Design and Algorithm of Intelligent Manufacturing Evaluation Model Based on Machine Learning

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Research Article

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Design and Algorithm of Intelligent Manufacturing Evaluation Model Based on Machine Learning

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Abstract: Machine learning is gradually developed and applied to more and more fields. Intelligent manufacturing system is also an important system model that many companies and enterprises are designing and implementing. The purpose of this study is to evaluate and analyze the model design of Intelligent Manufacturing System Based on machine learning algorithm. The method of this study is to first obtain all the relevant attributes of the intelligent manufacturing system model, and then use machine learning algorithm to delete irrelevant attributes to prevent redundancy and deviation of neural network fitting, make the original probability distribution as close as possible to the distribution when using the selected attributes, and use the ratio of industry average to quantitative expression for measurable and obvious data indicators. As a result, the average running time of the intelligent manufacturing system is 17.35 seconds, and the genetic algorithm occupies 15.63 seconds. The machine learning network takes up 1.72 seconds. Under the machine learning algorithm, the training speed is very high, obviously higher than that of the genetic algorithm, and the BP network is 2.1% higher than the Elman algorithm. The evaluation running speed of the system model design is fast and the accuracy is high. This study provides a certain value for the model design evaluation and algorithm of various systems in the intelligent era.

Keywords: Machine Learning, Intelligent Manufacturing System, Model Design, Evaluation Algorithm

1. Introduction

With the wide use of computers and the Internet, an intelligent network connection came into being. The development of network information technology has brought good opportunities for industrial production and social and economic development. Relevant data show that the contribution rate of network information technology to economic growth in industrialized countries is more than 39%. The new model of intelligent manufacturing system will promote the reconstruction of the whole industrial scale, thus generating greater market demand and becoming stronger. Intelligent manufacturing has become the hot spot of international competition in high-tech field in the future.

Machine learning includes supervised learning, unsupervised learning and reinforcement learning. This can be adapted to all functions by updating weights and thresholds. High dimensional feature vectors can be processed to perform feature extraction. Have learning ability, can be nonlinear generalization. If the training data is easy to expand, the network capacity can be increased to increase the network storage capacity. This is very important for evaluating the model design of intelligent manufacturing system.

We searched the design method of intelligent manufacturing system model. Wang L constructs the framework of light component intelligent manufacturing system (LAIMS) based on explaining cloud manufacturing (CM) and network physical system (CPS) of system to provide industrial automation and manufacturing intelligent solutions. The function and relationship of each layer is in the structure, as well as the role of CPS, cm and big data analysis. Intelligent manufacturing system defines and describes laims resources, service model and operating system, and points out that the main concepts of intelligent control are optimal state and five intelligent control methods. By analyzing the intelligent control management and main effective technologies of the automatic intelligent insulating glass production line, the effectiveness of the proposed framework and its intelligent control method is proved. His method framework system is not complete and practical. Considering the complexity of individual production model and heat treatment process, as well as unreasonable production schedule and tracking difficulty of work unit process [1]. Baiyu L proposed an intelligent manufacturing execution system (MES) for heat treatment based on Internet of things. Based on the interaction model of heat treatment production information and the analysis of data collection and processing problems in the seminar, an intelligent system is constructed by using web technology, barcode technology and RFID technology. His intelligent manufacturing system realizes the integration, networking and intelligent management of heat treatment workshop. His intelligent manufacturing system can improve the level of production management and product quality, and effectively promote production scheduling, scheduling, tracking and statistics. In his method, the test link of intelligent manufacturing system is very complex, and the overall efficiency is not high [2-3]. The intelligent manufacturing system designed by Yari M basically includes software composed of computing, storage and network resources. His software defined network (SDN) is new network architecture. He separates the network control plane from the network data transmission plane, and realizes the programmable control is the design idea of Sdn. His research analyzed the characteristics and importance of intelligent manufacturing system, pointed out the problems faced by intelligent manufacturing system, and scattered the advantages of Sdn. He proposed a conceptual model combining SDN and intelligent manufacturing system. His research made a detailed study on intelligent manufacturing from the aspects of technical significance and equipment model. His method is just a conceptual model, which is not convincing [4-5].

This paper first introduces the evaluation of Intelligent Manufacturing System Based on neural network, and then describes the machine learning mode and error prevention analysis model of intelligent manufacturing system in detail. The idea of intelligent manufacturing is very important in the system design. This research also explains the five layer structure of intelligent manufacturing system: production environment layer, state sensing layer, data storage layer, state analysis layer and decision support layer. In the detailed design of intelligent manufacturing evaluation system, four measurement indexes and methods are used. The stability analysis of intelligent manufacturing system, the performance evaluation and comparative analysis of network model, and the evaluation and analysis of system enterprise examples are carried out for the results of machine learning algorithm evaluation model [6-7].

2. Machine Learning and Intelligent Manufacturing System Model

2.1 Machine Learning Mode

(1) Learning with mentors

Control learning can understand the function from a specific learning method and predict the result according to the function. In supervised learning, the input data marked by the output results is used as the training mode, that is, the input mode and training objectives are used. Supervised learning is usually used to solve two types of situations: the first is the classification situation. The commonly used algorithms are support vector machine (SVM), Bayesian network (BN), etc. Another type is regression. Regression is to find the best function to approximate the known finite data, and calculate the output (prediction) of the unknown input data through the approximation function (i.e. approximation (x, y)). Curve of minimizing cost function L [8-9]:

$$L(f,(X,Y)) = \|f(X)-Y\|^2 \quad (1)$$

The commonly used machine learning methods of regression analysis includes linear regression, neural network, decision tree, etc.

