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Blood Classification Technique using Deep Learning

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Abstract: ***This study aims to develop a system to distinguish blood cells from images. Precise and programmed analysis of blood cell images has been considered as an effective way for the determination of types of blood cells such as Eosinophil, Lymphocyte, Monocyte, Neutrophil. In this work, we extracted different blood cell features such as Eosinophil, Lymphocyte, Monocyte, Neutrophil and then applied convolutional neural network based models for the detection of types of blood cells with photographs involved in structured analysis. It described the innovative solution that provides efficient classification detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various types of blood cells. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available blood cells given image dataset. So, it observed that neural networks can capture the colors and textures of lesions specific to respective type, which resembles human decision-making. And this model to deploy Django web framework.. We experimented with different type of blood cells as input to convolutional neural networks for effective classification of blood cells.***

Keywords: Deep Learning, Artificial Intelligence, Convolutional neural networks (CNNs), Augmentation, Deploy

I. INTRODUCTION

The goal is to develop a deep learning model for Types of Blood cells classification by convolutional neural network algorithm for potentially classifying the results in the form of best accuracy by comparing the CNN architectures. A collection of RGB image collections we have.We need to train the machine to classify the blood-cell types. This project contains four different cell types like EOSINOPHIL, LYMPHOCYTE, MONOCYTE, NEUTROPHIL. We train to teach the machine to achieve the accuracy and get the possible outcome.To begin this exploratory analysis, first use matplotlib to import libraries and define functions for plotting the data. Depending on the data, not all plots will be made. This study aims to develop a system to distinguish blood cells from images. Precise and programmed analysis of blood cell images has been considered as an effective way for the determination of types of blood cells such as Eosinophil, Lymphocyte, Monocyte, Neutrophil. In this work, we extracted different blood cell features such as Eosinophil, Lymphocyte, Monocyte, Neutrophil and then applied convolutional neural network based models for the detection of types of blood cells with photographs involved in structured analysis. It described the innovative solution that provides efficient classification detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various types of blood cells. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available blood cells given image dataset. So, it observed that neural networks can capture the colors and textures of lesions specific to respective type, which resembles human decision-making. And this model to deploy Django web framework.We experimented with different type of blood cells as input to convolutional neural networks for effective classification of blood cells.

II. PROPOSED SYSTEM

We proposed approach consists of stage performance were performed to detect the type of blood cells from the data sets and standardize them to size then classification was made by Convolutional Neural Network which is a deep learning algorithm and success was achieved to deep learning technique so that a person with lesser expertise in software should also be able to use it easily. It proposed system to predicting type of blood cells. It explains about the experimental analysis of Samples of images are collected that comprised of different blood cells. The primary attributes of the image are relied upon the shape and texture oriented features. An efficient blood cell detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various types of blood cells. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available blood cells given in image data set.

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The sample screenshots displays the types of blood cells detection using color based classification model. And to deploy this model web application for Django framework

A. Advantages Of Proposed System

- Increasing throughput & reducing subjectiveness arising from human experts in detecting the type of blood cells.
- It is essential to detect a particular type of blood cell. In our country people are not getting correct information about the type of blood cells.

B. Preparing Data set

This data set contains approximately 2000 train and 376 test image records of features extracted, which were then classified into 4 classes:

