Research on Image Recognition Algorithm Based on Computer Deep Learning

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Abstract. Image recognition is an important research direction in the field of image, which has become a key technology in many fields, such as machine vision. However, there are still many problems in traditional image recognition, such as sharpening and noise. With the artificial intelligence algorithm gradually applied to all walks of life, Deep learning (hereinafter referred to as DL) algorithm has been applied to image recognition, which has also made great achievements in image, voice, text and other aspects. Traditional image recognition methods need to design features manually. Therefore, the traditional image recognition speed is low, which will lead to low recognition rate. With the advent of the era of big data, massive image data has been generated on the network. Therefore, the traditional recognition method has been unable to meet the needs of image recognition, which requires us to constantly improve the recognition method. Based on CNN method, this paper analyzes the process of image recognition, which will improve the recognition rate of images.

Keywords: Computer, Deep Learning, Image Recognition Algorithm

1. Introduction

With the popularity of the Internet, image data has been increasing exponentially, which leads to more diverse forms of pictures [1]. Therefore, the traditional recognition methods can’t meet the needs of people, which requires us to combine artificial intelligence algorithm to optimize image recognition, especially DL[2]. DL is an intelligent algorithm based on bionics, which can automatically learn and extract features by simulating human brain, which will give full play to the advantages of big data. Through DL, image recognition can improve the efficiency of image recognition, which will improve the accuracy of image recognition. Based on the machine learning method of artificial feature extraction, this paper identifies the plant image with single solid color background, which can recognize the complex plant image in natural environment [3-6]. Through DL, the whole image of trees is recognized automatically. Through the analysis of typical DL algorithm, this paper proposes a combination method, which can identify images more efficiently [7].
2. DL algorithm

2.1. CNN algorithm

CNN is an algorithm inspired by biological vision system. For two-dimensional data recognition, CNN designed a multi-layer perceptron model. Therefore, CNN is a combination of feature extractor and classifier, which can obtain the feature vector of input image through continuous learning. By inputting the classifier of the tail, CNN can better classify and recognize the data.

2.2. Convolution neural network structure

CNN is a special kind of feedforward neural network model, which has a deep structure. CNN is generally composed of input layer, volatile layers, sub sampling layers, full connection layers and output layer. The convolution layer is called detection layers, and the down sampling layer can also be called pooling layers. The input layer is usually a matrix, such as an image. We can think of convolution and pooling as hidden layers. Other layers are ordinary hidden layers, which need to be calculated according to different calculation methods. Through the training process, we can optimize most of the weight parameters. The overall structure of convolution neural network is shown in Figure 1.

![Figure 1](image1.png)

**Figure 1.** The overall structure of convolutional neural network.

2.3. Pool process

Pooling is to perform aggregation of space or feature types, which can reduce spatial dimensions. Through the pooling process, we can reduce the amount of computation, which will characterize the translation invariant property. By reducing the input dimension of the next level, we can effectively control the risk of over fitting. According to the different calculation forms, we often divide them into average pooling, maximum pooling and pyramid pooling. Among them, maximum pooling and average pooling are commonly used. The schematic diagram of maximum pooling process is shown in Figure 2.

![Figure 2](image2.png)

**Figure 2.** Schematic diagram of maximum pooling process.
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3.1. Single background leaf image preprocessing
For different types of images, we can use different methods for segmentation. For a single background leaf image, we can unify the leaf background color to white, which can improve the accuracy of classification features. After graying the image, we can use the algorithm to calculate the adaptive threshold, which can quickly and accurately segment the target area. After the calculation, we can mark the part which is less than the threshold value as the background part, which can set the corresponding original color image to white. The pretreatment process of single background leaf image is shown in Figure 3.

![Figure 3. Single background leaf image preprocessing process.](image)

3.2. Preprocessing of leaf image with complex background
For the leaf image with complex background, there are complex background image and interference noise around the leaf image, which is difficult to make accurate segmentation through simple preprocessing. Therefore, after removing the noise, we can mark the key parts for subsequent processing. Through ROI segmentation of ROI detection method, we can achieve good results. Through watershed transform algorithm, we can extract the leaves accurately. The processing flow of leaf image with complex background is shown in Figure 4.

![Figure 4. Leaf image preprocessing with complex background.](image)

3.3. Realization of plant image recognition algorithm
In the process of CNN model training, the data set is divided into training set and test set. After the effective region screening, we can further screen the effective region, which can extract the features of the effective region through convolution kernel. In the same way, we can reduce the complexity of the whole process, which will ensure the extraction of the core features of the data set. Then, after the training of the whole connection layer, we can get the recognition model of plant image, as shown in Figure 5.
Figure 5. Plant image recognition process.

In order to show the advantages of CNN model more clearly, this paper compares the recognition accuracy of each plant in five kinds of complex background plant images, and the comparison results are shown in Table 1.

Table 1. Accuracy of plant identification.

| No. | Plant species    | CNN  |
|-----|------------------|------|
| 1   | Red axle         | 0.922|
| 2   | Dandelion        | 0.963|
| 3   | Water vetch      | 0.951|
| 4   | Chinese violet   | 0.948|
| 5   | Datura           | 0.954|
4. Conclusion
Through the analysis of CNN DL algorithm, this paper proposes that it can recognize images more efficiently. Finally, this paper analyzes the five plant species and gets the accuracy of the analysis.

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