(2) Unsupervised learning

The data generated in the actual operation of intelligent manufacturing system is usually non signed data. In some cases, because the label of the sample is completely unknown, that is, the training mode with label can not be provided, so the tutor learning can not be used. Unsupervised learning methods can be used to solve such situations. The sample data of unattended learning has unknown categories, which must be distinguished according to the similarity between sample data [10-11].

There are two cases of unsupervised learning. One is based on the estimation of probability density function. Using certain methods to find and classify the distribution parameters of each category in the feature space. The other is the composition screening method based on the consistency between samples. The initial grains in different conditions are defined, and the samples are divided into different cases according to the fusion degree between the sample and the core. Classification is used to extract the hidden information in the data set, and can screen and detect the future data [12-13].

(3) Strengthen learning

Reinforcement learning is one aspect of selection optimization, which uses "reward function" to achieve training purposes. The use of artificial intelligence AlphaZero made it famous. However, in many cases, the scope of amplifier algorithm to prevent abnormal power supply system is very limited, because it is difficult to provide a reward function that can accurately evaluate the working environment around the machine [14-15].

There are two kinds of machine learning algorithms: offline learning and online learning. Offline learning is accomplished by providing records obtained from a certain probability distribution from a specific environment. Machine learning is to update the weights and thresholds according to the whole training group to minimize the error in the actual distribution. The online learning process is composed of time series data, and the model is updated by continuous data input. This can improve the adaptability to the actual data [16].

The evaluation of production system is a problem of pattern recognition, because it is difficult to continue to obtain data for practical reasons. Therefore, machine learning in this study has taken over the online learning method and offline learning algorithm. By providing the special data X and tag y corresponding to the production system, the neural network learns the features and outputs the evaluation results through the optimization algorithm, weight and threshold updating method.

2.2 Evaluation of Intelligent Manufacturing System Based on Neural Network

(1) Neural network modeling

Neural networks can adapt to any function by updating weights and thresholds. Machine learning can identify high-dimensional feature sectors for feature extraction. With learning ability, it can be extended to non training data. The extension is simple and must be saved. If the amount of information is greater than the storage value, the network capacity can be increased to solve the problem. This method has strong adaptability and can adapt to different samples according to the change of training mode [17-18]. The neural network framework is shown in Figure 2

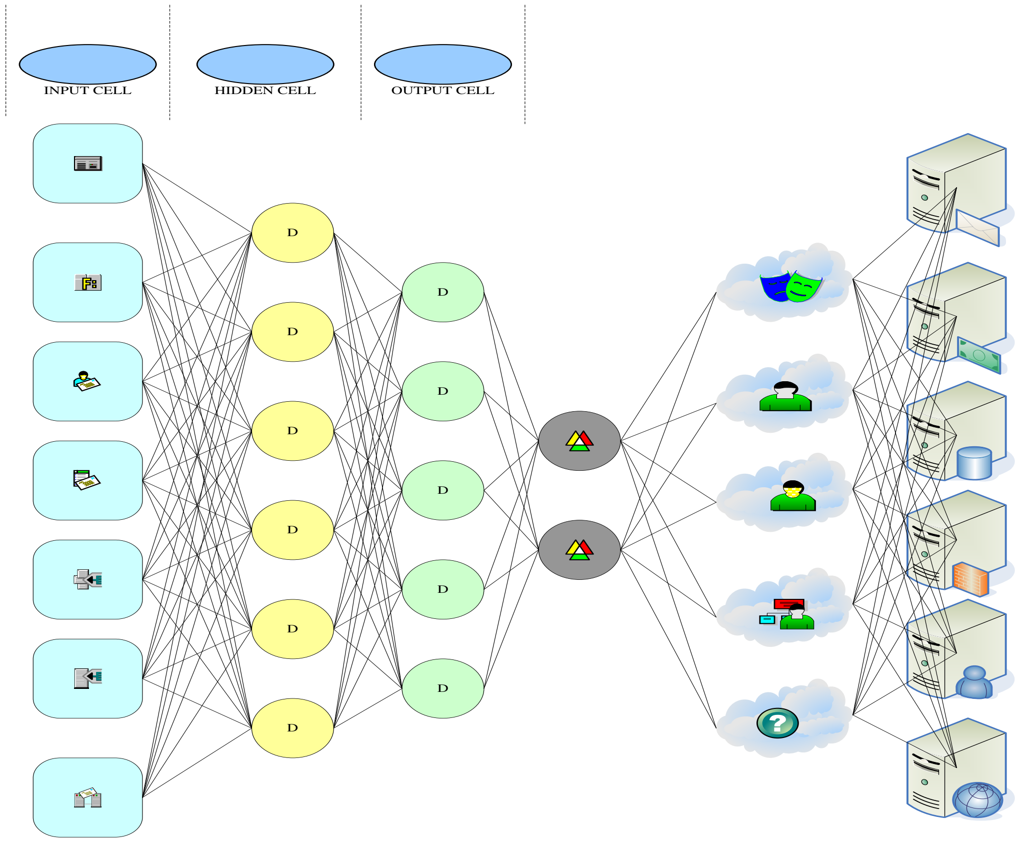

Figure 2. Basic framework diagram of neural network

In this study, neural network can be selected as machine learning algorithm to design and evaluate intelligent manufacturing system[19].Generally speaking, the algorithm of neural network is as follows：

$$G(x, y) = \exp\left(-\frac{x^2 + y^2}{2\sigma^2}\right) \tag{2}$$

It is achieved by convolution of smoothing kernels with different σ values with the image. The resulting expression formula is as follows

$$L(x, y) = -\frac{1}{\pi\sigma^4}\left(1 - \frac{x^2 + y^2}{2\sigma^2}\right)\exp\left(-\frac{x^2 + y^2}{2\sigma^2}\right) \tag{3}$$

