



Quality-guided image classification toward information management applications[☆]



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ABSTRACT

Image information management (IIM) is a key technique to improve the performance of large-scale image retrieval. However, IIM is still a big challenge due to the large sum of image datasets and traditional algorithms cannot cope with this problem. In order to solve these disadvantages, we propose a novel image classification algorithm based on image quality assessment (IQA) for image information management. Specifically, we first incorporate both low-level, high-level features as well as quality scores for image representation, where we leverage convolution neural network for deep feature extraction. Then, deep feature vector can be generated by column-wise stacking. Thus, each image can be represented by a feature vector. We leverage GMM to learn the distribution of obtained feature vectors. Similar image categories have similar probability distributions, we leverage the learned GMM model to calculate the posterior probability and image can be classified into corresponding category. Experimental results demonstrate the performance of our proposed method, and image information management is easier to implement.

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1. Introduction

With the increasing variety of image acquisition equipment and the continuous maturity of image processing technology, a large number of images are generated in every field every day, which makes the images exist in a massive form. As an important information carrier, images become the acquisition and acquisition of people. An important form of transmission of information. For a large number of images, the number of images that each user really needs is very small, so it is very important to find the images that users need in a valid time. Image information management is the focus of improving image retrieval efficiency. Therefore, image information management system research has always been a hot topic [40–43].

Based on the importance of graphic images, many research teams have conducted research and analyzed the importance, necessity, practicality and development prospects involved, and achieved good results [44–47]. Wen Jing [1] found that computer technology is developing rapidly and constantly creating and inno-

vating in development, making breakthroughs in graphics and image processing technology, and graphic image processing has become an important subject in modern computers. It has been widely used in print advertising, criminal investigation, monitoring, graphic analysis and identification, and judicial identification, and has played an extremely active role in the development of society. Hu Wenjia [2] proposed that graphic image technology is an epoch-making art creation method that realizes the fundamental change of the animation film industry and will occupy a decisive position in the future art industry. Li Qingliang [3] and others found that computer graphics and image processing technology has played an important role in many fields. Therefore, it is necessary to strengthen the research on computer graphics and image processing technology, maximize the value of graphic image information processing technology, and promote the continuous advancement and development of this technology. Yuan Xia [4] proposed that computer graphics and image processing technology are widely used in various industries, enriching the visual scene, providing convenience for production and life, and having good development prospects. Understanding the key technologies of computer graphics and image processing is a must for every computer application technician, and then ensures the practical application of processing technology. Lu Yingchun [5] introduced

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the contents of computer graphics and computer image processing technology, followed by the main techniques of computer graphics and image processing technology, and finally introduced the application of computer graphics image processing technology. Peng Cheng [6] proposed that computer graphics is a new science based on computer technology, which is mainly applied in graphic image processing technology in computer graphics. It has certain practical value and significance for its research and analysis. In this regard, the article mainly conducts simple research and analysis on the application of computer graphics and graphic image processing technology. Yin Qilin [7] introduced the background of deep learning and the knowledge of convolutional neural networks, aiming to understand the basic model architecture and optimization methods of deep learning applied in the image field. Secondly, it mainly focuses on image recognition, forensics and detection. In particular, it discusses the evolution and development of deep learning in multiple directions in the image field. The purpose is to understand the latest research on specific image processing problems by deep learning and master various models or techniques. Lu Wei et al. [8] statistically analyzed user tags from approximately 1 million image datasets downloaded from Flickr, and extracted high frequency words for user tag frame matching. Compare the user tag with the Image Net database tag. Images containing high frequency words are annotated using the MXNet deep learning algorithm to analyze the labeling results. Li Dinghang [9] proposed a detection algorithm for indoor obstacles based on image depth information, in view of the fact that blind people are easily affected by obstacles in indoor environments. The simulation results of Li Jianfei [10] and others show that the spread spectrum algorithm based on DCT can improve the peak signal-to-noise ratio (PSNR) value of hidden images without reducing the embedding strength. Wang Zhongren [11] carried out a three-dimensional reconstruction experiment on randomly placed industrial workpieces, which can better recover clear contour point clouds for parts with overlapping, height and posture, and can also be produced in overlapping areas. Hierarchical.

