

Research Article

Research and Implementation of the Text Matching Algorithm in the Field of Housing Law and Policy Based on Deep Learning

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Machine learning enables machines to learn rules from a large amount of data input from the outside world through algorithms, so as to identify and judge. It is the main task of the government to further emphasize the importance of improving the housing security mechanism, expand the proportion of affordable housing, increase financial investment, improve the construction quality of affordable housing, and ensure fair distribution. It can be seen that the legal system of housing security is essentially a system to solve the social problems brought by housing marketization, and it is an important part of the whole national housing system. More and more attention has been paid to solving the housing difficulties of low- and middle-income people and establishing a housing security legal system suitable for China's national conditions and development stage. Aiming at the deep learning problem, a text matching algorithm suitable for the field of housing law and policy is proposed. Classifier based on matching algorithm is a promising classification technology. The research on the legal system of housing security is in the exploratory stage, involving various theoretical and practical research studies. Compare the improved depth learning algorithm with the general algorithm, so as to clearly understand the advantages and disadvantages of the improved depth learning algorithm and depth learning algorithm. This paper introduces the practical application of the deep learning model and fast learning algorithm in detail. Creatively put forward to transform it into an independent public law basis or into an independent savings system.

1. Introduction

The so-called deep learning is a kind of learning network which superimposes the number of hidden layers on the basis of neural network. Deep learning was born with the development of information age. Machine learning enables machines to learn rules from a large amount of data input from the outside world through algorithms, so as to identify and judge [1]. Deep learning architecture is composed of multilayer nonlinear arithmetic units, and the output of each lower layer serves as the input of higher layer, which can learn effective feature representation from a large number of input data, and the learned high-order representation contains much structural information of input data [2]. In case of unemployment, illness, disability, widowhood, aging, or loss of earning ability under other circumstances beyond

control, they have the right to enjoy security. Housing security is an important content to solve the people's livelihood problems, which affects the vital interests of the broad masses of people [3]. The digitization of information has brought breakthroughs in people's access to information, especially the emergence of a large number of digital processing tools, which greatly improves people's ability to obtain and process information. Automatic text categorization refers to the use of computers to automatically categorize text sets according to a certain categorization system or standard. Texts belonging to the same category are marked with the same category tag, providing a systematic solution for text information retrieval [4].

As the so-called "food, clothing, housing, and transportation", housing is one of the essential material conditions for human survival and development. The housing

problem is a major socioeconomic problem for any country in the world, and the right to housing is a basic human right of human beings [5]. Therefore, the importance of improving the housing security mechanism is further emphasized, and expanding the proportion of affordable housing, increasing financial input, improving the quality of affordable housing construction, and ensuring fair distribution are clearly the main tasks of government work [6]. Although China has established a market-oriented housing sales market and fully developed the commodity value of housing, it has neglected housing as the basic element of people's life. It contains the connotation of the right to life, which is the cornerstone of human rights [7]. In-depth learning can be understood as the development of neural networks, which abstract and model the basic features of human brain or biological neural networks, can learn from the outside environment and adapt to the environment in a similar way to the interaction with life [8]. Chinese word segmentation has always been a difficult problem in natural language processing. It not only consumes machine time, but more importantly, the accuracy of existing methods is far less than 100%, which further affects the accuracy of classification [9].

With the development of the times, computers have penetrated into various fields of human society more and more widely. The traditional way of working with pen and paper is being replaced by digital computers. To solve this problem, we propose a reverse matching algorithm for keywords, which can be processed in terms of words, while avoiding the difficult problem of word segmentation. From the experimental results, it can be compared with the current mainstream technology [10]. The main idea of text dynamic matching algorithm is to adopt the matching strategy from the whole to the local and use the dynamic programming algorithm to match characters without relying on character positions [11]. The learning methods used for in-depth learning mainly focus on the useful representation of the learning data. In the higher level of the neural network, the learning characteristics do not change with the changing factors and are more robust to sudden changes in the actual data [12]. It can be seen that the legal system of housing security is essentially a system to solve the social problems caused by the housing market, and it is an important part of the whole national housing system. Particularly with the rapid progress of urbanization, industrialization, and marketization in China, the scale of the resident population in cities and towns continues to expand, and the price of commodity housing remains high [13]. More and more attention has been paid to solving the housing difficulties of low- and middle-income people, establishing and perfecting the legal system of housing security that is suitable for China's national conditions and development stages.

