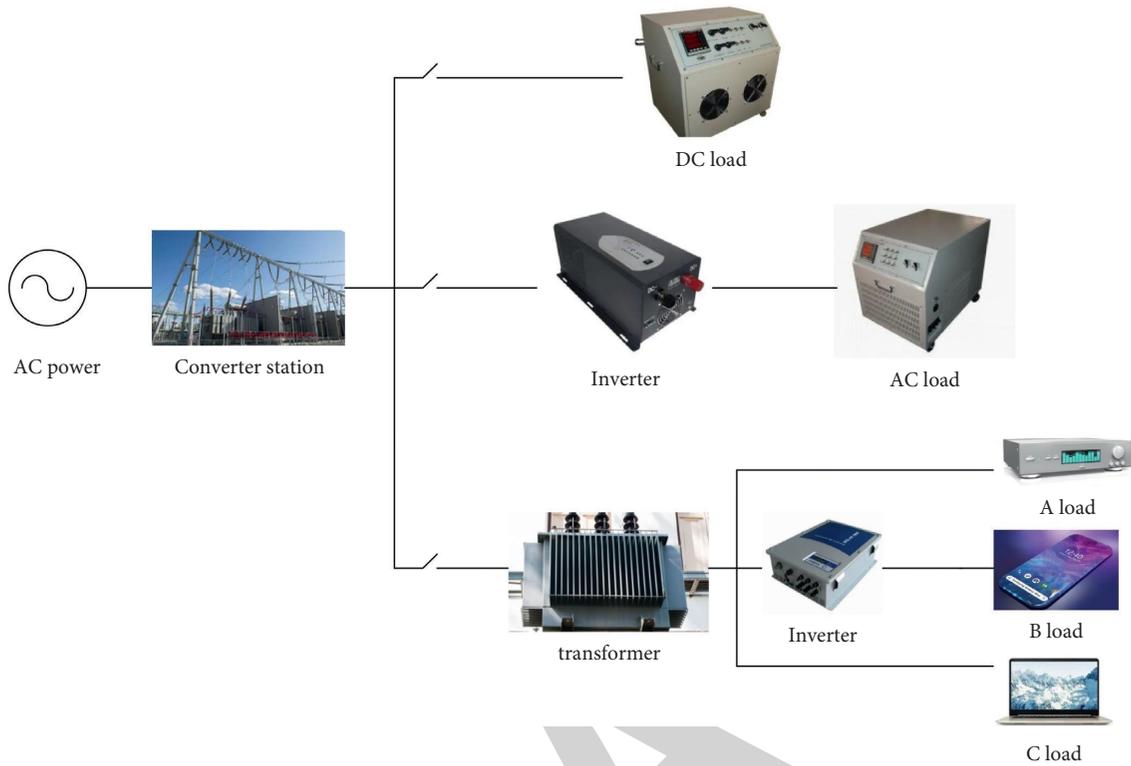


FIGURE 5: DC distribution network structure.

The quality control system of construction projects refers to the process of forming production factors and quality from comprehensive quality management in order to meet the quality requirements of construction products. The distribution of the whole process is carried out from top to bottom, from the production department to the quality control department. Responsibility system and other systems for quality inspection and supervision clarify the responsibilities of quality positions for construction companies, rationally organize personnel at all levels to monitor the construction process in real time, ensure construction quality, and improve the management level of the construction unit. From the main problems of traditional construction project quality control, we can see that it is necessary to effectively organize all parties involved in the construction by means of information transmission, mutual cooperation of managers, and building a shared platform and establish a more complete quality control of construction projects. The system can solve the shortcomings of traditional construction project quality control [24].

The formation process of project quality is not independent, but is produced by the division of labor by various departments through different organizational methods. Due to the different division of labor between traditional departments, the communication between departments is not timely, which causes delays in construction schedules and many construction quality problems. The information transfer based on convolutional neural network technology is based on the convolutional neural network model. The platforms for all departments to carry out work are

integrated. If there are any problems during the construction process, each department will upload the problem to the convolutional neural network. In the model, after the management receives the information and improves it, it will share it with the main responsible department and implement it in place to better ensure the quality of the project, as shown in Figure 7.

For construction units, building models can be compared beforehand, and reasonable design plans can be selected; in the construction process, the convolutional neural network information platform is used to understand the quality control of the whole construction process and supervise it; in the later stage, the completion acceptance and acceptance of the model can be compared with the model operation and maintenance management [25]. The maximum temperature of the concrete center during the construction process was measured, and the specific values are shown in Table 1.

