Application of Computer Image Processing Technology in Ethnic Digital Imaging

Nan Jiang*
Lijiang Teachers College, Lijiang Yunnan, China, 674199

*Corresponding author e-mail: jiangnan1983930@163.com

Abstract. In the computer field, graphics and image processing technology has occupied a relatively key core position in computer technology. Image processing not only provides convenience for people's daily life, but also makes people's visual experience have a strong impact. In today's information age, science and technology play a leading role. Whether it is a cause, a field, a country, or the world, the rapid development and progress cannot be achieved without the integration and application of science and technology, as well as the digital digital image. At present, the background for the development of national digital imaging is the continuous and in-depth development of science and professionalism, and the growing international development trend. At present, the continuous improvement and development of computer image processing technology will have a profound impact on the field of national digital imaging. The purpose of this article is to study the application of ethnic digital images based on computer image processing technology. This paper uses the Dropout method to fit the training data and uses the Softmax function to calculate the probability distribution. In the experiment, 60% of the reference image is selected, 20% of the training set is used as the verification set, and 20% is used as the test set to repeat the median hundreds of times to reduce the error. And the data preprocessing method with local contrast normalization is adopted to improve the effect. The experimental results show that when the number of filters is 64, the image quality is the best. In the current IQA-Basic image processing results, the VSI is relatively poor. In IQA.Weighted2, the training image block is calibrated by the reference image quality assessment method, which has better results.

Keywords: Image Processing Technology, Fusion of Science and Technology, Ethnic Digital Imagery, Image Quality Evaluation

1. Introduction
In the current era of rapid development of information technology, new computer information technology continues to develop, and computer image processing technology is one of them.
Computer image processing technology is to convert image content into specific digital signals, and use a series of comprehensive technical means such as current computer hardware technology and software technology to realize the processing of computer image digital signals. In this process, by analyzing the feature values detected by a specific target image, a perfect detection of the detected image can be achieved. Computer Information Technology. In image detection, the application of this technology can help more and more depth detection personnel understand the intrinsic value of the image. When using computer image processing technology to detect images, it mainly undergoes several key processes such as image reading, image analysis, data acquisition, and data analysis. With the development of computer information technology, computer image processing technology has been developed. This technology is mainly implemented through the use of high-level computer languages and software. The main purpose of applying computer image processing technology to ethnic digital images is to display some ethnic cultures through images.

Combined with the background of mature application of computer technology, the application of computer technology and image related technology has been formed. The entire image processing technique is mainly used for preprocessing. With this technology, not only can the image be improved and optimized, but also the deep content of the image connotation, especially the prediction function of the technology, which can realize the wide application of the technology [1]. According to the comprehensive application of current computer image processing technology, image processing technology has become an important trend of the times. Therefore, by using digital technology, it provides important help for the further development of image processing technology. Compared with computer image processing technology, image processing involves more image enhancement and restoration. In the application process of computer image technology, by detecting and inputting image information, a reasonable conversion of the entire image content can be achieved [2]. For the current development of digital imagery in the country, its specific needs are not only to improve the integration of various technical equipment, but also to analyze from different perspectives. To a certain extent, the use of computer image processing technology in the process of image design and change can detect the advantages and disadvantages of national digital images in a timely and accurate manner. Therefore, in this process, it is not only specific image processing, but also effective understanding of the image itself. In the context of the mature application of computer technology, image processing technology has become more mature and widely used [3].

This paper uses the Dropout method to fit the training data and uses the Softmax function to calculate the probability distribution. In the experiment, 60% of the reference image is selected, 20% of the training set is used as the verification set, and 20% is used as the test set to repeat the median hundreds of times to reduce the error. And the data preprocessing method with local contrast normalization is adopted to improve the effect.