2. Related Works

In order to improve people's welfare, alleviate housing conflicts and social conflicts, and maintain social stability, governments of all countries have actively intervened in housing problems. Fan et al. completely put forward the

backpropagation algorithm for artificial neural network, which injected new blood into the research of machine learning [14]. Duan et al. put forward the idea of initializing each layer of neural network by unsupervised learning and tried to understand the reasons why unsupervised learning helps the deep learning process. This paper studies the reasons why the original training process of deep structure neural network failed [15]. Document Article 25, paragraph 1, of the Universal Declaration of Human Rights issued by the United Nations General Assembly clearly states that "Everyone has the right to a standard of living necessary for the health and well-being of himself and his family, including food, clothing, housing, medical care, and necessary social services" [16]. The document puts forward the concept of deep belief network and a new training method, which overcomes the bottleneck of the training of neural networks, and initiates the upsurge of research on neural networks [17]. Guidelines for training methods of neural networks with different kinds of depth structures are given in [18]. The in-depth learning method has been successfully used in text data learning tasks and visual recognition tasks.

Buhler et al. put forward the concepts of deep network and deep learning in the articles published in famous academic journals, which started the research upsurge of deep learning [19]. Pleasence et al. pointed out that the Declaration on Housing Human Rights adopted at the International Symposium on Urban Housing held in London also pointed out that a house with a good environment and being suitable for people is the basic human right of all residents [20]. Hao et al. found that the information processing of the visual system is hierarchical in the visual cortex, which stimulated the exploration of the information processing mechanism of the nervous system: the working process of nerve center brain, that is, through low-level abstraction from the original signal, and gradually iterative to high-level stage [21]. Litjens et al. proposed a Perceptor model that can classify some simple shapes, which triggered the first wave of neural network research. However, its feature extraction layer is artificially constructed, and the single hidden layer structure limits its learning ability, making it contrary to intelligent perception [22]. The unsupervised learning algorithm for deep trust network proposed solves the problem of deep learning model optimization [23]. The most effective normative legal documents related to housing security are only department rules, and their provisions are vague and lack operability. Although they leave a large space for local legislation, there are many and imperfect normative documents related to housing security.

3. The Development Status of Deep Learning

3.1. The Advent of Deep Learning. In the computer field, deep learning is often applied to algorithm improvement. Strictly speaking, the emergence of deep learning is due to the development of neural networks. Nowadays, many learning methods are shallow structure algorithms, which have some limitations [24]. For example, in the case of limited samples, the ability to represent complex functions is limited. For complex classification problems, its generalization ability is

limited to a certain extent. When representing a specific input distribution, some structures of complex functions are incompatible with each other [25]. All samples come from Sina, Sohu, NetEase, and Tencent. Since the pages on these websites are already well categorized, we only need to download them to the local computer with an offline browser for the next step of preprocessing. Deep learning is multilevel learning, as shown in Figure 1.

Generating deep structure is a kind of deep structure that realizes pattern classification by learning the high-order correlation of observed data or the statistical feature distribution between observed data and associated categories. A typical Boolean query is one based on simple metamatching. It has the advantage of being easy to implement, but because of the different types of documents and scenes being queried.

For real estate enterprises to build and operate low-income houses according to government standards, the government will reduce relevant fees and taxes, provide discount loans, and provide low-cost public land to reduce costs. Other researchers have defined the legal system of public housing from the perspective of public housing policy: China's public housing law regulates and restricts the acquisition of land for public housing construction, supply, distribution, transaction, service and management of public housing, and the financial support and government subsidies of public housing. This is because the principle of a country ruled by law not only provides basic transaction stability for market economy but also reflects the self-control of state power under market economy conditions. The reason why this greedy learning algorithm can be better extended is that it trains each layer of the deep structure separately so that the parameters of each layer are close to the optimal parameters. Improve the accuracy of deep learning algorithm and deep learning algorithm to compare images during training. Figures 2–5 are shown.

However, the practice found that the algorithm still has limitations, and the most important problem is the “gradient explosion” problem; that is, the farther away from the output layer of the neural network system, the more difficult to train the parameters, and the more the layers are, the more obvious this problem is. Understanding and processing the received information is an important part of human cognitive activities. Because the structure of these pieces of information is generally complex, it is necessary to construct a deep learning machine to achieve some human cognitive activities.