For the design unit, the main work to be completed is in the early stage of quality control, the deepening of the design of the drawings, and the review of the drawings; the model established by the convolutional neural network technology can integrate various disciplines and use visual technical means to check all kinds of conflicts in the drawings. Insufficiency: quality control can be continuously improved in the midterm based on on-site feedback information; in the later period, it can be compared with the entity for completion acceptance and operation and maintenance management. At the same time, at the beginning of the design, it is necessary to fully consider the shrinkage equivalent

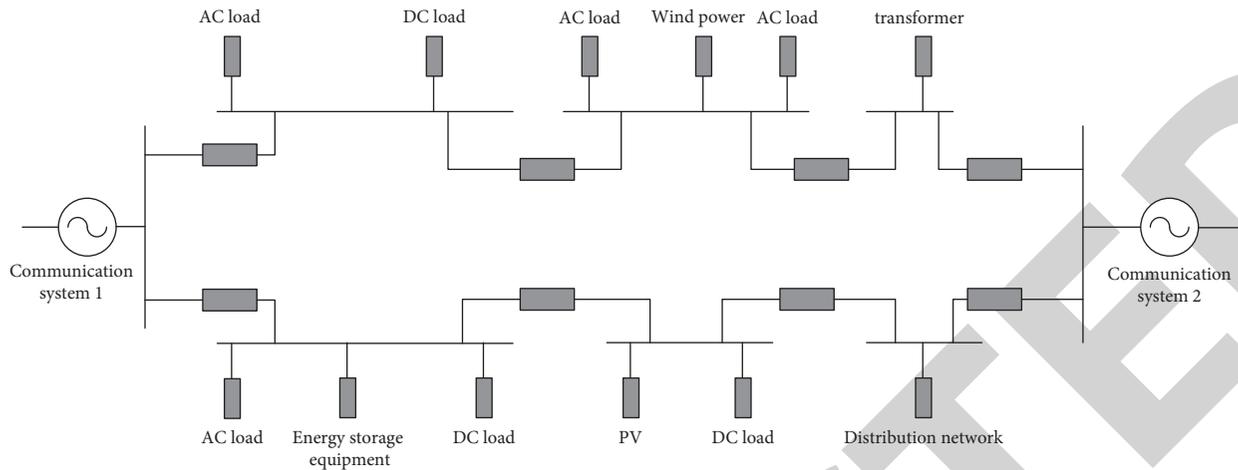


FIGURE 6: Schematic diagram of the structure of a ring-shaped DC distribution network.

temperature during the actual construction process, as well as the temperature difference between the inside and the surface and the large temperature difference. The specific measured values are shown in Tables 2 and 3.

For the supervisor, follow-up and manage the quality of the entire construction process. Through the data platform of the convolutional neural network model, the mobile tools are used to check and compare quality information anytime and anywhere, analyze and dispose of the quality problems found, upload them to the management end, provide reference for subsequent similar constructions, and improve the quality of construction. At the same time, zero-point calibration of the measurement equipment is carried out to ensure that the measurement allowable deviation of various raw materials should not be greater than the construction regulations, as shown in Table 4.

For the construction party, the collision detection and visualization technology are mainly based on the convolutional neural network model beforehand; the quality tracking inspection and comparison are done during the whole process, and the construction plan is continuously improved; afterwards, the owner and the established inspection are successfully completed completion acceptance. At the same time, the performance requirements of the construction must be ensured. The specific parameters are shown in Table 5.

It is not difficult to see that the quality control and production activities carried out by using convolutional neural network technology are all carried out around the convolutional neural network information model. The quality information obtained by each participating party will eventually be summarized into the convolutional neural network model, so for convolutional neural network, quality control should ensure the smooth transmission of information.

3.3. Construction Experiment of Quality Control Equipment Installation. The installation steps include construction preparation, re-testing of the foundation, body assembly, equipment fixing, connecting the secondary line, equipment

adjustment, field test, and quality inspection and evaluation. The architectural model for construction can be preset in advance, and a reasonable plan can be determined through comparison between the models. In this way, the basis of the design is who uses the model to construct more, and the efficiency is improved.