2. Method

Computer image processing refers to the use of computer technology to process and analyze images. Generally speaking, the entire processing technology mainly includes the specific acquisition, analysis and processing of digital images and digital expression. For computers, as digital processing equipment, it is mainly digital image processing technology, including spatial domain processing and compression processing [4-5]. Therefore, some programming languages are used to process images.
2.1. Image compression and coding
With the corresponding technical requirements, delete redundant or useless information to ensure a reduction in data storage. In the application of image compression coding technology, wavelet transform coding, neural network coding and model-based coding are used to improve the application effect [6].

2.2. Image segmentation
In the process of national digital image research, image segmentation technology is very important for image analysis and image processing. Segment images based on disjoint feature regions, and analyze interesting targets with high demand, providing a basis for quantitative analysis and qualitative analysis, and a guarantee and platform for the development of 3D technology [7].

2.3. Image recognition
Based on image processing and analysis, image recognition and classification are effective. It is worth mentioning that the current image recognition technology mainly uses artificial intelligence management modules, which can systematically classify, manage and estimate images according to different environments, and use statistical classification and grammatical structure recognition modules to comprehensively analyze and judge [8-9]. And fuzzy recognition technology.

2.4. Dropout method
The model was fitted to the training data, so that a part of the information in the training set was learned to reduce the loss. There are many ways to avoid overfitting. Dropout is a typical one. It can provide regularization for most models, and it is simple to calculate and powerful. Dropout can be regarded as an integrated algorithm that combines a lot of neural networks, but the amount of neural network model parameters is huge, and it takes a lot of time and storage space to train the prediction process, so generally only a few neural networks are integrated. Dropout is an approximation algorithm of integrated algorithms. This method can be applied to neural networks without increasing excessive computational complexity [10]. Specifically, Dropout integrates a network composed of any combination of base network nodes. In practical applications, this operation is usually approximated by output multiplication by zero. In practical applications, Dropout "deletes" some hidden units in the network with a certain probability, and then optimizes it with a back propagation algorithm like normal neural networks [11]. Dropout is an integrated algorithm, so it has the advantage of multi-model fusion, and at the same time, it can reduce the collaborative working effect between neurons.

2.5. Softmax function
Softmax can be used to represent the distribution of a discrete variable with a variety of different possible values. It is often used as a classifier. It can use mathematical formulas to represent the probability distribution of n different values. It is often used in conjunction with one-hot coding [12].

Assume that the value of the random variable is \( y_0 \), \( y_1 \), \( \ldots \), \( y_n \) discrete data, and define the
probability of selecting each variable as \( Y_i = P(y = i | x) \). Here, each probability value is greater than or equal to 0 and less than or equal to 1, and the sum of all probabilities is 1 to be a valid probability distribution\[13\]. In neural networks, Softmax is generally connected after the linear layer, that is:

\[
z = w^T h + b
\]

The exponential form of softmax has good properties when training the neural network by maximizing the log-likelihood function, and its exponential operation and logarithmic operation cancel each other out.

\[
\log \text{softmax}(z)_i = z_i - \log \sum_j \exp(z_j)
\]

At the same time, the softmax output probability distribution has a total of 1, and the increase of an output must lead to the reduction of other components. This introduces the competition between categories. Scientific researchers believe that this structure is just in line with the human brain winner mechanism.

3. Experiment

3.1. Get data

During the experiment, the image quality evaluation data set is randomly divided. For all reference images, 60% of its data and its corresponding distorted image are selected as the training set, 20% as the verification set, and 20% as the test set. In order to avoid the difference in the effect caused by the data set partitioning, this paper uses the above partitioning method to repeat the experiment 100 times, and finally takes the median value of 100 experiments as the final experimental result. The parameters of the convolutional neural network are all initially set using a random initialization method. The dropout probability of the Dropout layer is 0.5. The network training process uses the Adam algorithm to optimize and can converge faster. 0.0001 and 0.00001, and added a weight attenuation of 0.00005. Although the large-scale image segmentation can bring a small increase in effect, it will significantly increase the training and prediction time. Considering that the experiment is repeated multiple times, the final image block size is 32 squares, and the input of the network RGB color map. In the experiment, this paper also uses a reference image quality evaluation algorithm to calibrate the image patches and then train the network, which can reduce the image patch training errors.