The effect is related to the value of σ, the smaller the σ, the smaller the smoothing effect, and the more noise

$$Q = \frac{1}{2a^2 r^{-1}}\left(\frac{2b^2}{a^2 r^{-1}} p - t\right)^{-1}\left[a^2 r^{-1} t^2 + 2\left(1 - b^2\right)t\right] \tag{4}$$

Represents the degree of membership of the cluster centers, and calculates each cluster center:

For the degree of membership of cluster centers, calculate each cluster center:

$$v_j = \frac{\sum_i^n = 1 u_{ij}^m x_i}{\sum_i^n = 1 u_{ij}^m} \quad (5)$$

Calculate the cost function. If the cost function is less than a certain threshold or the change of the cost function during two iterations is less than a certain threshold, the algorithm stops, and the cost function is

$$J(U, v_1, \ldots, v) = \sum_{i=1}^{c} J_i = \sum_{i=1}^{n} u_{ij}^m d^2(x_i, v_j) \quad (6)$$

Update the membership matrix U, and then return to the step

$$u_{it} = \sum_{j=1}^{c} (d_{it} / d_{it})^{-2/(m-1)} \quad (7)$$

For the membership matrix output by the algorithm, no human intervention is required in the algorithm implementation process. In order to avoid the possible misjudgment of this method, based on the cosine similarity, the cosine value of the angle between the point and the cluster center is used to weight the Euclidean distance. Then:

$$d_v\left(x_t, v_j\right) = sim(x_t^{(j)}, v_j) * \sqrt{\left(x_t^{(j)} - v_j\right)^T (x_t^{(j)} + v_j)} \quad (8)$$

Neural networks are more effective than general machine learning methods.

(2) Optimization of neural network by genetic algorithm

Genetic algorithm has two main methods to optimize neural network. Genetic algorithm is used to initialize weights and thresholds. The initial position of neural network can effectively avoid the appropriate initial position to determine the achievable learning rate and progress. Local optimization; genetic algorithm is used to optimize the weights and thresholds of neural network to change the algorithm [20-21]. The genetic algorithm process is shown in Figure 3:

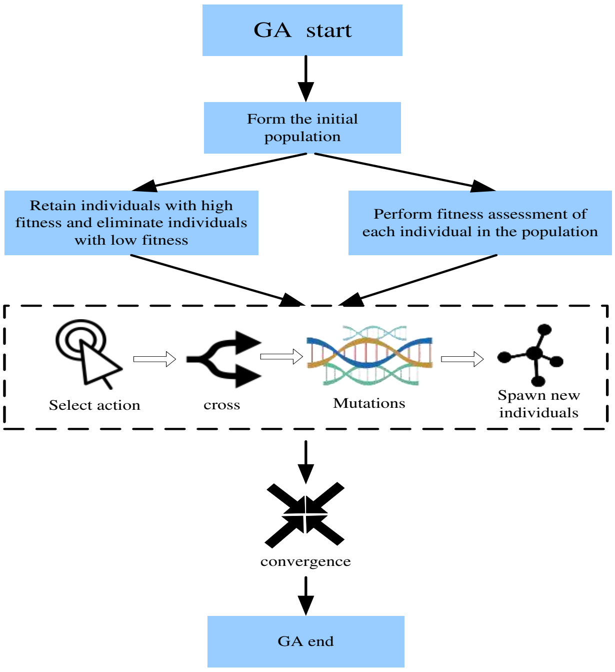

Figure 3. Genetic algorithm process

2.3 Error Prevention Analysis Model of Intelligent Manufacturing System

(1) Ssae pre learning. Intelligent manufacturing system has a variety of processes, and the characteristics that affect its operation are also diverse. All features affecting remote control shall include topological data of main control, remote sensing data of control and pre operation conditions of equipment. Remote signaling data of adjacent controlled equipment, status of other equipment and remote signaling data of the whole network before and after equipment operation. There are many conditions leading to the failure, and the value of each function depends on the specific situation. Therefore, the samples that need to be checked in unsupervised learning training must be classified in advance.

After preprocessing, the samples are added to SSE and simulated in each layer according to the unsupervised learning method of each layer. In this method, error data and controllable samples can be used, and multiple samples can be used for verification. Unsupervised learning teaches you the high-dimensional features of the learning materials in the hidden layer. If the number of hidden level units exceeds the input units, you can learn too many basic vector sets to display input vectors. Most neurons are in a state of resistance. If the spark function is used in machine learning, the effect will be better [22].