3.2. The Tortuous Development of Neural Networks. Deep learning is a research direction with abundant technologies and models in the field of machine learning, which represents a kind of machine learning method that uses deep neural network to achieve data fitting. As a result, the neural network has completed the transition from shallow network to multilayer deep network, from which the concept of deep learning was born, and it is more and more widely used in various fields. In recent years, there are more keywords and published literature trends in the field of in-depth learning as shown in Figure 6.

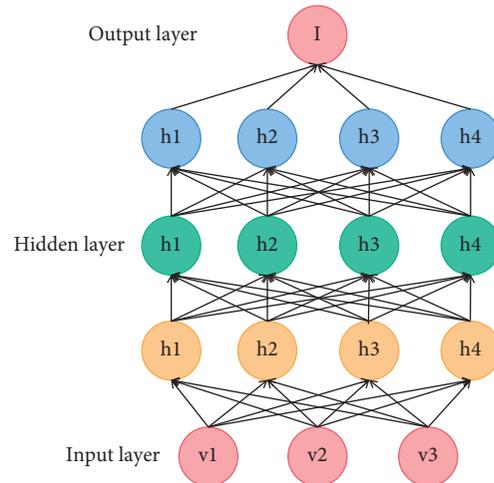


FIGURE 1: Schematic diagram of deep learning with multiple hidden layers.

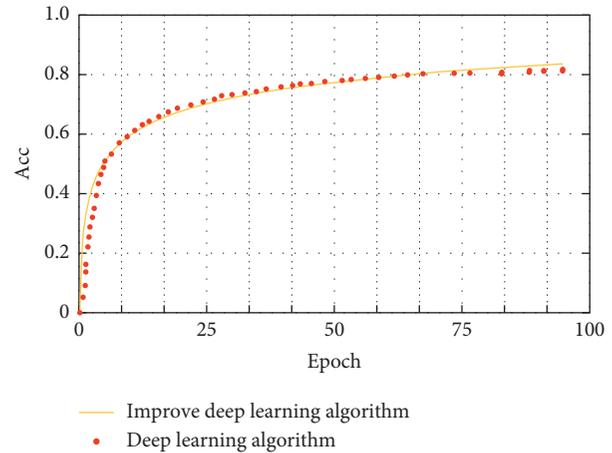


FIGURE 2: Improved deep learning algorithm and deep learning algorithm comparison image.

A group of local cells in the upper layer serve as the input of the adjacent cells in the next layer. This view of local connection originated from the perceptron. Some experiments and research results prove that unsupervised pretraining has great advantages over random initialization. Unsupervised pretraining can not only initialize the network to get good initial parameter values but also extract useful information about input distribution, which helps the network find a better global optimal solution. Because of its strong social policy purpose, the legal system of housing security has more uncertainty and variability than other basic national laws such as civil law and criminal law.

China's housing security system is a housing supply system based on affordable housing. Different housing supply policies are implemented for different income families. The lowest-income families rent low-rent housing provided by the government or units. To this end, a management department specially responsible for public housing construction has been set up, whose duty is to lead the construction of affordable housing. Applicants who have

built good housing can stay with less rent, and the remaining subsidies are paid by the federal government. The deep structured neural network has a deep nonlocal learning structure, which can learn features in data sets with great changes from fewer samples, and shows stronger feature recognition ability than the kernel method. At the top two levels, the weights are connected so that the lower output will either provide a reference thread or be associated with the top so that the top will link it to its memory. This project is coled by the world's leading experts in large-scale computer systems by the Director of the prestigious Stanford University Artificial Intelligence Laboratory. The computing platform trains a machine learning model called the deep neural network, as shown in Figure 7.

Therefore, how to use massive data to train model parameters and make the training results reach the peak of accuracy is the difficulty of deep learning. Different features of the previous feature map can be extracted by convolution with different convolution kernels, and these feature maps representing different features can be used as the input data of the next subsampling layer. The model will have a sliding window size up and down during training. The model maps the intermediate words to the word vector, directly uses the word vector of the intermediate words as the hidden layer, and incorporates several feed-forward neural networks to predict multiple words before and after. The calculation process is as follows:

$$\begin{aligned} y_{t-2} &= b_{t-2} + W_{t-2}x_t, \\ y_{t-1} &= b_{t-1} + W_{t-1}x_t, \\ y_{t+1} &= b_{t+1} + W_{t+1}x_t, \\ y_{t+2} &= b_{t+2} + W_{t+2}x_t. \end{aligned} \quad (1)$$

On the other hand, each word of the model can be trained multiple times, while each word of some language models can only be trained once.