3.2. Data preprocessing

Data preprocessing is a very important step. Through preprocessing, data can be simplified as much as possible, eliminating unrelated information and enhancing useful information. In image simulation, simple prediction operations can greatly reduce the difficulty of network image simulation, thereby improving the reliability of feature extraction, image segmentation, matching and recognition. The local contrast normalization preprocessing method is commonly used in image quality evaluation methods. At the same time, the DMOS value given by the data set is normalized to [0,1]. Such a preprocessing operation will bring a small effect.
4. Discussion

4.1. Influence of network structure on image quality evaluation algorithm

First, the fixed convolution depth $k = 1$, and the effect of the number of filters $m$ on the experimental results is explored. It can be concluded that the effect of IOA.Basic is getting better and better as the number of filters increases. When the number of filters is 60, the effect reaches saturation, and SROCC and PLCC only float a little. The number is 64. It can also be concluded that when the number of filters reaches 20, the effect of IQA.Basic has surpassed the Brisque algorithm, which also proves that, like object detection and image classification tasks, convolutional neural networks can also be used in image quality evaluation problems. Get good performance. After the number of fixed filters $m = 64$, the influence of the depth $k$ of the convolutional network on the experimental results is discussed. In general, as the depth increases, the network's non-linear mapping capability is enhanced and the effect is enhanced. The increase in the network depth also brings the problem of gradient disappearance / gradient explosion. Normalized BN and jump transfer are to solve this problem. An effective tool for a class of problems. The experiment shows the change of SROCC and PLcc with increasing $k$. Experiments prove that when $k$ is greater than 2, SROCC and PLCC will not increase with the increase of the network depth. At the same time, the training difficulty of the network will increase, and the training and testing time will increase. The buildup depth is set to 2.

**Table 1.** Network structure selected by experiments

| IQA—Basic | Layer & parln |
|-----------|---------------|
| Conv1     | Conv2d(3, 64, kernel_size=(3, 3), stride=(1, 1))+ReLU() |
| Conv2     | Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1)) |
| Pooling   | Global max pooling+Global min pooling |
| Linear    | Linear(in_features=2 x 64, out_features=512)+ReLU()+Dropout(p=0.5) |
| Linear    | Linear(in_features=512, out_features=100)+ReLU() |
| Reg       | Linear(in_features=100, out_features=1) |

It was found in the experiment that the results after the training and the convergence before the results were similar to the linear regression, so the linear regression method was finally selected. Through the above experiments, we determined the IQA-Basic model, as shown in Table 1.

4.2. Comparison and analysis with other algorithms

In this paper, IQA-Basic is compared with the mainstream image quality evaluation methods with and without reference on the TID2018 dataset. Among them, the classic artificial feature method is reproduced. And the FSIM method proposed by Kang et al. Made a few improvements in order to improve the effect, but the final results did not fully reproduce the results in the paper.
In the above figure, IQA-Weighted is a method that uses a reference image quality evaluation method to calibrate the quality score of image blocks. The algorithm does not separate the verification set when the data set is divided, resulting in a relatively large training set. It is believed that this approach has brought a certain degree of improvement in effect. In FSIM, gradient maps are used to generate image block weights. Analyzing the data, it can be found that the results of IQA-Basic image processing are better than VSI, which shows that the weight map generated based on the category activation response has an effect on image quality evaluation. At present, the results of IQA-Basic image processing have relatively poor VSI, IQA. Weighted2 In the training of small image blocks, the reference image quality evaluation method is used to calibrate the image block quality score, and the results are better.