(2) PCA dimension reduction. The multi-layer stack self-service encoder makes the dimension of the sparse sphere of SSE network larger. The scattered feature information will make the training and classification effect insufficient. Therefore, the PCA method is used to reduce the high-dimensional features to the classifier, and the process is as follows.

The dimension is the dimension of X=m×n, and the dimension of sampling is the feature of k:

$$X = \begin{bmatrix} x_1^{(1)}, x_2^{(1)} \dots x_n^{(1)} \\ x_1^{(2)}, x_2^{(2)} \dots x_n^{(2)} \\ \dots \\ x_1^{(m)}, x_2^{(m)} \dots x_n^{(m)} \end{bmatrix} \quad (9)$$

The covariance matrix C of sample set X is calculated:

$$C = \begin{bmatrix} \mathrm{cov}(x_1, x_1), \mathrm{cov}(x_1, x_2) \dots \mathrm{cov}(x_1, x_n) \\ \mathrm{cov}(x_2, x_1), \mathrm{cov}(x_2, x_2) \dots \mathrm{cov}(x_2, x_n) \\ \dots \\ \mathrm{cov}(x_m, x_1), \mathrm{cov}(x_m, x_2) \dots \mathrm{cov}(x_m, x_n) \end{bmatrix} \quad (10)$$

$$\mathrm{cov}(x_j, x_k) = \frac{\sum_{i=1}^{m} (x_j^{(i)} - \bar{x}_j)(x_k^{(i)} - \bar{x}_k)}{n-1}, \ j,k = 1 \dots n \quad (11)$$

$$\bar{x} = \frac{1}{m} \sum_{i=1}^{m} x^{(i)} \quad (12)$$

In order to obtain the eigenvalues and eigenvectors of covariance matrix C, the eigenvalue decomposition method is usually used.

$$C = QDQ^{-1} \quad (13)$$

Where Q represents the self vector matrix of C, C represents the coefficient matrix of training test set X, and D represents the diagonal matrix, and its value is the corresponding data on the diagonal [23-24].

The natural vector arrangement f is established by sorting the values from large to small, taking the largest k, and taking the intrinsic vector of k corresponding to each eigenvalue as the row vector.

Get dimension reduction matrix Y

$$Y = FX^T \quad (14)$$

(3) SVM classification. In the case of linear separation, the classification interface of support vector is

$$wx + b = 0 \quad (15)$$

When w and B are the interface parameters, the distance between the point closest to the hyperplane and the hyperplane must be the farthest in order to obtain the limited optimization data:

$$\max_{w,b} \frac{y^*(wx^* + b)}{\|w\|} \quad (16)$$

$$s.t. \frac{y_i(wx_i + b)}{\|w\|} > \max_{w,b} \frac{y^*(wx^* + b)}{\|w\|}, i = 1,2,\ldots,n \quad (17)$$

Where y * and x* denote the point closest to the hyperplane. Where w and b can be changed in proportion, so y* (wx* + b) can take any value. For the convenience of calculation, take 1. Constrained optimization problem:

$$\max_{w,b} \frac{1}{\|w\|} \quad (18)$$

$$s.t. y_i(wx_i + b) \geq 1, i = 1,2,\ldots,n \quad (19)$$

The classification problem becomes the minimum ‖w‖ problem. This is a convex quadratic programming problem that can be solved:

$$\begin{aligned} &\min_{w,b} \|w\| \\ &s.t. y_i(wx_i + b) \geq 1, i = 1,2,\ldots,n \end{aligned} \quad (20)$$

2.4 Five Layer Structure of Intelligent Manufacturing System

(1) Production environment layer

The production environment layer refers to the traditional Chinese medicine production seminar, traditional Chinese medicine production engineering units, production environment, etc., using intelligent manufacturing system. Subsequent data collection will take place from this layer. Through a variety of monitoring equipment, such as energy meter, temperature sensor, etc., state data of processing unit can be collected and stored in intelligent manufacturing system. After the analysis, the quality management and production management decision support information is formed. Through a series of decision instructions generated, released, sent and driven, the final feedback will affect the actual production environment [25-26].

(2) State sensing layer

State control layer is a layer that directly affects the actual working environment and affects the actual working environment. Through the state perception control layer, it can complete the identification and data collection of equipment, quality, energy consumption, logistics and other states in the production environment, and realize the control of various states through the self-discipline control and the interaction between human and computer. In the process of state identification, a variety of collection devices and transmission methods are used to reliably send the data from the formal environment to the upper data storage, providing reliable basic data for subsequent system analysis and decision-making.

(3) Data storage layer

The data storage layer is the necessary channel to store various state data collected in the application environment. According to the specific logical relationship and processing process, this layer can effectively store the state data collected in the actual environment. According to the data format and various types of data information types, the conceptual model and logical model of data standardization are established to realize unified management. Through the data storage, according to the requirements of data extraction and analysis by the superior analysis layer, the basis of management decision support is established [27-28].

(4) State analysis layer

The state analysis layer is the level of statistical analysis related to the six state contents of formal data stored in the system. The analysis layer can mine the data needed by the storage layer corresponding to the management and decision support needs of the actual environment, and establish relevant independent and non independent related models to provide theoretical methods and data support corresponding to advanced decision support.