3.3.1. Construction Preparation

- ① Site layout: the site layout should be standardized and reasonable, and the site where the components are in place and assembled should have measures for protection, crane location, etc.
- ② Technical preparation: factory technical documents, original test reports, equipment storage records, installation drawings, installation and commissioning record files, and on-site technical clarifications.
- ③ Personnel arrangement: person in charge of technology, installation and test, special responsibility for safety and quality, and cooperating personnel.
- ④ Materials and machinery: cranes and lifting tools, special tools and materials attached to the product, equipment for gas injection under vacuum, equipment for measuring the water content of SFe gas, gas leak detectors and related test equipment, etc.

3.3.2. Acceptance of Civil Works and Retest of Foundation

- ① Wang Jian's project has been basically completed, the acceptance, handover, and visas have all been completed, and the requirements of the regulations have been met.
- ② The basic center line needs to be rechecked according to the manufacturer's delivery documents. Between adjacent or alternate intervals and between AIS and main transformers and outlets, the deviation of the AIS central axis should be within the permitted range of the specification.
- ③ The embedded steel parts should be well grounded and meet the design standards. Basic inspection: the

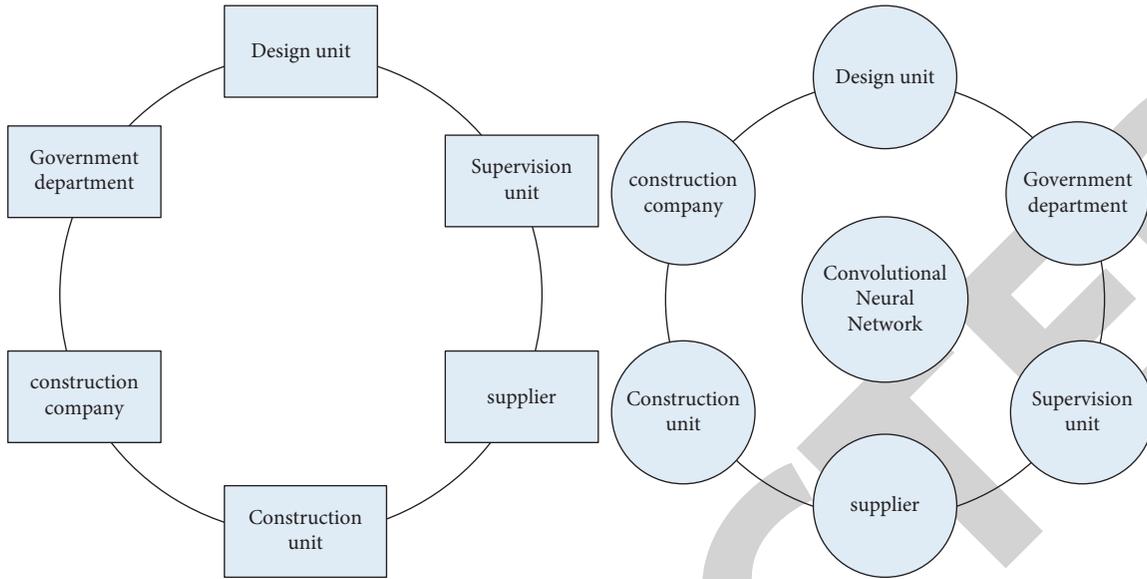


FIGURE 7: Information transmission methods of traditional construction companies and convolutional neural network technical conditions.

TABLE 1: The maximum temperature of the center.

Age	3	6	9	12
TM (°C)	58.7	63.9	65.2	64.6
Temperature rise (°C)	32.3	41.0	39.2	38.1

TABLE 2: Concrete shrinkage equivalent temperature.

Age	$T_y(t)$ (°C)	Age	$T_y(t)$ (°C)
3	0.9	12	3.9
6	1.8	15	4.7
9	2.7	18	5.2
12	3.6	21	6.3
15	4.2	25	7.1

deviation of the center line should be $\leq \pm 5$ mm and adjacent and the whole should be $\leq \pm 10$ mm; the horizontal deviation should be $\leq \pm 2$ mm and adjacent and all should be $\leq \pm 10$ mm. Inspection of the base surface: the center line error should be $\leq \pm 5$ mm; the horizontal error should be $\leq \pm 2$ mm.

