Intelligent Algorithm of Semantic Analysis Based on BP Neural Network

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Abstract. With the growth of scientific and technological information technology and the rapid popularization of the Internet, network big data and information technology are also growing rapidly. Information technology provides people with more information, and it also significantly increases the operating and management costs of my country's Internet companies. In order to solve this problem thoroughly, people propose a new type of it development, research and business model, namely BP neural network technology. At present, BP neural network technology has been widely used in various application fields such as network storage, search engines, distributed computers, e-commerce, social networks, and has achieved rapid growth. This article mainly adopts the method of organically combining theoretical exploration and empirical research, and systematically analyzes the data collected through research based on the views and research contents of some scholars in recent years. Combining with the analysis of the data of intelligent semantic analysis algorithm, some relevant characteristics of BP neural network are summarized. This article mainly focuses on the research of an intelligent algorithm for image semantic analysis for image processing. The semantic analysis intelligent algorithm can well change the situation of target detection difficulties. This article uses an intelligent algorithm based on BP neural network to automatically analyze and distinguish differences. The final results of the research show that this paper uses the attention model and proposes a semantic analysis algorithm combined with graphic target detection through a multi-scale segmentation network. The experiment shows that the three performances of attention are 71.6, 56.5 and 49.3, which can be learned this algorithm is better than the same comparison algorithm in terms of three performance evaluation indexes.

Keywords: Neural network · Data analysis · Semantic analysis · Target detection

1 Introduction

With the development of Internet technology step by step to the present, computer technology has gradually matured. Using computer technology can solve some tedious and complicated problems. Computer technology is a field that can cover many fields, such as using computer technology to process digital images and videos and gain a higher level of understanding. In terms of mechanical manufacturing and application, it can automate

I. Ahmad et al. (Eds.): STSIoT 2021, LNDECT 122, pp. 497–504, 2023.
https://doi.org/10.1007/978-981-19-3632-6_60

humans to complete tasks that can be accomplished by visual systems. Computer vision includes the following methods: capturing, editing, identifying, and processing digital images. In addition, if digital information and symbolic expressions are to be generated, large-scale data must be drawn from real-world networks [1]. Semantic image analysis is mainly a basic analysis method based on computer vision processing technology. It involves semantically divided regions belonging to different objects. Semantic analysis and object detection technology play a vital role in the understanding of images, and they also have an indispensable position in our real life.

In recent years, many researchers have conducted in-depth research on the semantic analysis intelligent algorithm of BP neural network and achieved good practical application results. For example, ConjetiS believes that the BP neural network system is a parallel and distributed processing structure, composed of the interconnection between two processing units and a combination of directions called the connection signal path. These processing units have local memory and perform local operations. Each processing unit contains a single input and link. This input link can rely on one or more different inputs and branch into multiple parallel links according to its needs [2]. CarboJ believes that the BP neural intelligent network algorithm is very helpful for semantic analysis. The algorithm has strong adaptability and adaptability. It has brought very fast and effective advanced algorithms for the development of human science. It should be popularized in semantic analysis. In application [3]. At present, there are many researches on BP neural network semantic analysis algorithm. These previous theories and experimental results provide a theoretical basis for the research of this article.

This paper analyzes image semantic analysis combined with BP neural network. BP neural network not only improves the performance of semantic image analysis and classification, but also makes good progress in part of the work of structured production. This progress includes determining demarcation targets and forecasting key points. The next step from rough to subtle inference is of course to predict each pixel. Therefore, the BP network once again promotes the development of semantic image analysis, especially in more complex scenes and large-scale data sets, the performance of the analysis far exceeds the traditional methods [4]. Although the BP neural network has the ability to automatically process deep features, due to its numerous features, the existing semantic analysis methods based on the BP neural network still have some challenges.