However, the number of articles published tends to be stable, which shows that the number of researchers is basically saturated, the increment tends to be stable, and the deep learning research is carried out in an orderly manner.

4. Suggestions on Perfecting China's Housing Security Legal System

4.1. A Special Housing Security Law Should Be Formulated to Improve Supporting Regulations for Housing Security. Looking at the history of the establishment and development of housing security system in all countries in the world, all of them have legislation first and sound laws. However, from the current legislative situation in China, there is no unified housing security law at first, which is not suitable for the objective needs of the development of China's social security cause. From the point of view of means, it can be divided into direct compensation and indirect compensation. Direct subsidy means that the government directly acts on the housing tenants through financial subsidies and tax relief. At the same time, when investigating the relationship between housing security and market economy, economists have

noticed that the housing security system may destroy the housing market economy. However, they often stay at the level of abstract analysis and interpretation through mathematical models and do not analyze how to avoid the possibility of destroying the housing market economy from the specific normative design. Generating units can initialize model parameters to an approximate optimal solution for highly nonlinear parameter estimation problems, effectively controlling model complexity. In convolution neural networks, the feature extractor is usually composed of several convolution layers and pooling layers that overlay each other. The process of convolution and pooling can continuously reduce the feature map, but it also results in an increase in the number of feature maps.

Microsoft Research Asia has further deepened this achievement and established some huge deep neural networks, which are the largest similar models in the history of speech recognition research. However, there are still many problems to be solved in the field of deep learning at present, and further research is needed in five aspects: theoretical analysis, data representation and model, feature extraction, training and optimization, and research expansion. Obviously, the larger the vocabulary, the longer the classification time, but the too small vocabulary may miss some keywords, which will also affect the accuracy of classification. Select the keywords to be obtained through a large number of statistical data. The matching question expression consists of the logical relationship between the question word and the question word. When the system receives a user query, it first finds the same topic in the inverted text according to the question, takes out the document collection, and then performs the set operation according to the logical relationship in the question expression. Therefore, a unified housing security law should be enacted as soon as possible, and more detailed provisions should be made on the modes of housing security, the supervisory agencies of housing security, and the prevention of financial risks of housing security.

4.2. Legislative Principle. Housing security is one of the important components of the social security system. We know that the social security system arrangement belongs to the distribution of public goods and public resources in the public domain. Therefore, easing social unfairness and creating and maintaining social fairness are the basic starting point of social security system arrangement and the basic destination of social security policy implementation. As long as there are tax breaks, loans with extremely low interest, and financial allocations, the government will encourage developers to build low-cost public housing. Social rental subsidy is also known as market rental housing subsidy. Finally, financial aid refers to the housing security system that accomplishes the task of housing support through financial means such as compulsory savings and preferential interest loans. It should be pointed out that financial aid is also subject-funded in nature because it directly provides money to the recipient, thereby directly enhancing the ability of the recipient to pay in the real estate market. The

training time of deep neural network is too long and it is easy to fit, which makes the model modeling and generalization ability poor. How to transform the training algorithm of deep neural network to make it quickly converge to the optimal solution. Therefore, the training time is greatly reduced, and the model promotion performance is good, which is an important problem to be solved.

The whole network only needs to learn the difference between input and output, which simplifies the learning goal and difficulty and solves the problem of information loss and loss in information transmission to a certain extent. Then, the input of the visual layer is randomly selected to try to reconstruct the original input signal. Another possible answer is that the number and structure of local extremum change qualitatively with the increase of the depth of deep structure neural network, which makes it more difficult to train the model. Effectively improve the efficiency of the algorithm; from the experimental situation, the speed of operation is acceptable. Documents are considered equally important, rather than sorting their output by relevance. Secondly, through historical analysis and normative analysis, it comprehensively explains the existing problems of China's housing security system, especially the tension with market economy. Although there are differences in fairness between different countries and different modes of housing security legal system arrangements, the original intention and implementation process of this system are based on the principle of fairness.