- Eosinophil
- Lymphocyte
- Monocyte
- Neutrophil

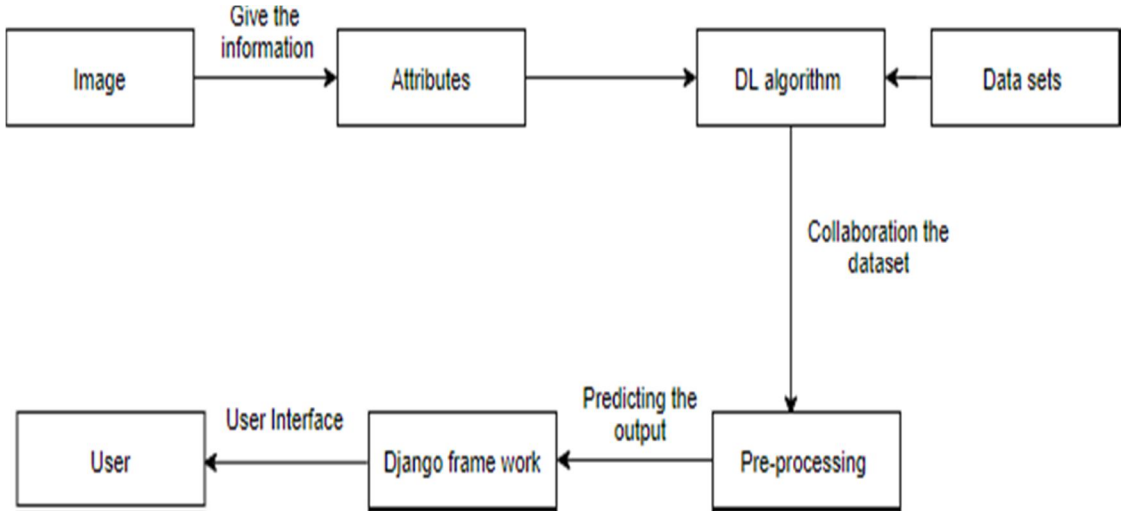

Fig. 1 Process Of Data flow Diagram

III. MODULES DESCRIPTION

A. List of Modules

- Data Augmentation
- Manual Net
- AlexNet
- LeNet
- Vgg Net
- Deploy

B. Augmentation

There are geometric and color space augmentation methods for images to create image diversity in the model. It is easy to find many coding examples for these augmentation transformations from open source libraries and in articles on the topic.Data augmentation techniques generate different versions of a real data set artificially to increase its size. Computer vision and natural language processing (NLP) models use data augmentation strategy to handle with data scarcity and insufficient data diversity.

Data augmentation algorithms can increase accuracy of machine learning models. According to an experiment, a deep learning model after image augmentation performs better in training loss (i.e. penalty for a bad prediction) & accuracy and validation loss & accuracy than a deep learning model without augmentation for image classification task.

1) *Adding Noise:* For blurry images, adding noise on the image can be useful. By ―salt and pepper noise‖, the image looks like consisting of white and black dots.
2) *Cropping:* A section of the image is selected, cropped and then resized to the original image size.
3) *Flipping:* The image is flipped horizontally and vertically. Flipping rearranges the pixels while protecting the features of the image. Vertical flipping is not meaningful for some photos, but it can be useful in cosmology or for microscopic photos.
4) *Rotation:* The image is rotated by a degree between 0 and 360 degree. Every rotated image will be unique in the model.
5) *Scaling:* The image is scaled outward and inward. An object in new image can be smaller or bigger than in the original image by scaling.
6) *Translation:* The image is shifted into various areas along the x-axis or y-axis, so neural network looks everywhere in the image to capture it.
7) *Brightness:* The brightness of the image is changed and new image will be darker or lighter. This technique allows the model to recognize image in different lighting levels.
8) *Contrast:* The contrast of the image is changed and new image will be different from luminance and colour aspects. The following image's contrast is changed randomly.

C. Alex Net

AlexNet is the name of a convolutional neural network which has had a large impact on the field of machine learning, specifically in the application of deep learning to machine vision. AlexNet was the first convolutional network which used GPU to boost performance.

AlexNet architecture consists of 5 convolutional layers, 3 max-pooling layers, 2 normalization layers, 2 fully connected layers, and 1 soft max layer. Each convolutional layer consists of convolutional filters and a nonlinear activation function ReLU. The pooling layers are used to perform max pooling.

D. Le Net

LeNet was one among the earliest convolutional neural networks which promoted the event of deep learning. After innumerous years of analysis and plenty of compelling iterations, the end result was named LeNet.

LeNet-5 CNN architecture is made up of 7 layers. The layer composition consists of 3 convolutional layers, 2 subsampling layers and 2 fully connected layers.

E. Vgg NET

VGG stands for Visual Geometry Group; it is a standard deep Convolutional Neural Network (CNN) architecture with multiple layers. The deep refers to the number of layers with VGG-16 or VGG-19 consisting of 16 and 19 convolutional layers.

The VGG architecture is the basis of ground-breaking object recognition models. Developed as a deep neural network, the VGGNet also surpasses baselines on many tasks and datasets beyond ImageNet. Moreover, it is now still one of the most popular image recognition architectures.

VGGNets are based on the most essential features of convolutional neural networks (CNN). The following graphic shows the basic concept of how a CNN works:

The VGG network is constructed with very small convolutional filters. The VGG-16 consists of 13 convolutional layers and three fully connected layers.

F. Deploy

- Deploying the model in Django Framework and predicting output
- In this module the trained deep learning model is converted into hierarchical data format file (.h5 file) which is then deployed in our django framework for providing better user interface and predicting the output whether the given image is EOSINOPHIL / LYMPHOCYTE / MONOCYTE / NEUTROPHL.
- Django is a high-level Python web framework that enables rapid development of secure and maintainable websites. Built by experienced developers, Django takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It is free and open source, has a thriving and active community, great documentation, and many options for free and paid-for support.