2 Related Characteristics of BP Neural Network and Network Model Analysis

2.1 Basic Characteristics of BP Neural Network

(1) Non-linear mapping capability

BP neural network technology is essentially a mapping function that performs input and output at the same time. Relevant theories have confirmed that BP neural network technology can approach any nonlinear continuous function under different accuracy [5]. In terms of calculation and mathematics, the traditional BP neural network is actually a method of local search and optimization. It needs to deal with and study how to solve complicated nonlinear related problems. As the weight of

the Internet gradually adjusted to local changes. When he falls to the end of the local minimum, the weight will quickly converge to the local minimum, causing pure training to fail. In addition, the neural network BP is also very sensitive to the initial weight of the network. Networks with different weights tend to converge at different low positions.

(2) The convergence speed of the BP neural network algorithm is slow

The original algorithm of the intelligent algorithm in the BP neural network is the italicity algorithm. Therefore, "sawtooth effect" will inevitably occur, resulting in lower efficiency of the BP algorithm. And because the optimized objective function is so complicated [6, 7]. In the BP neural network model, the weight and error change very little, which leads to the BP neural network model in the training. In order to enable the entire network to run the BP algorithm, the traditional one-dimensional search method cannot use the step size of each iteration, but has given the network step size update rules. This method will also lead to inefficient algorithm, all of which lead to BP The neural network algorithm converges slowly [8, 9].

2.2 Fusion of BP Neural Network Model

The merging of BP neural network models is to merge the results of multiple models using a specific algorithm, so that the merged result has the advantages of multiple models, and at the same time eliminates the shortcomings of each model. Using a more appropriate model fusion algorithm, the final performance will be better than that of any sub-model [10, 11]. In this paper, three BP neural network model algorithms are applied, and the division performance of the three algorithms is compared through experiments. BP neural network model fusion methods can be simply divided into learning methods and non-learning methods. The learning method is to linearly weight the feature score-cards of all sub-models through the learned weights. The difference from the above linear combination method is that this method is not needed, just in the test phase, after normalizing the feature score map of all models, each element takes the maximum value or the average value [12].

3 Research on Experimental Preparation of Intelligent Algorithms for Image Semantic Analysis

3.1 Experimental Method

The main method used in this article is to study the BP neural network model. In actual economic activities, the activation of BP neural network parameters plays a decisive role in the training speed of the model. If the initial parameters are close to the target parameters, the training model is easier to converge. The parameters are very different from the target parameters, so training the model will be more difficult. Take the two-channel BP neural network with attention network as the main structure proposed in this paper as an example. This article uses a two-stage training method, that is, the training task is divided into two stages. The results obtained from the first stage training serve the second stage. Experiments verify that this method can effectively improve the training accuracy of the model and reduce the training of the model.

(1) Differential network semantic segmentation algorithm

The perception of BP neural network refers to the size of the area corresponding to the original image of the element in the output feature map of each layer. The size of the receptive field is determined by the size of the nucleus and the step length at the same time, so the size of the receptive field of the first layer of pixels is R^l:

$$R^l = R^{L-1} + \left(K^l - 1\right)S^l \tag{1}$$

(2) Where S^l and S^l are the core size and step length of the first layer, respectively. According to the formula from back to front, the receptive field of any neuron in the final classification layer relative to the input image is called the receptive field of the entire FCN network. If the network has L layers, then

$$R^{FCN} = R^L \tag{2}$$

Assuming that the size of the input image of the FCN network is h_0 (that is, the width or height of the image), then the size of the feature map output by the first layer (the width or height of the feature map)

$$h_l = \left[\left(h_0 - R^l\right)/S^l + 1\right] \tag{3}$$

3.2 Experimental Data Collection

This paper establishes a semantic model under BP neural network to achieve balanced results. First, the relevant elements of BP neural network and the important links that must be considered in the research process of semantic analysis model configuration are explained. Several commonly used objective functions are analyzed to facilitate the selection of the best operation objective. In order to facilitate the establishment of the model and the research of the problem, combined with the analysis of the objective function and the theoretical summary of the BP neural network management, the model assumptions are made. Finally determine the objective function of this article, the test object is the performance comparison of different methods in the new test set.

4 Experimental Study on Image Semantic Analysis of BP Neural Network

4.1 Performance Comparative Analysis of Different Methods Used in the Test Set

Table 1 shows the three evaluation indicators of average pixel accuracy (pixel accuracy), class average pixel accuracy (mean accuracy) and average iou (region intersection over union) to show the different accuracy splits in the newly released test set of pascalvoc 2012 Algorithm to judge.