5. Matching Algorithm

5.1. The Basic Idea of the Algorithm. Matching algorithm and deep learning are both forms of artificial intelligence. To be exact, deep learning is a definite form of machine learning. Both matching algorithm and deep learning start from training and testing the model and find a weight through optimization to make the model better. Both can deal with digital (regression) and nondigital (classification) problems, although in many application fields such as object recognition and language translation, depth model is often more suitable than matching algorithm model.

The basic idea of the matching algorithm is very simple: first, construct a classification topic word list with weights, then take out keywords from the list in turn to the text to be classified for pattern matching, and add the weights corresponding to the words if the matching is successful. It can be seen that the ideal query method is that users have an accurate understanding of the contents of the query, have an accurate understanding of the contents of each document in the document set, match them one by one, and then output them in order from high to low. The accuracy and cross-entropy loss of training set and verification set in matching pyramid model and multichannel matching pyramid model vary with the number of training rounds. The horizontal coordinate is the number of training rounds, and the vertical coordinate is the loss of accuracy and cross-entropy, respectively. The main reason is that the Match Pyramid model records matching information with only one channel, resulting in the loss of information. The multichannel

matching pyramid model shows a strong learning ability, but there is a problem of fitting due to the increase of more parameters. Figures 8–11 are shown.

Dynamic programming is an effective design method compared to the exhaustive method, and its guiding ideology is to dynamically select the result that may produce the best solution, thus greatly reducing the amount of calculation. Dynamic programming follows the principle of “best principle”; that is, regardless of the previous state and strategy, the latter optimal strategy only depends on the current state determined by the initial strategy. In addition, the unsupervised layer-by-layer training process can help the training in-depth learning model, but experiments show that training still falls into local extremes and cannot effectively utilize all the information in the dataset. Can we propose more effective optimization strategies for in-depth learning to overcome this limitation?

Whether the strategy based on continuous optimization can be used to effectively improve the training process of deep learning needs to be further studied. For each neuron, a corresponding receiving domain is defined, which only receives signals from its own receiving domain. By combining multiple mapping layers, the relationship between layers and information in the spatial domain can be obtained, which is convenient for image processing. A fully connected network structure is one of the most basic methods in a deep learning network, which is often used for feature extraction and classification recognition in the early days. However, its neighboring layers are closely related, and the parameters of the fully connected layer structure are the most, which requires a large amount of storage and computing space. Different stages of housing development, different residents' security needs, different modes of security on the financial requirements of the government, the impact on the market mechanism, and the fairness of security are all different, showing a diversity of characteristics, which should coexist in a variety of forms. Since words are taken out of the dictionary and matched in the text, this process does not require word breaking, as opposed to the general matching process.

5.2. The Construction of the Thesaurus. The construction of thesaurus affects the performance of this classification technology from two aspects. One is the running speed of the system. The second is the accuracy of classification. It is difficult to achieve all the ideal states, so we can think about adopting a method that approximates the ideal state, that is, based on the full-text keyword matching, and then using the Chinese word segmentation method to recognize the context of the document and the whole document. Chinese grammar, context, and the way people simulate understanding semantics are also identified using statistical methods to calibrate the results of keyword matching. In the future, it is necessary to investigate whether there is a complete online learning process for training in-depth learning that can always have an unsupervised learning component. The calculation of LSTM at each time step is as follows:

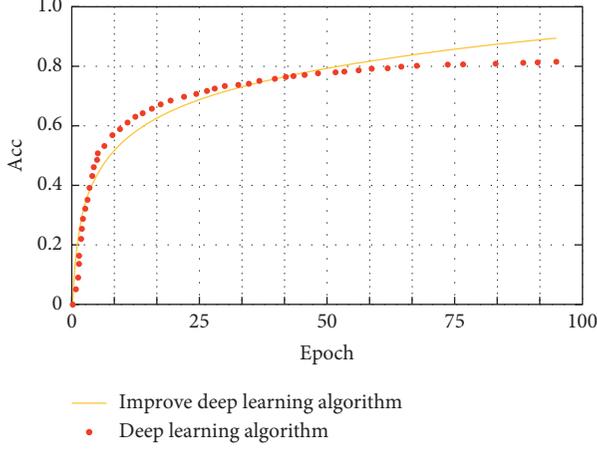


FIGURE 3: Accuracy of images during different training periods.