(5) Decision support layer

Decision support layer is the highest level of the system. Based on the analysis results of the previous layer, this layer analyzes the relevant data of the application environment, and generates the corresponding production management decision support information from three aspects of quality management, lean production, risk management and control. In addition, the system users make corresponding management decisions according to the decision support information, which can be converted into the decision of production adjustment or improvement. Decision support is based on the relevant results of previous state analysis, combined with the existing state of the actual environment, to generate decision support content for quality management, lean production, risk management and control. Based on the content of decision support information, the management decisions made by system users can be converted into production management instructions transmitted by each layer [29-30]. The corresponding relationship between the planning goals of the intelligent manufacturing system and the enterprise goals is shown in Figure 4:

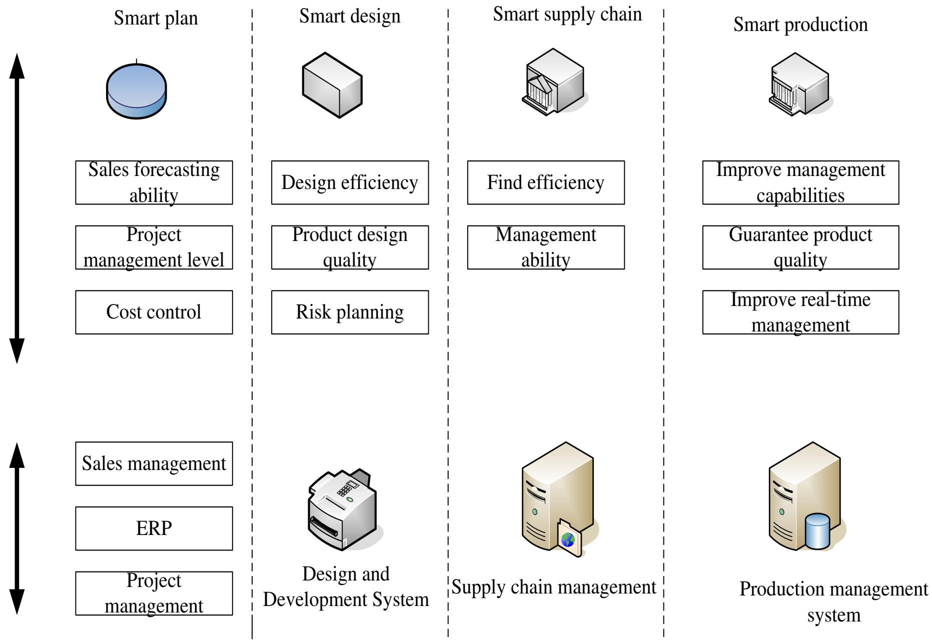

Figure 4. Smart manufacturing and corporate goals

3. Detailed Design of Intelligent Manufacturing Evaluation System

3.1 Simulation Parameter Setting

As shown in Table 1, the algorithm simulation parameters are set.

Table 1. Parameter setting of algorithm simulation

Parameter name	Parameter value	Parameter name	Parameter value
Population size	100	k1,k2	0.07
Crossover probability	0.7	k3	0.19
Mutation probability	0.1	k4	0.42
Maximum number of iterations	200	k5	0.30

3.2 Design of Evaluation Index

Based on the experience and understanding of 25 experts in the field of intelligent manufacturing system evaluation for many years, this paper summarizes the seven dimensions of the first level of intelligent manufacturing system evaluation: resource elements, new formats, production, logistics, system integration, interconnection, information interoperability and integration. Data aggregation uses advanced conceptual algorithms to perform data compression. This observation of abstraction is convenient and easy to understand. The general data use the basic function formula of borehole to describe the data, which helps to analyze the implicit relationship between the data. Firstly, all the relevant attributes are obtained, and then the irrelevant attributes are removed by dimension reduction method. When the selected attributes are used, the original probability distribution is as close to the distribution as possible.

3.3 Design of Measurement Index and Method

Each secondary indicator has several specific measurement indicators with different dimensions. The importance of brass index can be quantified. After getting the basic data, the number of continuous attribute values can be reduced by the difference of measurement indexes and the stratification of concepts, which is helpful for data mining in such a wide and abstract evaluation system. There are some problems such as brass index which are difficult to measure quantitatively, and the value between industries is insignificant. There are four methods for qualitative calculation.

(1) The quantitative representation of industry average is used for the measurable data indicators with obvious importance.

(2) The measurable indicators with large value difference are subdivided into individual indicators according to the industry level.

(3) Non quantifiable Abstract indicators replace the legal performance of expert evaluation.

(4) Weight and combine multiple values according to the actual situation.

4. Evaluation Model Analysis of Machine Learning Intelligent Manufacturing System

4.1 Stability Analysis of Machine Learning Algorithm in Intelligent Manufacturing System

In the planning results obtained by traditional genetic algorithm, it is easy to find that the remaining width is just equal to the cutting width, which will lead to the final number of cut cakes of some types larger than the expected number of cakes. When the raw materials are in short supply, this is the result that customers do not want to see. Based on this problem, this paper designs an adjustment scheme based on machine learning. If so, search the coil with the largest residual width to the coil with small residual width, and check the number of cakes corresponding to the cutting width of the current coil. If it is greater than 1, the number of pancakes corresponding to the cutting width of the current coil will be reduced 1, add 1 to the number of pancakes corresponding to the cutting width of the coiled material with the same remaining width and cutting width. As shown in Figure 5, the evolutionary trend of optimal individual fitness values of traditional and intelligent systems is shown, and Figure 3 is a comparison chart of 100 optimal fitness values.

