Research on Image Recognition System Based on Computer Deep Learning Neural Network

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Abstract. The selection and extraction of image recognition by artificial means needs more complicated work, which is not conducive to the recognition and extraction of important features. Deep learning and neural network represent the iterative expansion of computer intelligent tech, and bring significant results to image recognition. Based on this, this paper first gives the concept and model of neural network, then studies the utilization of deep learning neural network in image recognition, and finally analyses the picture recognition system on account of in-depth learning neural network.

Keywords: Image Recognition, Computer, Deep Learning, Neural Network

1. Introduction
With the iterative expansion of computer intelligent tech represented by in-depth learning and neural network, it has been widely and in-depth applied in many fields, and has achieved remarkable achievements [1]. For example, the utilization in the field of picture recognition makes significant progress in picture recognition, text information understanding and speech recognition. The utilization of in-depth learning nerve network in the field of picture recognition greatly expands the utilization scope of AI. Thanks to the efficient processing and storage capacity of machine learning for information, picture recognition and cognition can effectively improve the contents as shown in Figure 1, thus creating better conditions for the use and expansion of AI.

![Figure 1. Content of picture recognition and cognitive improvement](image_url)
In addition, the process of picture recognition is consistent with the pattern recognition process of artificial nerve network. In this recognition process, picture matching algorithm is required to have a high consistency with the template, so as to achieve effective response to complex and changeable environment, and to identify pictures that are not completely consistent with the feature template.

Picture recognition needs to solve the problem of feature representation selection and fuzzy matching. In the aspect of feature representation, selection and extraction are mainly realized by manual means [2]. However, this artificial mode needs more complicated work, which is not conducive to the recognition and extraction of important features. Secondly, at the level of fuzzy matching, the main formula is on account of the extracted feature representation, and the classification algorithm is used for fuzzy matching and picture classification [3]. On the other hand, nerve network can avoid the process of artificial construction of picture feature representation because of its network structure has many layers. It can not only calculate and learn more complex input features, but also represent more complex functional relationships.

In a word, with the iterative progress of picture tech, the remote information contained in the picture needs further use of computer to achieve more accurate picture recognition, so as to obtain more abundant picture data [4]. In-depth learning method can use CNN model for picture recognition on account of the correlation response to the picture, and analyze the picture data with the help of existing picture data. Therefore, the research of picture recognition system on account of computer in-depth learning nerve network has important practical value.

2. The concept and model of nerve network

2.1. Machine learning model

Shallow machine learning model has experienced the expansion of hidden layer BP network, SVM, boosting and so on. The latter two models can be regarded as having one hidden layer node or no hidden layer node. However, the nerve network is easy to over fit, the parameters are difficult to tune, and requires a lot of skills and training speed is relatively slow. In the case of limited samples and calculation units, the ability to express complex functions is limited, and the gradient is becoming more and more sparse and converges to the local minimum [5]. With the excellent feature learning ability of multi hidden layer artificial nerve network, the difficulty of in-depth nerve network training can be effectively overcome by layer-by-layer initialization of unsupervised learning.

In addition, in-depth learning of in-depth machine learning mode can realize complex function approximation by learning a kind of in-depth nonlinear network structure, represent the distributed representation of input data, and show a strong ability to learn the essential characteristics of data sets from a few sample sets [6]. The model focus on the depth of the model structure, and the in-depth learning is feature learning. The characteristics representation of specimens in the home space is changed into a new feature enclosure by layer feature change, which makes classification or prediction much simpler. In-depth learning realizes feature expression through multi-level abstraction.

2.2. The basic idea of in-depth learning

The concept of nerve network is different from the traditional training method. In order to greatly reduce the training time of multi-layer nerve network, two techniques of pre training and fine-tuning are adopted [7]. Among them, the former experiences unsupervised learning, initial value of parameters, layer by layer greedy training and so on. The first hidden layer is trained, the second is trained, and so on. Finally, the trained network parameters are taken as the initial values of the whole network parameters. The latter supervises the learning and further optimizes the training of the whole network with little change in the weight of the nerve network.

In-depth learning nerve network simulates the function mapping relationship between features and objectives. With more layers and more parameters, the simulation mapping function is more complex and more capacity. The number of layers remains unchanged, and the number of parameters of nerve network augments, which brings better representation ability. Add more levels, more in-depth feature
representation, and stronger function simulation ability [8]. As the number of layers of the cyber
augments, the abstract representation of each layer for the previous layer is more in-depth. That is,
each layer of neurons learns a more abstract representation of the value of the previous layer of
neurons. The main idea of in-depth network training is to train greedy layer by layer with unlabeled
data and fine tune the whole network with marked data.