$$f_t = \sigma_1(w_1[x_t, h_{t-1}] + b_1), \quad (2)$$

$$i_t = \sigma_1(w_2[x_t, h_{t-1}] + b_2), \quad (3)$$

$$o_t = \sigma_1(w_3[x_t, h_{t-1}] + b_3), \quad (4)$$

$$c_t = f_t^* c_{t-1} + i_t^* \sigma_2(w_4[x_t, h_{t-1}] + b_4), \quad (5)$$

$$h_t = o_t^* \tanh(c_t). \quad (6)$$

Formulas (2)–(6), respectively, represent the forget gate, input gate, output gate, and memory sheet. h_t is the hidden layer vector output at the t th time step, wherein w_1, w_2, w_3, w_4 represent the weight parameter of each corresponding part and b_1, b_2, b_3, b_4 represent the offset parameter of each corresponding part.

The neural network using permutation coding technology has achieved the same performance as some special classification systems in face recognition, handwritten numeral recognition, and small object recognition. After in-depth learning was proposed, it has been widely used in all fields of artificial intelligence research and has achieved good results. Particularly in the five areas of image, voice, video, text, and data analysis, the application effect is particularly obvious, but in-depth learning involves more than these areas.

The background, theoretical basis, typical deep learning models, fast learning algorithms, the latest progress, and practical application of deep learning are introduced in detail. Creatively put forward; either transform it into an independent foundation in public law or transform it into an independent savings system. With the commercialization of housing in the market economy of reform and opening up, the raw materials for the construction of commercial housing have risen. As some residents are still not rich and cannot afford the rising high housing prices, in order to maintain social stability and reflect social fairness, the government has made low-income people have housing, which has led to the emergence

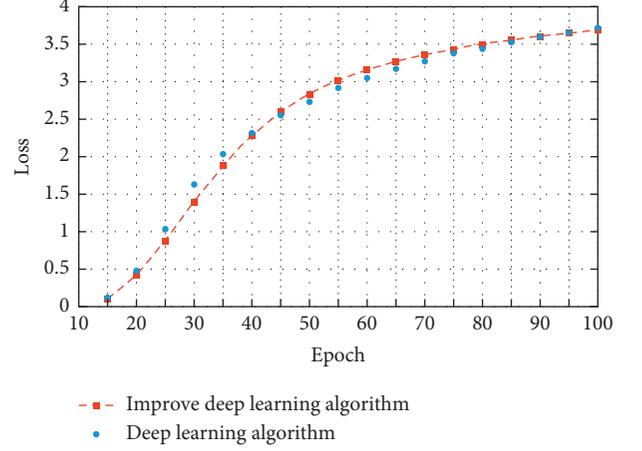


FIGURE 4: Comparison of image accuracy between the two algorithms during training.

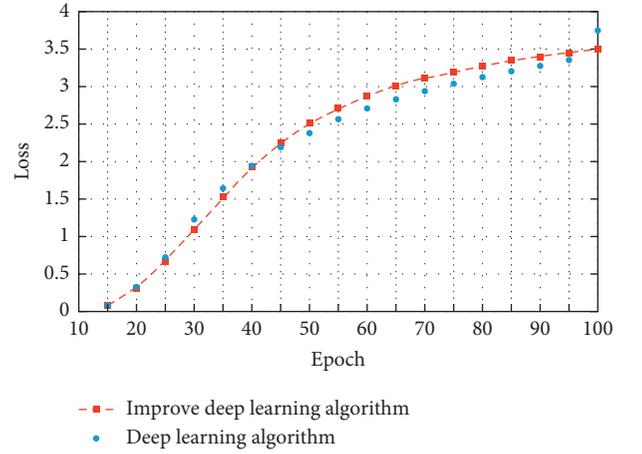


FIGURE 5: Comparison between depth learning algorithm and improved depth learning algorithm.

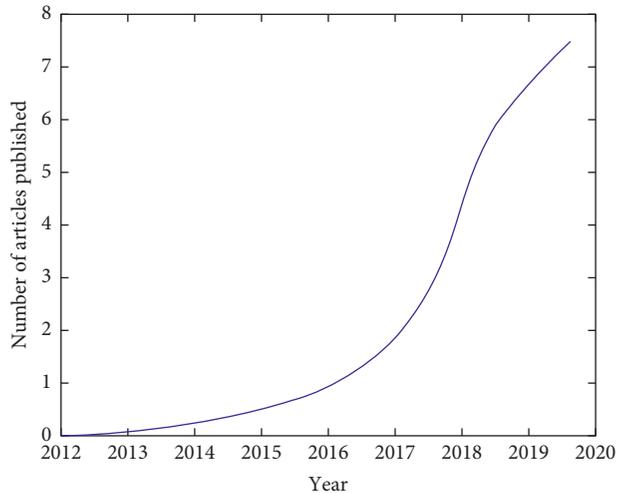


FIGURE 6: Trends in the number of papers published on deep learning topics.