5. Conclusion
With the continuous development and progress of computer technology, it is of great significance to apply computer image processing technology to national digital images. Compared with traditional analog image processing, computer image processing technology can process different information source images, whether it is light images, pop images, or microscope images and remote sensing images can be converted into two-dimensional array images under the application of digital encoding equipment. This paper uses the Dropout method to fit the training data and uses the Softmax function to calculate the probability distribution. In the experiment, 60% of the reference image is selected, 20% of the training set is used as the verification set, and 20% is used as the test set to repeat the median hundreds of times to reduce the error. And the data preprocessing method with local contrast normalization is adopted to improve the effect. The experimental results show that when the number of filters is 64, the image quality is the best. And the IQA. Weighted model is relatively optimal, followed by the IQA-Basic model.

References
[1] Okumura Ummin, Han Tian, Haiyu Zhu. Application of the Digital Image Technology in the Visual Monitoring and Prediction of Shuttering Construction Safety[J]. IOP Conference
Series Earth and Environmental Science, 2018, 128(1):012059.

[2] Umehara K, Ota J, Ishida T. Application of Super-Resolution Convolutional Neural Network for Enhancing Image Resolution in Chest CT[J]. Journal of Digital Imaging, 2018, 31(4):441.

[3] X. Bai, G. Lu, Y. Yan. Fractal Characteristics of Thin Thermal Mixing Layers in Coal-Fired Flame[J]. Journal of Combustion Science & Technology, 2017, 23(3):225-230.

[4] Bo Li, Xiaodong Kang. Application of CT Perfusion Imaging Technology in the Diagnosis of Hepatitis and Liver Cirrhosis[J]. Nephron Clinical Practice, 2017, 5(4):110-114.

[5] Nathan D. Smith, James S. Sharp. Accessible biometrics: A frustrated total internal reflection approach to imaging fingerprints[J]. Science & Justice, 2017, 57(3):193.

[6] Katrin Muradas Mujika, Juan Antonio Juanes Méndez, Andrés Framiñan de Miguel. Advantages and Disadvantages in Image Processing with Free Software in Radiology[J]. Journal of Medical Systems, 2018, 42(3):36.

[7] Spiros Kostopoulos, Panagiota Ravazoula, Pantelis Asvestas. Development of a Reference Image Collection Library for Histopathology Image Processing, Analysis and Decision Support Systems Research[J]. Journal of Digital Imaging, 2017, 30(3):1-9.

[8] Cheng Wei, Bowen Jin, Magdalena Szewczyk-Bieda. Quantitative parameters in dynamic contrast-enhanced magnetic resonance imaging for the detection and characterisation of prostate cancer[J]. Oncotarget, 2018, 9(22):15997-16007.

[9] Kyeongryeol Bong, Sungpill Choi, Changhyeon Kim. Low-Power Convolutional Neural Network Processor for a Face-Recognition System[J]. IEEE Micro, 2017, 37(6):30-38.

[10] K. Ye, W. Yu, W. Wang. Matrix Pencil Method Based Processing Approach for Spaceborne MEB SAR with Digital Beamforming in Elevation[J]. Dianzi Yu Xinxi Xuebao/Journal of Electronics and Information Technology, 2018, 40(11):2659-2666.

[11] Cong Luo, Xiangyang Li, Guangtan Huang. Application of oil–water discrimination technology in fractured reservoirs using the differences between fast and slow shear-waves[J]. Journal of Geophysics & Engineering, 2017, 14(4):723-738.

[12] B.-N. Jin, P.-J. Liu, Z.-X. Wang. Application of Digital Holography in 3D Measurement of Aluminum Combustion in Solid Propellant[J]. Tuijin Jishu/Journal of Propulsion Technology, 2018, 39(9):2102-2109.

[13] Jui-Chan Huang, Hao-Chen Huang, Hsin-Hung Liu. Research on the Parallelization of Image Quality Analysis Algorithm Based on Deep Learning[J]. Journal of Visual Communication and Image Representation,2019,102709.