2.3. The incentive function of in-depth learning
The nonlinear Sigmoid function has a larger signal gain in the central region, while a smaller signal
gain in the two sides of the region. At the level of neuroscience, the central region is much propinquity
to the excited state of neurons, and the bilateral regions are much propinquity to the neuron inhibitory
state, as shown in Figure 2 below.

![Figure 2. The incentive function of in-depth learning](image)

The input picture is non-linear convoluted by multiple trainable filter banks. After convolution,
feature maps are generated in each layer, and then each group in the feature map is pooled to get the
output value [9]. In CNN network, the neurons between layers are not fully connected. By using the
local spatial correlation between layers, the upper layer neurons are only connected with the lower
layer neurons which are similar to them through local connection, so as to greatly reduce the parameter
scale of the nerve network. Each convolution filter shares the same parameters. In convolution nerve
network, each convolution filter of convolution layer repeatedly acts on the whole receptive field to
convolute the input picture. The convolution results form the feature map of the input picture and
extract the local features of the picture.

3. Utilization of in-depth learning nerve network in picture recognition

3.1. Local receptive field of nerve network
The spatial connection of pictures is local, just like people feel the external picture through the local
receptive field. Each neuron only feels the local picture area, and then at a higher level, the global
information can be obtained by integrating these neurons with different local feelings. In CNN, there is
a partial connection between adjacent layers, that is, the sensing area of a certain nerve unit comes
from some upper neural units.

3.2. Nerve network characteristic graph and pooling
Multiple filters are needed to extract different features. The parameters of each filter are different,
which means that it puts forward different characteristics of the input picture, so that each filter
deconvolutes the picture and gets the reflection of different characteristics of the picture. According to
the principle of picture local correlation, only one pixel in an picture neighborhood can express the
information of the whole region [10]. CNN network layer is divided into convolution layer and
pooling layer. The former is feature extraction layer to obtain feature map, so as to enhance the
original signal features and reduce noise; the latter is feature mapping layer, which changes multiple
pixels of convolution layer into one pixel, so as to retain useful information and reduce data volume as much as possible, as shown in Figure 3 below.

**Figure 3.** Network layer architecture of CNN

The process of nerve network rasterization is that after the picture is pooled and subsampled, a series of feature maps are obtained, and the input of multilayer perceptron is a vector. Therefore, it is necessary to take out the pixels in these feature maps and arrange them into a vector.

4. **Picture recognition system on account of in-depth learning nerve network**

4.1. **Initialization of nerve network**
Firstly, in the FWD propagation phase, the specimen is taken from the specimen set and then input into the cyber. After, make the calculations of the corresponding practical output. Secondly, in the AFD propagation stage, the difference between the practical output and the corresponding theoretical output is calculated. In addition, the weight moment is adjusted by AFD propagation to emilite the error.

4.2. **Picture recognition system on account of in-depth learning nerve network**
The architecture of picture recognition system on account of in-depth learning nerve network is shown in Figure 4, including picture recognition module, graphical interface module and network service module. Firstly, at the level of picture recognition process of in-depth learning nerve network, the whole recognition process is completed through the steps of input picture, in-depth convolution picture feature extraction, classification prediction and output recognition structure. Secondly, in the programming level of the system, the whole process of nerve network pattern recognition is completed through data acquisition, data preprocessing, feature extraction and selection, and pattern classification.

**Figure 4.** Architecture of picture recognition system on account of in-depth learning nerve network

In addition, in the process of picture preprocessing, a directory for storing training data is established first, then the picture data is input into the directory, and then the picture size is adjusted
by using the correlation function. At the level of picture recognition and training, the estimator model is used to establish relevant models, train and predict, and the accuracy is evaluated on the test set or verification set.

5. Conclusion
In summary, in-depth learning method can use CNN model for picture recognition on account of the correlation response to the picture, and analyze the picture data with the help of existing picture data. The utilization of in-depth learning nerve network in the field of picture recognition makes the efficient processing of information and the improvement of picture recognition and cognition. In this paper, the concept and model of nerve network are studied, and the machine learning model and its idea are analyzed. By analyzing the utilization of in-depth learning nerve network in picture recognition, the nerve network feature map, pooling and local receptive field are studied. Finally, the analysis of picture recognition system on account of in-depth learning nerve network is given.

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