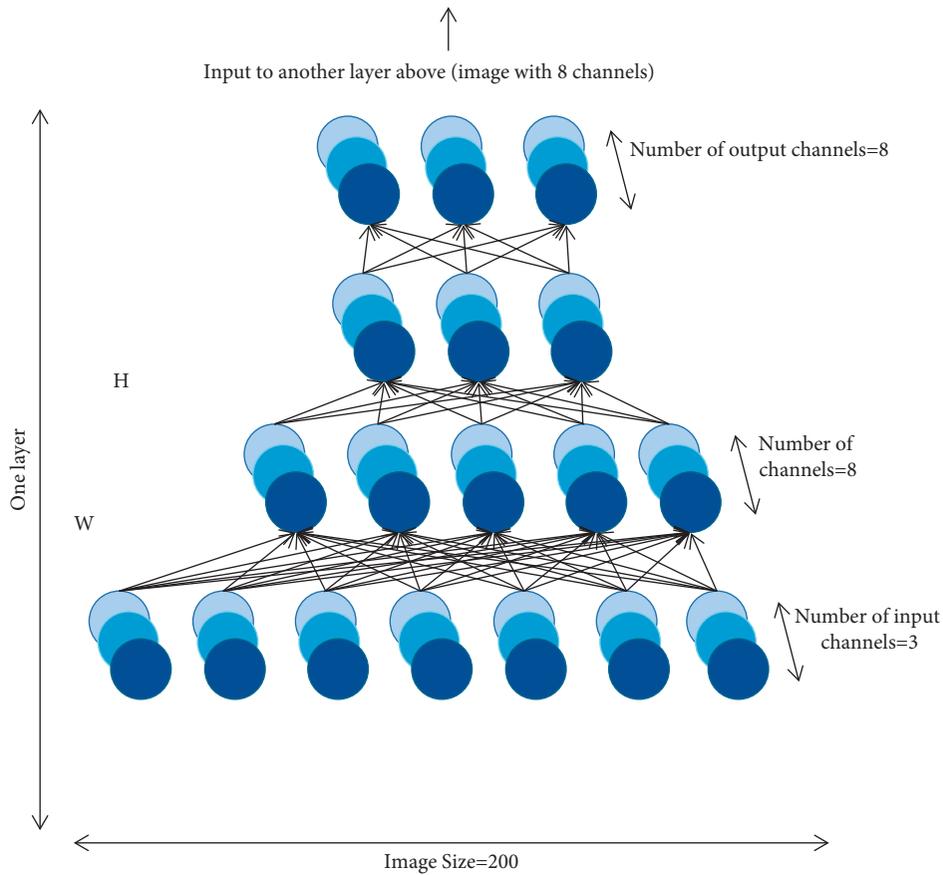


FIGURE 7: A subnetwork of a deep autoencoder.

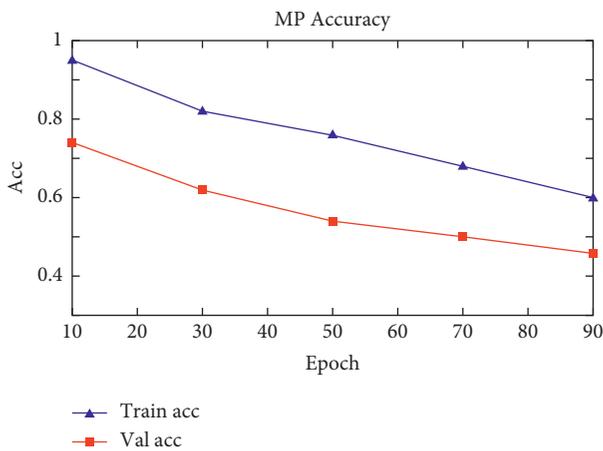


FIGURE 8: MP and MCMP accuracy rate and loss comparison images.