According to the data shown in Fig. 1, the evaluation results of different segmentation algorithms under the MSCOCO2014 test set are shown. The segmentation algorithms include: BP neural network (FCN), cavity pyramid module (ASPP) neural network,

Table 1. Performance comparison analysis of different methods used in the test set (%)

Algorithm	Pixel accuracy	Mean accuracy	Region intersection over union
FCN	68.5	52.7	42.1
ASPP	68.2	51.6	52.5
Attention	71.6	56.5	49.3
Ours	73.5	60.5	51.1

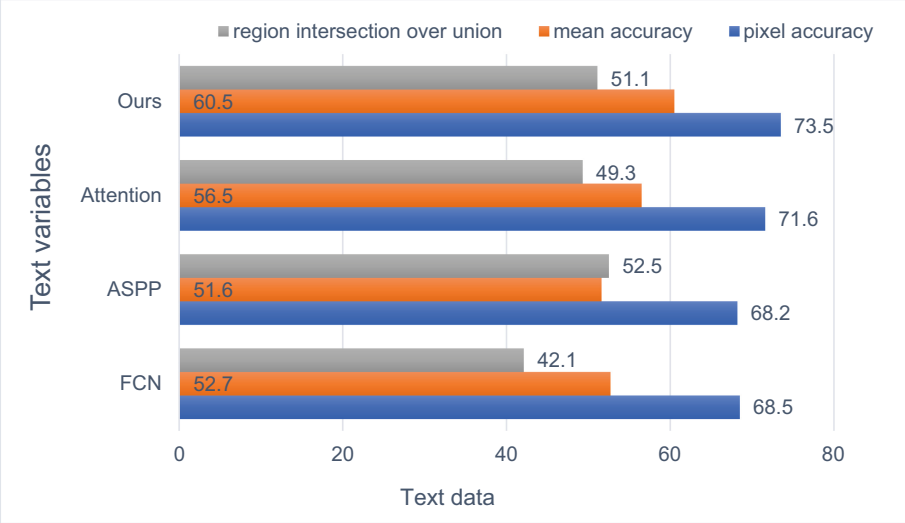

Fig. 1. Performance comparison analysis of different methods used in the test set (%)

using Attention model combined with multi-scale The segmentation network and the semantic analysis algorithm combined with graphic object detection proposed in this article, the three performances of FCN are 68.5, 52.7 and 42.1, the three performances of ASPP are 68.2, 51.6 and 52.5, and the three performances of Attention are 71.6, 56.5 And 49.3 It can be seen from the table that the algorithm in this chapter is better than the comparison algorithm in the three evaluation indicators.

4.2 Attention Performance Comparison Analysis

By comparing the performance advantages of Attention, it is compared with traditional algorithms for performance testing and analysis, and testing from the three aspects of propagation speed, memory usage and model size (Table 2).

According to the data in Fig. 2, it can be concluded that Attention has achieved a good balance between accuracy and speed. Attention's operating speed is obviously beyond the classic methods such as FCN, ASPP, Deeplab, etc. The forward and backward propagation speeds are 485ms and 612ms respectively, and the memory footprint and

model size are relatively small, only 1732M and 82M. Attention The feature re-use is completed by feature addition, which is similar to the FCN approach. In addition, this method is also conducive to the propagation of the loss value in the network. The calculated loss value can be directly transferred from the back layer to the front layer, thereby avoiding the problem of gradient disappearance, which allows the network to train more BP layer.