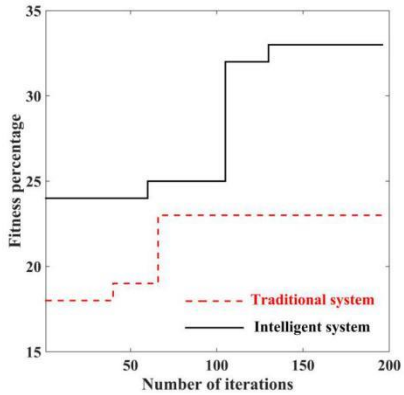

Figure 5. Evolution trend of optimal individual fitness values of traditional and intelligent systems

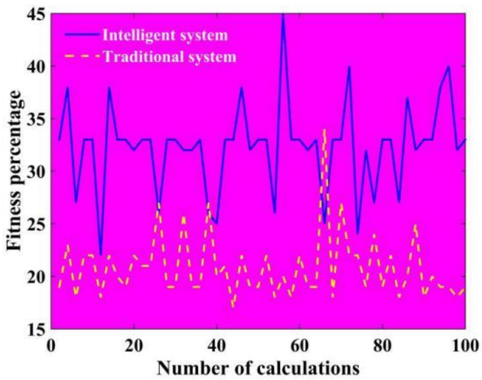

Figure 6. Comparison of 100 optimal fitness values

It can be seen from Figure 5 and Figure 6 that after analyzing the above simulation results, the solution of the coil cutting scheme planning problem based on the idea of machine learning can meet the actual needs of coil cutting management. From the performance point of view, the deviation of 100 calculation results before the improvement is small, and the fitness is basically stable at about 33%, which shows that the algorithm is stable. In order to verify the stability of the results obtained by the algorithm, the simulation experiment repeated 100 times of single experiment. The minimum completion time of 100 times of single experiment was recorded, and 100 times of scheduling results could be obtained. Through the simulation results of instance data, it can be seen that all scheduling results are stable in 73min and 73min It is proved that the algorithm has a certain stability between 82min.

4.2 Performance Evaluation and Comparative Analysis of Intelligent Manufacturing Network Model

The performance of the GABP neural network and the Elman neural network model are evaluated and compared. Figure 7 shows the change of the mean square error of the BP neural network model.

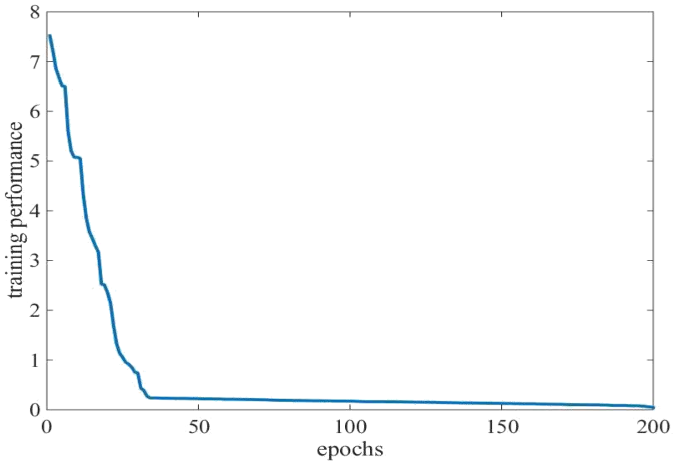

Figure 7. Error curve of standard BP network model performance

It can be seen from the figure that the error of the BP network model is basically stable after about 32 times, and the network mean square error is 0.0085, which is relatively stable.

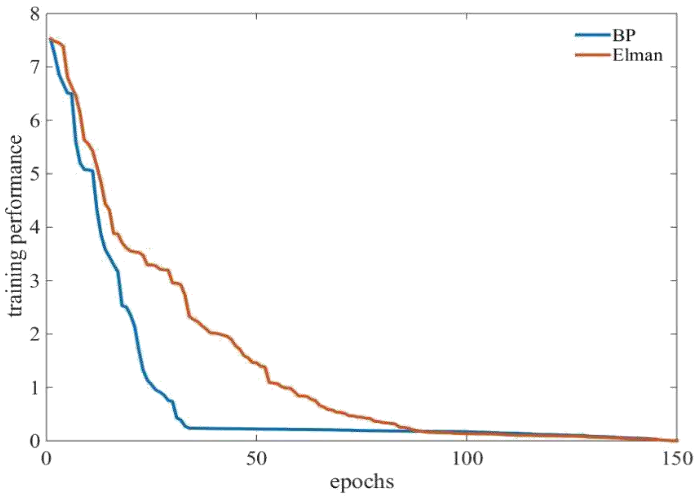

Figure 8. Network model error comparison results

It can be seen from Figure 8 that the Elman network model can be basically stable after more than 100 times, and the mean square error is 0.0056. It can be seen that

It can be seen that the optimal weight threshold obtained by using the improved GABP model is used to train the network, and it is found that there is a more accurate prediction accuracy, and the predicted value curve is almost completely consistent with the true value curve, and it is obtained under the Elman model There is still a certain error between the predicted value and the true value of. The BP neural network theoretically uses the idea of the gradient descent method, using the derivative value of the network error to the network weight to obtain the adjustment direction of the weight in the future, and finally achieve the goal of minimizing the error, which directly verifies the feasibility of the BP neural network.