IV. CONCLUSIONS

In this project, a research to classify blood cells types over static cells images using deep learning techniques was developed. This is a complex problem that has already been approached several times with different techniques. While good results have been achieved using feature engineering, this project focused on feature learning, which is one of DL promises. While feature engineering is not necessary, image pre-processing boosts classification accuracy. Hence, it reduces noise on the input data. Nowadays, Blood Cell detection software includes the use of feature engineering. A solution totally based on feature learning does not seem close yet because of a major limitation. Thus, blood cells classification could be achieved by means of deep learning techniques.

A. Future Work

Further improvement on the network's accuracy and generalization can be achieved through the following practices. The first one is to use the whole dataset during the optimization. Using batch optimization is more suitable for larger datasets. Another technique is to evaluate blood cells one by one. This can lead to detect which types are more difficult to classify. Finally, using a larger dataset for training seems beneficial. However, such a dataset might not exist nowadays. Using several datasets might be a solution, but a careful procedure to normalize them is required. Finally, using full dataset for training, pre-training on each blood cells, and using a larger dataset seem to have the possibility to improve the network's performance. Thus, they should be addressed in future research on this topic.

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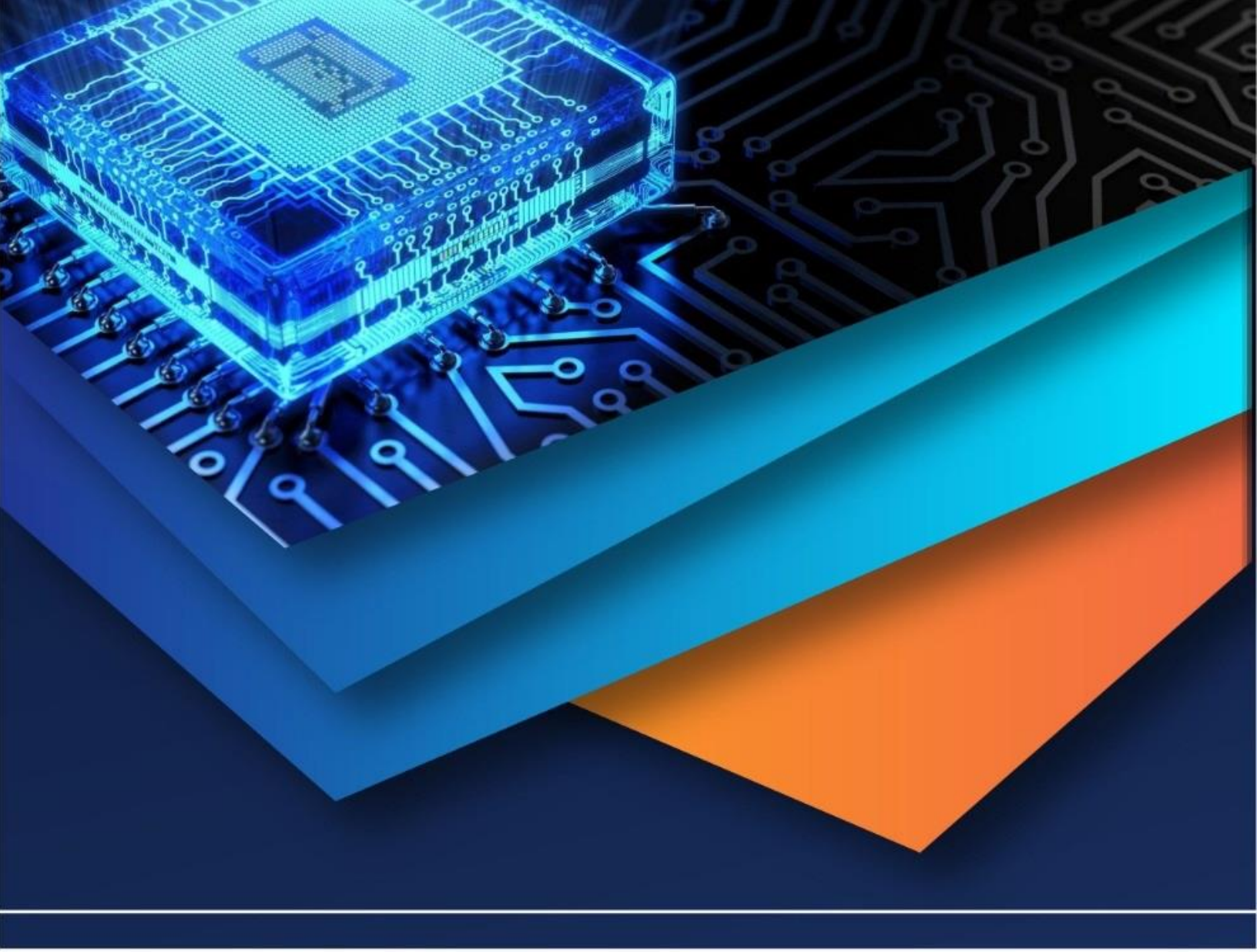

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