3.3.3. Precautions for the Assembly of the Equipment Body.

Mounting accessories should be implemented in the absence of sand, snow, rain, and ambient humidity not exceeding 80%. Measures must be formulated to prevent dust and moisture according to the equipment manufacturer's standards. The lifting tools should be selected according to the technical requirements of the equipment and scientifically determined. The hoisting point, the outer surface of the equipment, must not be damaged; the flatness of the installation bracket should meet the equipment manufacturer's standard, and the manufacturer's matching gasket should be used when adjusting the level of the bracket and the foundation and the level of the chassis and the foundation; install according to the equipment number and the

required order, no random installation should take place; the use of cleaning and lubricants, sealants, and wipers must meet the technical requirements of equipment; all the surfaces of the AIS components must be cleaned up before assembly, and the transport blocking end cover can be loosened only when installing.

3.3.4. Quality Inspection

- ① Equipment technical data, inspection report, and certificate of conformity; installation, inspection and evaluation records, and test adjustment records; relevant drawings and changed documents; list includes spare parts, detectors, and special tools.
- ⑤ Check the operation process, check the signal and lockout, check the record parameters, check the institution and its secondary circuit, and check the appearance.

After completing the above work steps, the work of installing quality control equipment is all over.

4. Quality Control Problems in the Construction Process

4.1. Construction Project Quality Control. The histogram is one of the commonly used tools for quality control. It directly reflects quality fluctuations and is clear about the quality prediction and monitoring status. It can help quality manager's judge and predict product failure rates. As shown in Figure 8, through histogram and causality diagram analysis, it can be judged whether the production process is stable, that is to say whether the process quality of a certain project is stable at a certain stage, and it also provides data for the calculation process more directly.

The cause and effect diagram can help quality managers understand the factors that affect quality management and

TABLE 3: The temperature difference between the inside and the surface and the big temperature difference.

Age	3	6	9	12
Inside and outside	18.3	24.3	23.6	21.9
Atmosphere	13.2	19.4	18.1	18.8

TABLE 4: Allowable deviation of raw material measurement.

Variety	Cement	Aggregate	Water	Admixture	Mixture
Per plate	±3	±1	±3	±2	±1
Grand total	±1	±1	±3	±2	±3

TABLE 5: Construction performance requirements.

Loss over time	On-site control index		
Slump ≤20 mm	Expansion ≤30 mm	Slump 201-227 mm	Expansion ≥489 mm

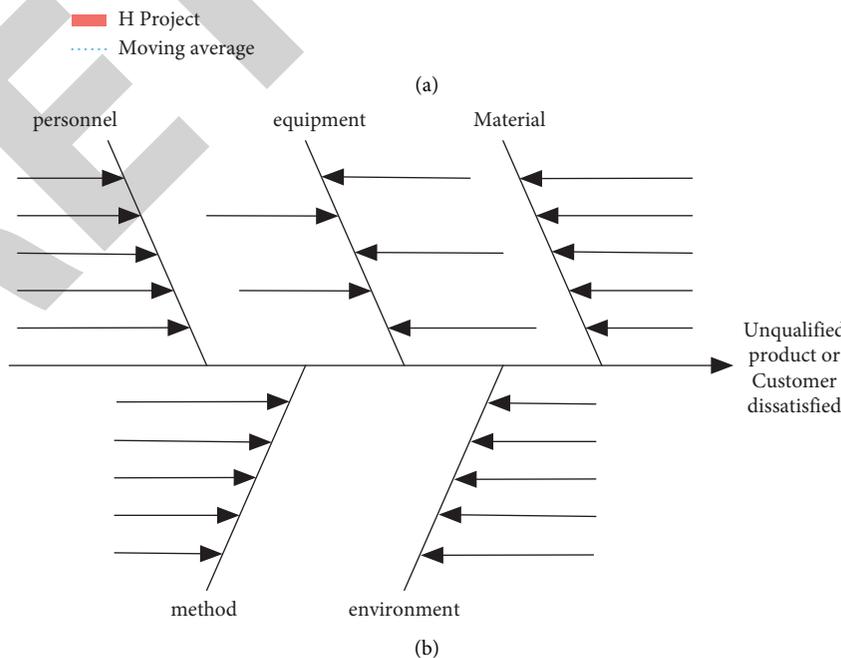
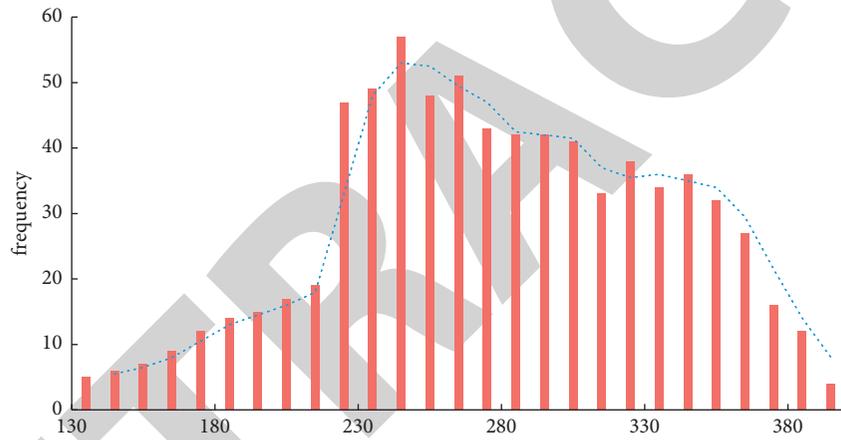


