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A Viewful Survey: The Neural Network for Blood Cell Image Classification and Diseases Identification

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Abstract: ***The diagnosis of blood-related diseases involves the identification and characterization of a patient's blood sample. Combined the convolutional neural network(CNN) and recursive neural network (RNN) in order to propose the CNN_RNN framework that can deepen the understanding of image content and learn the structured features of images and to begin end to-end training of big data in medical image analysis.***

Keywords: Artificial intelligence, convolutional neural network, recurrent neural network, transfer learning.

I. INTRODUCTION

It is well known that blood cells mainly include red blood cells, white blood cells and platelets. In blood, leukocyte plays an important role in the human immune function, so it is also called the immune cell. Usually, hematologists use granulated information and shape information in leukocytes to divide white blood cells into granular cells: neutrophil, eosinophil, basophil and non-granular cells: monocyte and lymphocyte. The proportion in the blood of these -ve types of cells is different for the diseased and non-diseased bloods. Doctors often use these basic data as criteria for determining the type and severity of this disease. Therefore, the study of white blood cell classification has important significance and value for medical diagnosis.

II. LITERATURE SURVEY

Based on the significance of blood cell classification in the diagnosis, researchers have proposed many algorithms to classify blood cells. In 2003, Sinha and Ramakrishnan [1]classified cells using SVM with a recognition rate of 94.1%.They used Bayesian classifiers to classify cells and the recognition rate was 82.3%.

In 2006, Yampri *et al.* [2] used 100 images to perform the same experiments. They implemented the automatic threshold and adaptive contour to segment cells, and used the smallest error method to classify them, and the recognition rate was 96% . Utilized the KNN algorithm However, the KNN algorithm does not handle unbalanced samples well.

In ImageNet on 2012, Krizhevsky *et al.* [3] refreshed the records of the image classification. Here, they used a structure known as AlexNet. Excellent neural network algorithms such as VGG, Xception and ResNet have emerged. They also perform well in image classification tasks [4]_[7].

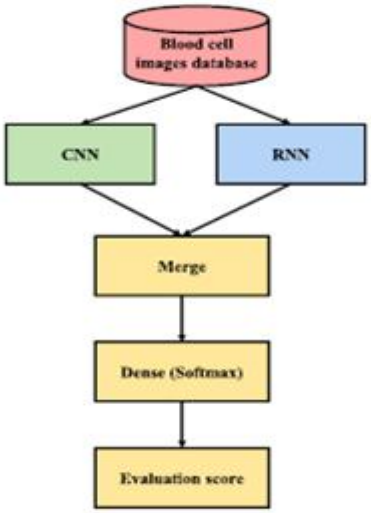

Fig. 1 Overview of the proposed method using CNN-RNN framework and transfer learning for classifying blood cell images.[9]

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In this paper, They propose an architecture that combines CNN and RNN [9], [10]. As shown in Figure 1, it integrates the local features extracted from the CNN and the features obtained from the RNN to perform the blood cell classification.

The KNN method is only relevant to a very small number of neighboring samples in the category decision. Based on this theory, Young (1972) experimented with 199 cell images. He first used histogram thresholds to segment white blood cells and classified them using a distance classifier

Bikhet *et al.* [11] used entropy based and iterative thresholding methods to divide cells and classify them with a distance classifier, with a recognition rate of 90.14%.

Theera-Umpon and Dhompongsa (2007) used a Bayesian classifier to classify the bone marrow images of the Ellis Fisher Cancer Center at the center of Missouri (only one cell per picture), and the recognition rate was 77% [8], [5].

Ghosh *et al.* [13] used a watershed algorithm to segment 150 cell images and classify them using a Bayesian classifier, and the recognition rate was 83.2%.

Rezatofighi and Soltanian-Zadeh used the Gram-Schmidt Orthogonal and Snake algorithm to segment 400 blood smears and classified them using SVM. Their recognition rate was 90% [6]

Previously related blood cell classification algorithms mainly include the KNN algorithm, Bayesian classifier, SVM classifier, etc.

Deep learning algorithms such as deep residual network also have good performance in image classification tasks. However, these neural network classification algorithms cannot fully utilize some features of the image that have a long-term dependency relationship with image labels, and thus these classification methods cannot classify cell images like people with memory. For this purpose, we introduce a recurrent neural network and fuse it with a convolutional neural network to perform the task of blood cell image classification.

Bayesian classification is based on statistical classification and uses its knowledge of probability statistics to classify data. In many classifications, naive Bayes algorithm can be compared with decision tree and neural network algorithm.