Although many people have done a lot of research on graphic image technology, there are many shortcomings and even disadvantages in the methods they use. First, the processing time is too long, the reaction time is too slow, resulting in low efficiency. Second, the operation steps are cumbersome, and it is easy for others to find it difficult to operate. Third, in the actual operation process, the image information management method is complicated and changeable. These methods are difficult to adapt to frequent changes. However, the deep learning algorithm can solve all the above shortcomings, and it has the advantages of being simple and easy to operate, and not cumbersome.

Based on the superiority of the deep learning algorithm, some teams began to conduct research on him in many aspects, and the results achieved were very satisfactory. Li Jianwei [12] applied deep learning to the construction of the "Internet + Artificial Intelligence + Automatic Question and Answer" model to build a QS system for intelligent consulting platform, and proposed key technical problems and solutions for deep learning information recommendation based on convolutional neural networks. How does the library realize the management and value mining of big data knowledge services. Gong Hao [13] et al. proposed a method for classification and identification of remote sensing image farmland based on convolutional neural network, in view of the shortcomings of slow convergence and low recognition accuracy of existing neural networks. The algorithm can use a larger convolution kernel to efficiently extract gradient information. Liu Yueeming [14] and others used the deep learning RCF (Richer Convolutional Features) network model to extract the aquaculture area in the bay. Li Wei [15] proposed that deep learning, as a rapid development of emerging technologies, and non-supervised learning that does

not rely on a large number of labeled data, is gradually improving, and it is expected to better assist in the development of new drugs. Dong Jiarong [16] established an effective deep learning system, which can only perform certain types of specific functions, and cannot handle tasks in multiple fields across categories, with obvious pragmatic features. A deep learning system designed to accomplish a particular pragmatic task is difficult to adapt to the complex real world, so it cannot be truly intelligent, and it is even less likely to achieve strong artificial intelligence. Zhang Xiaomei [17] et al. proposed a CNN-BiLSTM-CRF-based combat document named entity recognition method. Firstly, the convolutional neural network (CNN) is used to extract the character-level feature vector, and then spliced with the word vector and part-of-speech feature vector. Input to achieve the purpose of improving the recognition rate. Li Zhijin [18] et al. applied the deep learning algorithm to a deep learning model based on principal component analysis, and constructed a printed label detection system to extract information and learn from it. Ma Tao [19] et al. applied the deep learning and convolutional neural network structures to the narrowband interference of OFDM systems and improved system performance. Yu Tingyi [20] based on deep learning, combined with the classical semantic segmentation and residual model in the field of computer vision, constructed an URNet network structure and improved the classic bottleneck layer structure. The experimental results of Tian Junfeng [21] and others show that BVDetector can effectively detect the vulnerabilities related to library/API function calls in binary programs, and reduce the false alarm rate of binary vulnerability detection to 2.3% and the false negative rate to 8.2%. Guo Tao [22] uses a deep learning algorithm to propose a new image detection method. By obtaining the infrared running image of the analog line ceramic suspension insulator, the infrared image is denoised and the insulator string region in the infrared image is obtained. The effective segmentation with the background area effectively extracts the target area. Jiang Hongkai [23] et al. applied the deep learning method to establish accurate mapping between monitoring data and the health status of key mechanical components to achieve accurate fault diagnosis and prediction. The model of Xu Xing [24] and others can achieve 97% recognition accuracy for the verification code image of the website. This method is better than the convolutional neural network only. Wang Lishun [25] and others apply the deep learning algorithm. Based on the Google Net network architecture, and referring to the classical idea algorithm of other classification models, a fabric defect classification model suitable for the actual production environment is constructed. The fabric defect database is constructed by using different kinds of fabric pictures marked by quality inspectors, and the database is used to train the fabric defect classification model.

In order to solve some problems in current image information management and classification methods, and to further improve the effect of image information management, this paper proposes a research on image information management system based on deep learning algorithm. Firstly, the current research status of image information management is reviewed [26]. The limitations of various image information management systems are pointed out. Then the image information management features are extracted. The image feature vectors are obtained by convolutional neural network (CNN) and support vector machine (SVM). As an input to the deep learning algorithm [27], the image information manages the quality result as an output of the deep learning algorithm.

2. Method

2.1. Image features

Wavelet analysis performs multi-scale decomposition of images by contraction or translation to obtain high-frequency coefficients

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