FIGURE 8: Histogram and causality diagram analysis of a project. (a) Project histogram. (b) Project cause and effect analysis diagram.

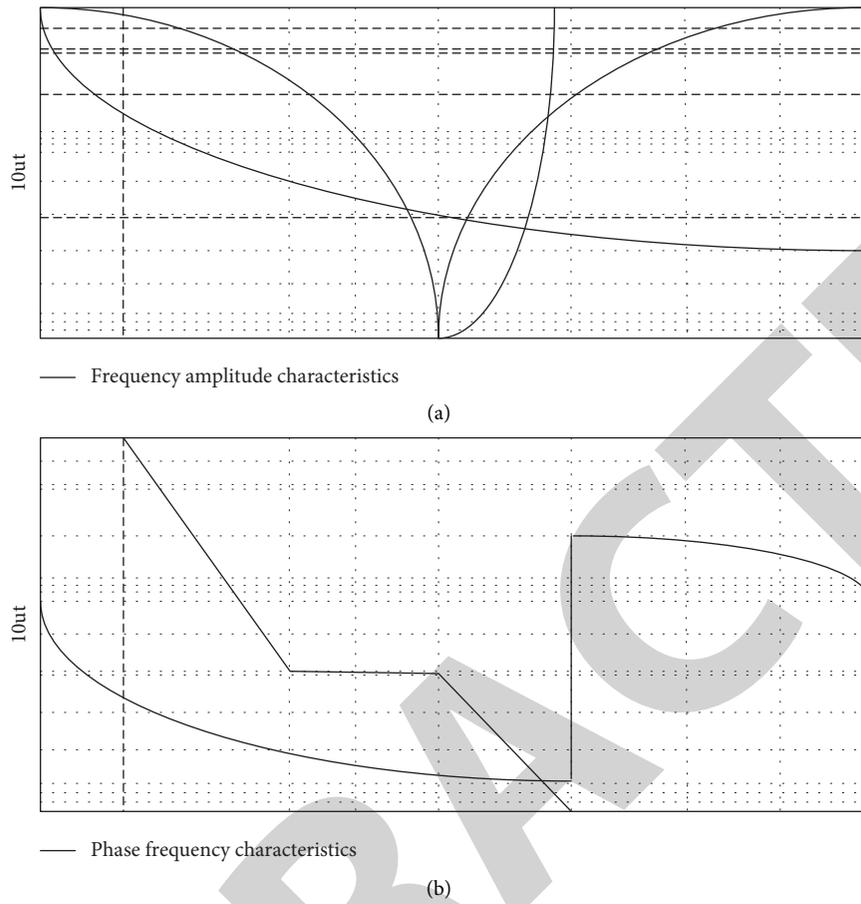


FIGURE 9: (a) Amplitude-frequency characteristic curve of current harmonic separation. (b) Phase-frequency characteristic curve of current harmonic separation.