Table 2. Attention performance comparison analysis table

Algorithm	Forward propagation (ms)	Backpropagation (ms)	Memory footprint (M)	Model size (M)
FCN	412.5	498.71	1123	123
ASPP	115.06	172.73	1985	165
Attention	485	612	1732	82
Ours	325	454	1885	886
DeepLab	47.1	71.91	1853	87

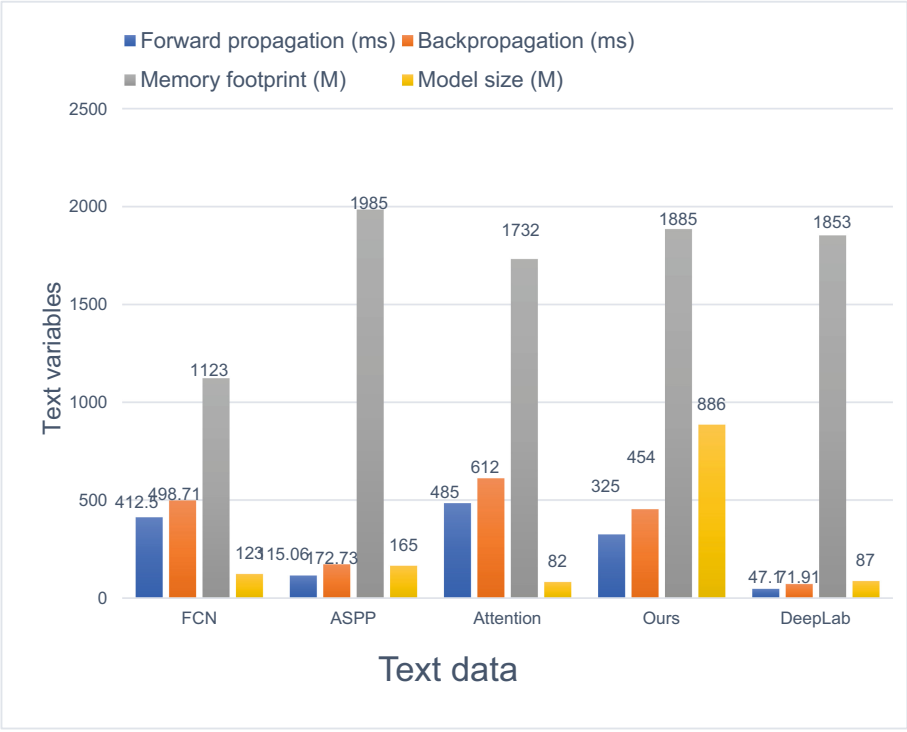

Fig. 2. Attention performance comparison analysis

4.3 Comparison and Analysis of the Accuracy of Different Methods Used in the Test Set

This article collects data on the results of 400 questions answered, and is screened according to the answers, and there are 388 valid sentences remaining. The effective sentences are analyzed by FCN, ASPP, Attention, Ours and DeepLab algorithms respectively. The analysis results are shown in Table 3.

Table 3. Accuracy comparison analysis table

Algorithm	testing amount	Correct quantity	Correct rate (%)
FCN	388	302	77.84
ASPP	388	265	68.3
Attention	388	200	51.55
Ours	388	261	67.27
DeepLab	388	190	49

As shown in Table 3, Through experimental comparison, it is found that the accuracy of the BP network algorithm (FCN) is the highest, and the accuracy of 388 sentence semantic analysis is 77.84%, which is 68.30%, 51.55%, and 67.27% compared to ASPP, Attention, Ours, and Deeplab respectively. Compared with 49%, the BP network algorithm (FCN) has certain advantages over other algorithms in the processing of semantic analysis through comparative analysis of the accuracy rate.

5 Conclusions

In this paper, the semantic image analysis and the analysis of the BP neural network model are combined with each other. The experimental verification shows that the algorithm has a better positioning effect in locating microscopic targets in objects in complex scenes. As a high-tech technology, computer vision has been developed for decades, and its low price, cost, intelligence and other advantages make it irreplaceable and important in certain areas of the commercial market. In the next few years, with the relatively rapid development of big data and the Internet market, this provides a good opportunity for computer vision technology. The BP neural intelligence algorithm and its improved model have solved the adaptation, other problems are difficult to optimize, and are far superior to other traditional resource extraction algorithms. Due to these external and inherent environmental influences, computer vision technology has achieved obvious and rapid development. This research work uses BP neural network as the main basic framework to solve the problem of semantic analysis of targets in complex scenarios. However, deep learning technology includes not only excellent models such as BP neural network, but also other networks suitable for semantic segmentation such as GAN. Therefore, I hope that in future work, other deep learning techniques can be explored to meet the existing challenges of semantic image analysis.

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