Table 2.Run results of different models

algorithm	Evolutionary algebra	Number of iterations	operation hours
BP	/	1169	262.484576
GABP	96	32	128.184564
Elman	184	122	191.471568

It can be seen from Table 2 that compared with the Elman neural network model, the use of the GABP neural network model reduces the number of iterations, speeds up the operation of the network, and improves the problem of slow operation of the traditional BP neural network.

4.3 Case Evaluation and Analysis of Intelligent Manufacturing System Enterprises

According to the classification requirements of intelligent manufacturing capability, the average score of single ability is graded, and the grade distribution of single ability of intelligent manufacturing is obtained. In the production process, 37% of the enterprises' intelligent manufacturing capacity can not meet the planned level requirements 2% of the enterprises reached the optimization level; in the logistics sector, more than half of the enterprises' intelligent manufacturing capacity failed to meet the requirements of the planned level, 15% of the enterprises were at the planned level, 10% were at the integration level, and 7% reached the optimization level; in the level of resource elements, 15% of the enterprises were at the planned level, 20% were at the standard level, 20% were at the integration level, and 71% of the enterprises could not reach the planned level At the level of interconnection and interworking, 15% and 5% of the enterprises are at the integration level and 5% at the optimization level. At the information fusion level, 2% of the enterprises reach the optimization level, and 2% of the enterprises reach the leading level. As shown in Figure 9, the scores of various capabilities of intelligent manufacturing of enterprises.

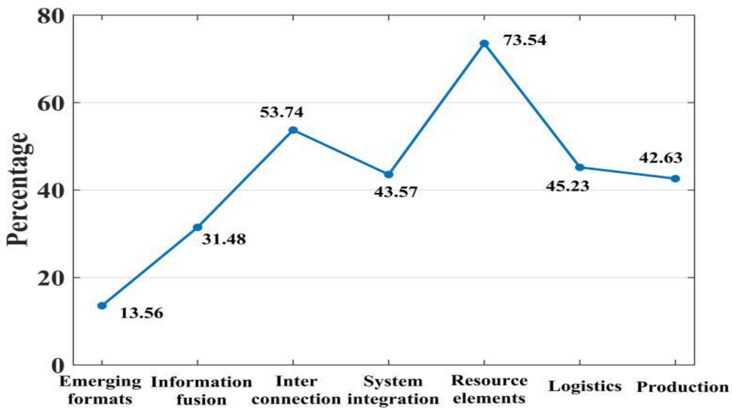

Figure 9. Survey the scores of various capabilities of intelligent manufacturing of enterprises

Figure 10 shows the comparative analysis of intelligent manufacturing capabilities among different enterprises.

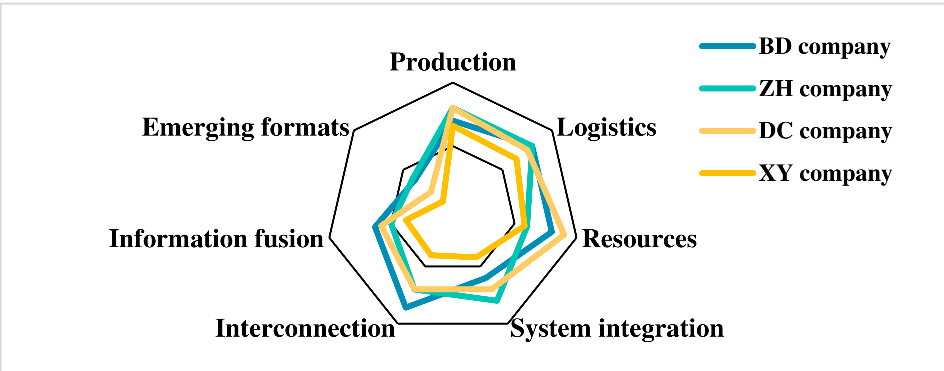

Figure 10. Comparative analysis of intelligent manufacturing capabilities among different enterprises

It can be seen from Figure 6 and Figure 7 that the intelligent manufacturing capacity of these four enterprises is generally low at the level of emerging formats. The intelligent manufacturing capability of DC company is higher than that of the other three enterprises in the resource element link; the intelligent manufacturing ability of ZH company is higher than that of the other three enterprises in the system integration link; the intelligent manufacturing ability of BD company is higher than that of the other three enterprises in the interconnection link; from the overall point of view, the intelligent manufacturing ability of XY company is the weakest among the four electric tool manufacturing enterprises. In general, the four power tool manufacturing enterprises surveyed have their own advantages in different aspects of intelligent manufacturing, and XY company needs to further strengthen in the fields of production, logistics, resource elements, system integration, etc. Industries should learn from each other's strong points to make up for each other's weaknesses and integrate information with each other.

We make statistics on the evolution trend of fitness and average fitness under different algorithms, and the results are shown in Figure 11.