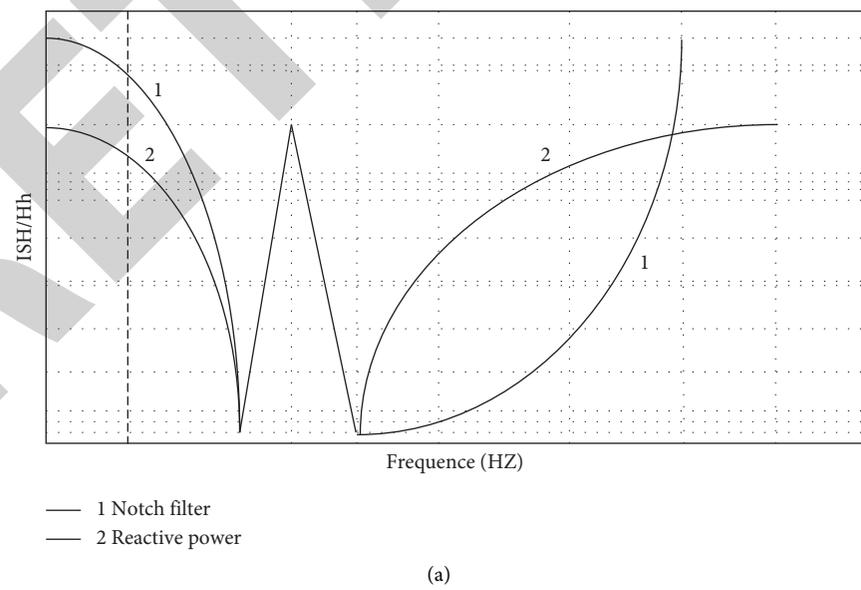


FIGURE 10: Continued.

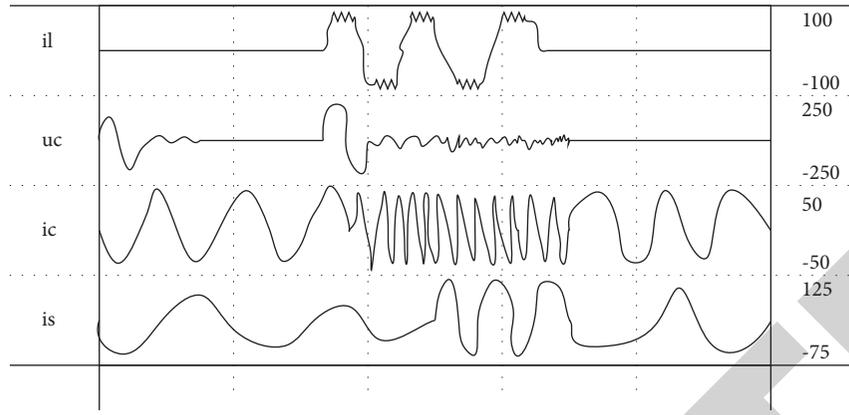


FIGURE 10: Transient characteristics of the hybrid active filter using the instantaneous reactive power theory method. (a) Notch filter and reactive power curve. (b) Phase-locked loop technology.

