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CLASSIFICATION OF DIABETIC RETINOPATHY LEVELS BY USING DENOISING AUTOENCODER (DAE)

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Abstract : Diabetes problems can lead to a disease called diabetic retinopathy (DR), which damages the retina's blood vessels irreversibly. DR is a major cause of blindness, if not identified in it's early stages. In recent years, Deep learning (DL) methods have emerged as powerful tools for image analysis, demonstrating remarkable success in various medical imaging applications. Combining multiple datasets, Accuracy, Sensitivity, Specificity and Processing difficulty are the major drawbacks of existing work by using Convolutional Neural Network (CNN) method. The proposed system classifies DR images into five stages - no DR, Mild, Moderate, Severe, Proliferative DR and it gives accurate result for multiple datasets lesions localization system for increasing many applications in the field of medical image processing and diagnosis process based feature analysis is performed to get the better system by using the application of De-noising Autoencoder (DAE) techniques for the classification of diabetic retinopathy with high accuracy and that exceeds the current state-of-the-art results.

Index Terms - Diabetic Retinopathy, Deep Learning, Convolutional Neural Network, Image Analysis, De-noising Autoencoder, Multiple datasets.

I. INTRODUCTION

A primary cause of blindness in working-age adults, diabetic retinopathy (DR) affects about 93 million individuals globally [1]. According to the World Health Organization (WHO), DR might affect up to 500,000 individuals. The deep learning (DL) approach has become popular over the past ten years and has been incorporated into numerous domains, including medical picture analysis. DL can identify features accurately from input data for classification or segmentation and typically outperforms all traditional image analysis techniques [2]. The early stage of retinopathy is known as non-prolific diabetic retinopathy (NPDR) and is curable if detected in time. The advanced stage of DR is referred to as prolific diabetic retinopathy (PDR), where the retinal damage has become incurable and can lead to vision loss [3]. The five DR stages depend on the types and numbers of lesions on the retina image, Samples of the various DR stages (no DR, mild DR, moderate DR, severe DR, and proliferative DR) [4]. Denoising Autoencoders a stochastic version of Autoencoders used for dimensionality reduction, by preventing the problem of learning the identity function thus making them useless [5].

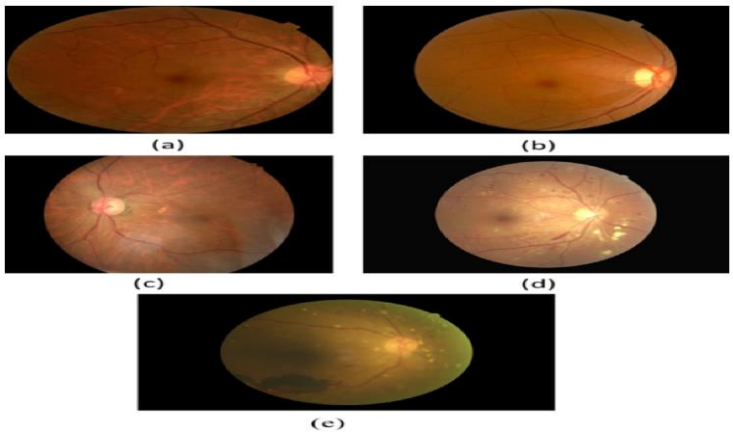

Figure 1: The DR stages (a) No DR, (b) Mild DR, (c) Moderate DR, (d) Severe (NPDR), (e) Profilerative DR

II. LITERATURE REVIEW

In [6], it was shown that the we utilize GMD method for eye classification by using convolutional de-noising autoencoder algorithm. In [7], such algorithms could increase the accuracy and efficiency of glaucoma diagnosis in a better and faster manner. In [8], CAN creates a single, very effective technique by fusing concepts from diffusion de-noising, masked auto encoding, and contrastive learning. In [9], it has shown that the deep convolution neural network (DCNN) algorithm can be successfully used to detect a microaneurysm and early diagnosis system to increase the efficiency and accuracy NPDR prediction. In [10], Image denoising techniques are used to eliminate the noise and generates clean image from the noisy image. In [11], the obtained the results to network applicable in real time, mobile application due to its high denoising speed and low memory usage. The suggested method in [12] may be able to identify important characteristics in the fundus pictures that may aid in the precise diagnosis of DR. In [13], the constructed capsule network attains an accuracy of 97.98%, 97.65%, 97.65%, and 98.64% on the healthy retina, stage 1, stage 2, and stage 3 fundus images. In [14], we show that our SAGN model can use a significant amount of unlabeled data to achieve comparable performance with a limited number of annotated retinal pictures. In [15], it improves performance in the clinical 5-class classification scheme for the benchmark datasets, but not for the clinical dataset. In research paper [16] explained about how to measure the Diabetes from a patient using IR sensor along with other parameters like temperature,SPO_2…In [17]discussed about which type of diabetes is the patient is suffering is classified by using machine learning algorithms with high accuracy.In [18]explained about the classification of diabetes of patient using one of the deep learning method of Convolutional Neural Network(CNN).