The classification idea of SVM is essentially similar to the linear regression LR classification method. It is to obtain a set of weight coefficients that can be classified after linear representation. SVM first trains a separation hyper-plane,and then the plane is the decision boundary of the classification. Classical SVM algorithm is only suitable for two types of classification problems.[15]

III.RESULT ANALYSIS

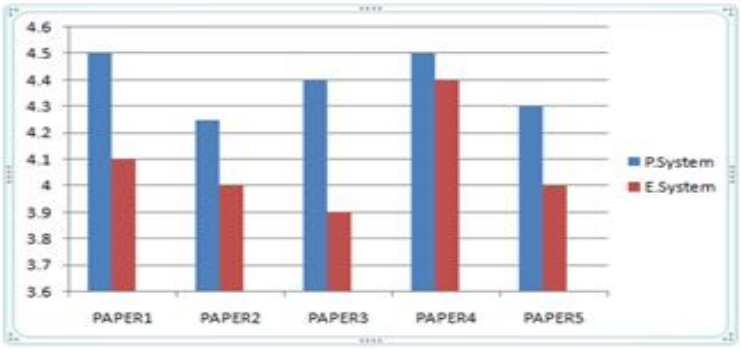

Fig. 2Comparison table

IV.CONCLUSIONS

In this work, A depth neural network architecture that combines the features of convolutional neural networks (Xception) and recursive neural networks (LSTM).We then implement the combined Xception-LSTM framework for blood cell image classification. Our model preserves the temporal and spatial information of image features and can learn structured information of image features. Unlike previous manual feature extraction methods, which rely on cytoplasmic/nuclear segmentation, our method can automatically extract and classify the deep features embedded in cell image patches. Compared with the previous existing methods, our proposed technique achieved the highest performance in terms of classification based on the blood cell dataset. We hope that this segmentation-free, highly accurate blood cell classification method can be used to develop medical-aided diagnostic systems for blood-related diseases in the future.

V. ACKNOWLEDGMENT

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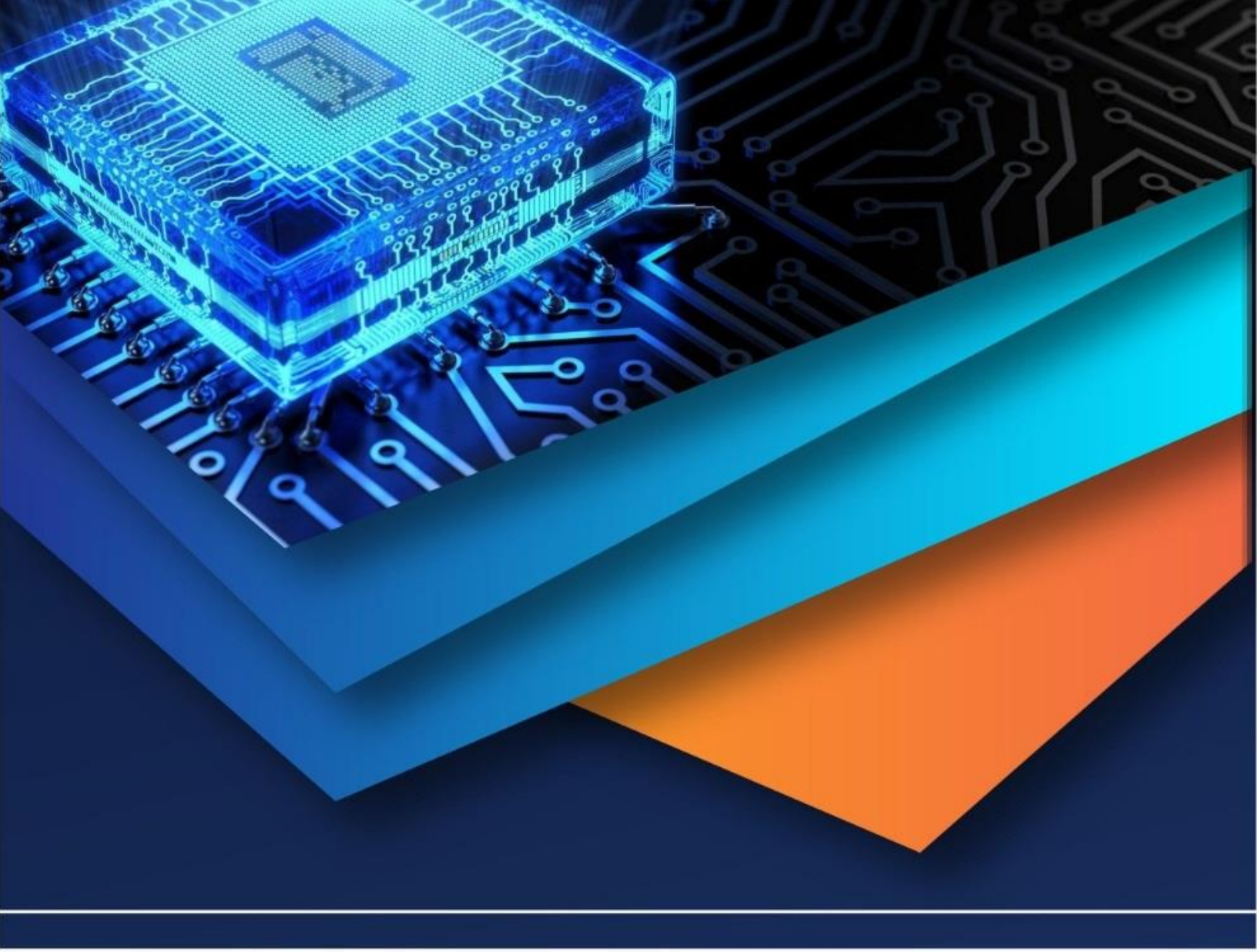

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