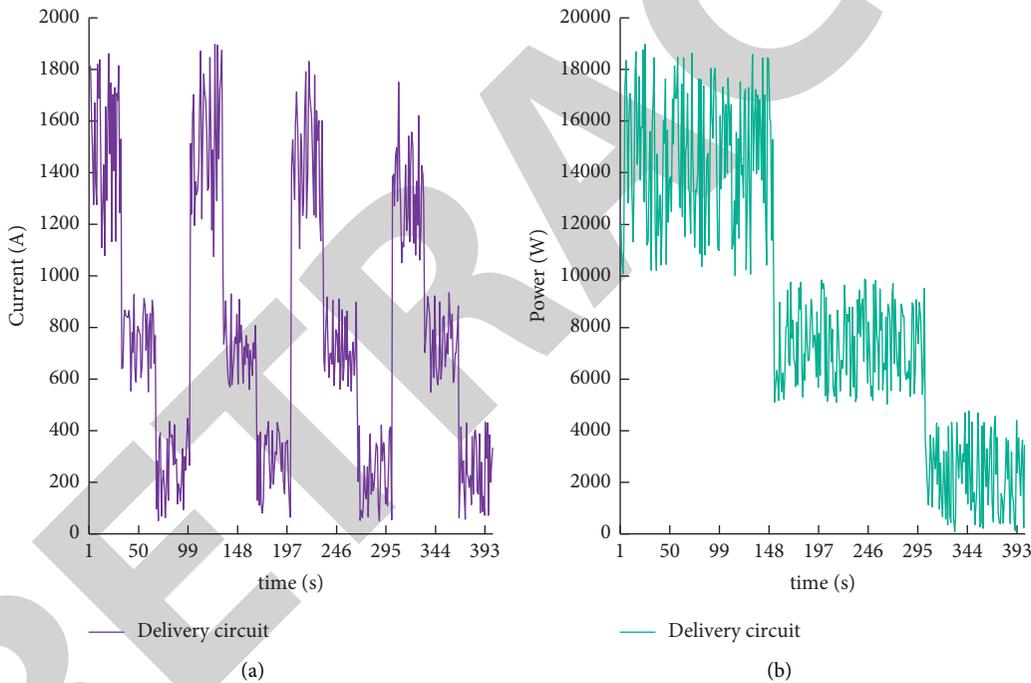


FIGURE 11: Current and power changes in the construction process of power engineering based on convolutional neural network. (a) Rated current. (b) Power value.

control at a glance, summarize various factors that affect quality management and control, and finally give solutions. Mr. Ishikawa Shin believes that the factors that affect quality need to be brainstormed based on the production process and production experience, and finally, all the factors that may affect quality are summarized. The most important influencing factors can be directly reflected on the map.

4.2. Power and Electrical Quality Control Strategies. Using high-speed devices and digital signal processing technology, the calculations required by the instantaneous reactive power theory method, including the low-pass filter, can be realized by

digital methods, so the required calculation accuracy can be guaranteed, and there is no problem of parameter drift. However, in order to achieve the required real-time performance, the devices used must have sufficient computing speed. At the same time, in order to ensure the reliable operation of the system in an environment with strong electromagnetic interference, the hardware design and software programming of the system have high requirements, and the system structure is complex and the cost is high.

Using the fundamental wave trap to separate the current harmonics, the amplitude-frequency characteristics and phase-frequency characteristics shown in Figure 9 can be obtained.

From the comparison of Figure 9, it can be seen that the impact on the active power filter that usually uses open-loop control is serious because the amplitude and phase distortion of the harmonic separation will directly seriously affect the filtering effect of the active power filter, so the notch filter method is not suitable for the active power filter with open-loop control.

However, this project has proved through theoretical analysis that the impact is very small for the hybrid active filter using closed-loop control, and some of the impact is still beneficial, as shown in Figure 10. By using digital notch filter and phase-locked loop technology, the problem of frequency drift can be completely solved.

Based on the above methods, a more ideal effect is finally obtained. The response time of the trap is less than 15us, and the attenuation of the fundamental wave 50HZ frequency component can reach more than 80db, which is lower than the fundamental frequency. The output phase of the 50HZ trap is ahead of the input phase and higher than the fundamental wave. Frequency: the output phase of the notch filter lags the input phase, but as the frequency extends to both ends, its phase shift gradually approaches zero.

4.3. On-Site Measurement Data and Power and Electrical Loads. In order to fully understand the power quality during the construction of the power project and provide a reasonable solution, I conducted on-site measurements of the power quality and working status of the transmission circuit and obtained more comprehensive operating data.

The current trend of power engineering based on convolutional neural network is shown in Figure 11. It can be seen from the figure that the current fluctuations in the power engineering based on the convolutional neural network during the construction process are quite frequent. There are multiple pulse currents in the cycle, the pulse current interval is 1s, and the current changes between 30% and 100% of the rated current.

The picture on the left shows the current change, and the picture on the right shows the power change. It can be seen from the figure that whether it is light load or full load, the power factor of the transmission circuit is extremely low. In view of the load characteristics of the circuit load, it is recommended to adopt a comprehensive treatment plan for reactive power and harmonics, with a convolutional neural network, to control reactive power, mainly, and harmonics. In this way, on the basis of the original, the quality problems of the construction process are controlled by using the convolutional neural network. On the premise of ensuring the transmission problems of power and electrical engineering, the overall quality has increased by 37%, which greatly guarantees the construction of the project.

5. Conclusions

The main research direction of this study is on the existing construction technology of power and electrical engineering. Through learning by convolutional neural network, unpervised analysis of engineering related data, and feature

extraction, the effect of controlling quality problems in the process of engineering construction is achieved. This study uses the multilayer convolution algorithm of the convolutional neural network to optimize, the overall data extraction efficiency is improved by 71%, and the overall quality control of the project is improved by 37%; it effectively guarantees the progress of the construction and the quality of the construction at the same time, and it has both practicality and theoretical research.

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 declare that they have no conflicts of interest to report regarding the present study.

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