III. EXISTING WORK

Diabetic retinopathy (DR) is one of the most dangerous consequences of diabetes that can cause lifelong blindness. It has become more prevalent in recent years. Moreover, diabetic patients' retinal blood vessels are damaged by DR. As a result, numerous deep learning and artificial intelligence approaches have been put out to automatically identify anomalies in DR and its various stages from retinal pictures. There are two deep learning-based models in the system. The first model (CNN512) classified the image into one of the five DR stages by feeding the entire image into the CNN model. Diabetes is becoming more commonplace globally, and DR complications are rising along with it. If DR is discovered in its last stages, it poses a hazard to the vision of diabetic patients. Finally, both of the structures, CNN512and YOLOv3, were fused to classify DR images and localize DR lesions, obtaining an accuracy of 89% with 89% sensitivity, 97.3 specificity and that exceeds the current state-of-the-art results. To reduce the risk of blindness, it is crucial to identify and treat DR in its early stages. As the number of DR patients increased, the manual diagnosing method was no longer adequate. In this method, combining multiple datasets, accuracy, sensitivity, specificity and processing difficulty are the major drawbacks of existing work by using Convolutional neural network. To overcome the existing method we are going to proposed method.

IV. PROPOSED WORK

In Previous Technologies, many authors used various deep learning algorithms to predict diabetic retinopathy classification. But in this method, classifies DR images into five stages-no DR, Mild, Moderate, Severe, Proliferate DR and it gives accurate result for multiple datasets lesions localization system for increasing many applications in the field of medical image processing and diagnosis process based feature analysis is performed to get the better system by using application of de-noising autoencoder (DAE) techniques for the classification of diabetic retinopathy with high accuracy and that exceeds the current state-of-the-art results.

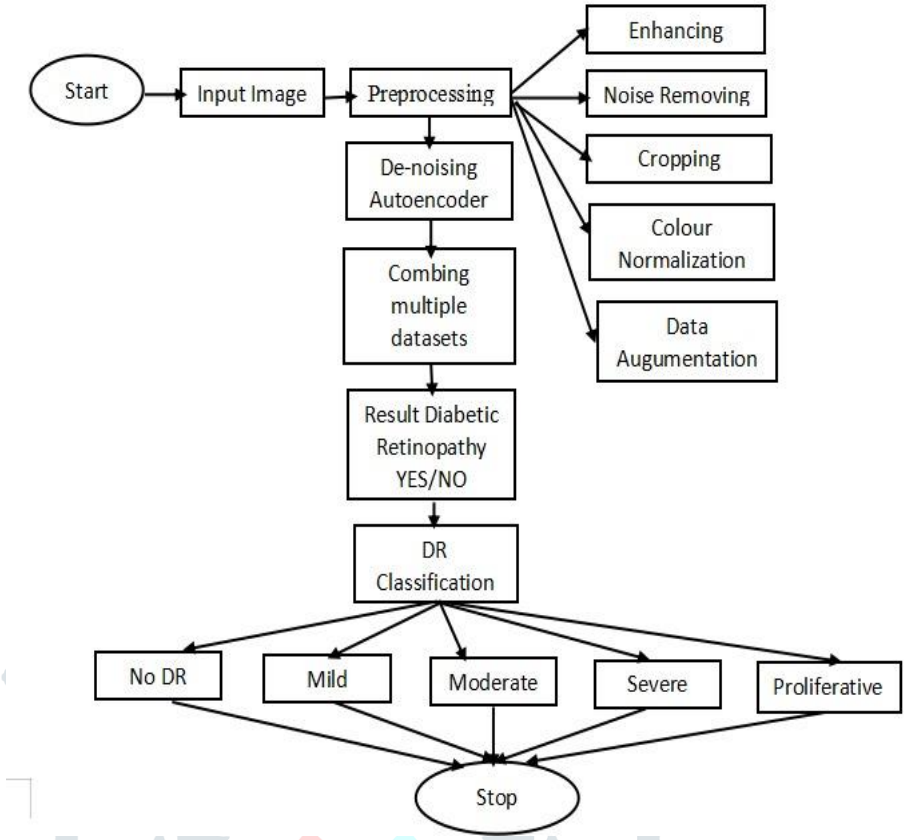

Figure 2: Block Diagram

V.RESULTS AND DISCUSSIONS

Basing on the DAE algorithm , system accurately classifies the DR level by using 5 stages of DR such as No DR, Mild, Moderate, NPDR and PDR.Based on performance measurements.The below figure3 shows the output of system for given retina image of diabetes patient, by using DAE algorithm it gives an output ,as patient is suffered from Mild DR. Basing on that further, we can suggest the patient whatever the medication necessary.

Figure 3: Output

VI.CONCLUSION

The study looks into using the DAE algorithm, which has multiple hidden layers, to obtain high accuracy in the classification of diabetic retinopathy. In the future, the technique might be improved to use AI algorithms for inputs like large datasets to achieve good results.

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