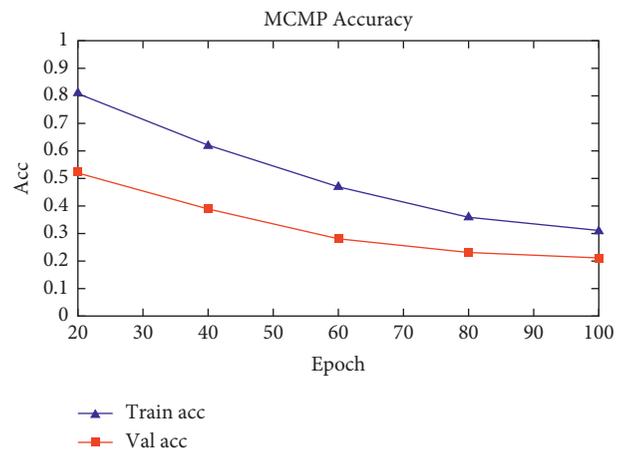


FIGURE 9: Comparison of accuracy and loss between MP and mcmp under different parameter backgrounds.

of the housing security system. In this way, the “Sandwich class” households between low and middle income and the lowest income, as well as a large number of migrant workers, are not guaranteed, and there are no detailed and scientific regulations on how income standards are

divided. At present, there is no particularly good way to determine each weight value. It can only be determined by repeated experiments, step-by-step adjustment of the weight by computer using the hill-climbing method, and finally manual intervention.

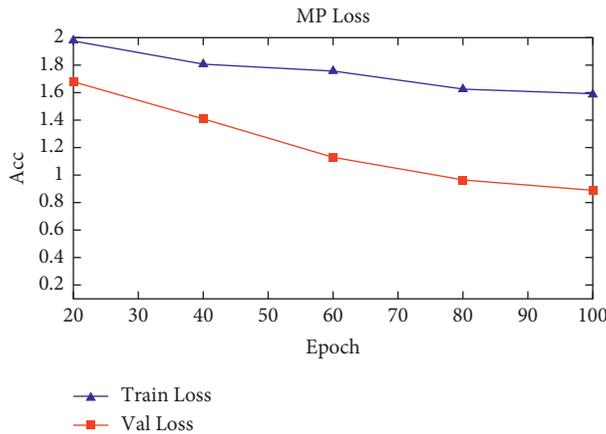


FIGURE 10: MP and MCMP accuracy rate and loss comparison images.

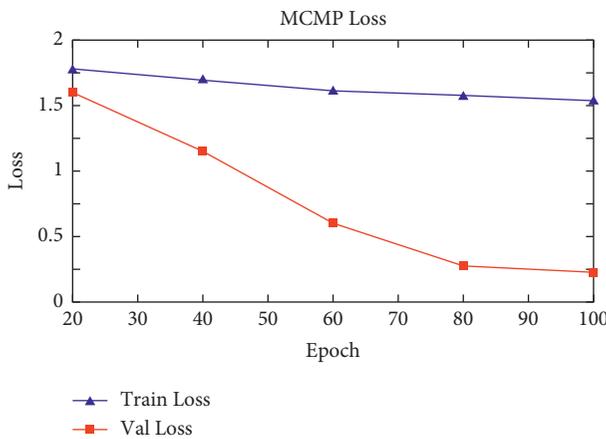


FIGURE 11: Comparison of accuracy and loss between the two models.

6. Conclusions

The greedy unsupervised layer-by-layer learning algorithm better solves the efficiency problem of deep learning and allows deep learning to better realize the effective modeling of multiple types of complex intelligence problems. In recent years, it has been widely researched and applied in many fields. As far as the aforementioned learning network architecture is concerned, as the number of intermediate hidden layers becomes more and more, people's demand for large-scale effective data and high-performance computing power is also increasing. Moreover, there is a growing demand for future hardware research, which also puts forward new requirements for deep learning equipment. The classifier based on a matching algorithm is a promising classification technique. The research on the legal system of housing security is currently in the exploratory stage, and this aspect involves a variety of theoretical and practical research. In recent years, China's construction of rule of law has been making great strides, but the construction of the housing security legal system is slow, and the special housing security law has not been issued. The real estate market can

be said to be the most important economic field of a country, and its success or failure is often directly related to the stability of a country's political power. Thus, a diversified legal system of housing security is formed, with the new low-rent housing system as the core, supplemented by the necessary financial support and financial support.

Data Availability

The 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.

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