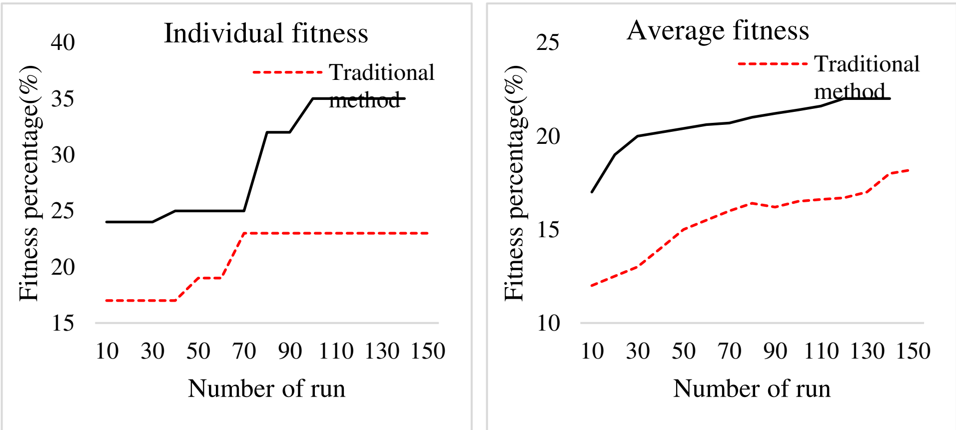

Figure 11. Changes in fitness before and after improvements

It can be seen from the figure that the deviation of the calculation results for the first 100 times of improvement is not big, and the fitness is basically stable at about 33%, but after the calculation exceeds 100 after the improvement, the gap between the two groups widens, indicating that after the improved algorithm, The calculation stability is good.We compare the optimal applicability before and after 60 improvements, and the results are shown in Figure 12:

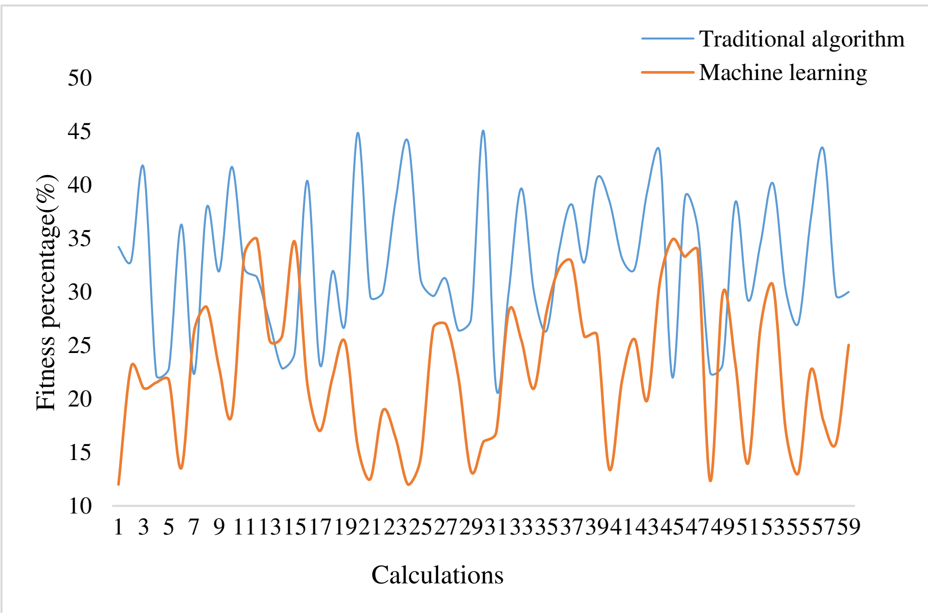

Figure 12. Comparison of optimal fitness values

Table 3 shows the fitness, selection probability and cumulative probability of 10 individuals. In order to select crossover individuals, multiple rounds of selection are required. For example, in the first round, a random number of 0.81 is generated, which falls between the 5th and 6th individuals, and the 6th individual is selected. In the second round, a random number of 0.32 is generated, which falls between the first and second individuals, then the second individual is selected. And so on.

Table 3. Selection probability and cumulative probability

Individual	1	2	3	4	5	6	7	8	9	10
Fitness	2.1	1.8	1.6	1.4	1.2	0.9	0.8	0.5	0.2	0.1
Probability of choice	0.17	0.16	0.14	0.12	0.10	0.08	0.07	0.04	0.02	0.01
Cumulative probability	0.17	0.24	0.49	0.52	0.63	0.72	0.89	0.85	0.89	0.91

5. Conclusion

The research and evaluation method can help enterprises to establish strategic objectives, adopt appropriate methods and paths to achieve intelligent manufacturing, and actively promote the progress of enterprise intelligent manufacturing. Through continuous improvement, the closed-loop optimization of product design, process, manufacturing, management, logistics and other aspects of product life cycle is realized, and the rapid improvement of enterprise digital design, intelligent equipment upgrading, process optimization, waste and no production, visual management, quality management, traceability and intelligent logistics can be realized.

The two kinds of neural networks are tested and evaluated from the aspects of network attribute, topological structure and parameter updating method. After training, the neural network can be tested. Under the condition of short training period, it can achieve the ideal training test with high adaptive accuracy, low memory requirements generalization and high generalization of test samples.

In this paper, the machine learning neural network model combined with the research data, from the company's own point of view, the overall evaluation of the intelligent manufacturing system, and the company's level of comparative analysis, put forward the overall plan to promote intelligent manufacturing, the company formulated. Intelligent manufacturing system has proved its value, that is, feasibility and effectiveness.

Ethical approval

This article does not contain any studies with animals performed by any of the authors. This article does not contain any studies with human participants or animals performed by any of the authors.

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Informed Consent

Informed consent is not required for this article.

Authorship contributions

Xianwang Li: Conceptualization, Methodology, Software

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