Diabetic Retinopathy Detection System

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***Abstract*—Diabetic Retinopathy (DR) is a diabetes-related eye illness that can damage the retina and cause severe visual impairment. As a result, early detection of diabetic retinopathy is crucial for preventing blindness in humans. Our goal is to detect diabetic retinopathy using machine learning methods. As a result, we attempt to outline the numerous models and strategies used, as well as the methodologies employed, and examine the accuracies and outcomes.**

It will determine which method is most appropriate and accurate for prediction. To detect retinopathy in photos, machine learning goes through several processes, including converting the image to a suitable input format and applying various preprocessing algorithms. It also entails training a model on a training set and validating it with a different testing set. Methods offered in this study include image preprocessing, supervised learning, and feature extraction. First, the photos are pre-processed. They are converted. The image is also properly resized. Because the photos are heterogeneous, they are compressed into an appropriate size and format. The primary goal of this effort is to develop a reliable and noise-tolerant system for detecting diabetic retinopathy.

***Index Terms*—Machine learning, Diabetic Retinopathy.**

I. INTRODUCTION

This project showed the development of an automated system for detecting diabetic retinopathy in color retina scans using machine learning techniques. Diabetic retinopathy is one of the most prevalent diabetes complications. It is a serious and widespread condition among diabetics. People with diabetes are more likely to develop a variety of eye disorders over time. Detecting DR has traditionally been a time-consuming and laborious process that requires an ophthalmologist or trained clinician to analyze and interpret digital color images of the retina in order to determine the existence of vascular irregularities caused by DR.

There are different stages of DR

• NPDR (Non-Proliferative Diabetic Retinopathy)

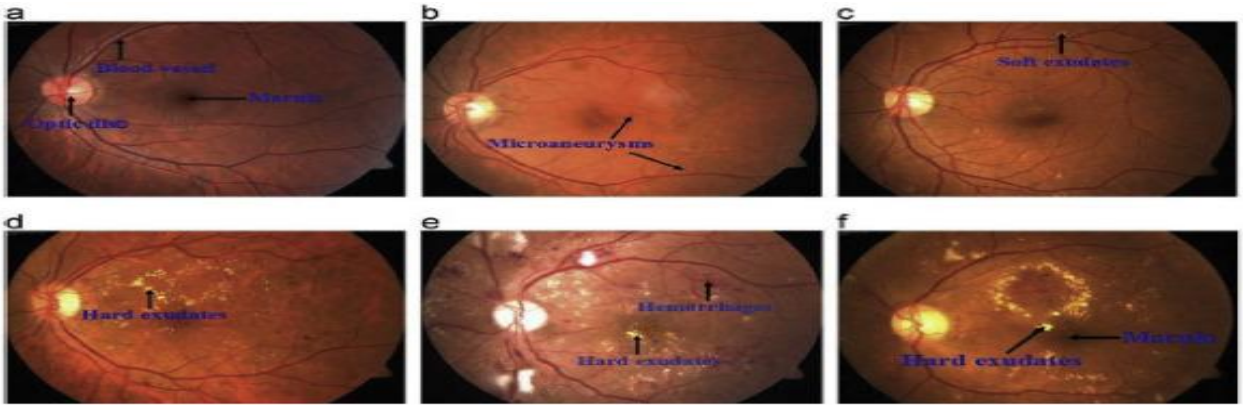
• Mild DR

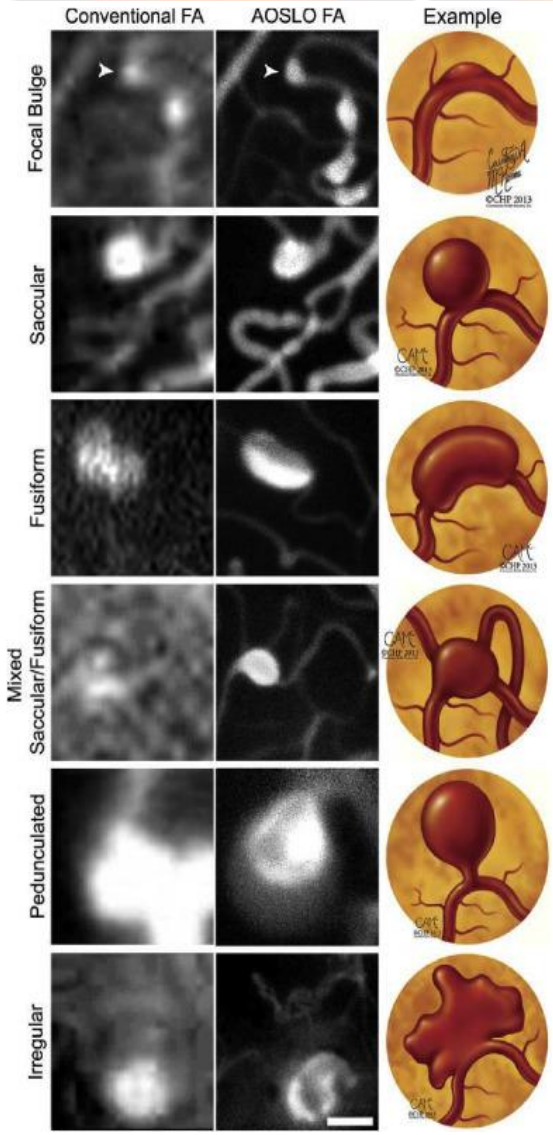
• PDR (Proliferative Diabetic Retinopathy)

NPDR is the initial stage of DR. During this stage, blood vessels in the retina begin to leak fluid and some blood into the eye. Mild DR is defined as having one micro-aneurysm (MA), which is a little circular red dot at the end of a blood artery. PDR is another stage of DR. During this stage, blood vessels in the retina constrict and the passage of blood fluid is interrupted by vessels due to obstruction, causing pressure to build up in the eye and potentially damaging the optic nerve. PDR is more harmful than NPDR, hence early identification of DR is critical. People with DR who are at risk of losing their vision can be treated with a laser to avoid blindness. However, there is presently no treatment that may restore previously lost eyesight, thus early discovery of DR is critical to preventing further eye loss and saving the patient's life. The proposed methodology is to investigate machine learning techniques for detecting diabetic disease using thermal images of an eye, as well as to introduce the effect of thermal variation of abnormality in the eye structure as a diagnostic imaging modality that ophthalmologists can use to make clinical diagnoses. The suggested project work involved designing and implementing a system that can diagnose eye diabetes disease using thermal images. The system extracted several features using image segmentation and used a CNN machine learning classification method to detect the real disease.

The interface will take the form of application software in which the user can insert a retina image, which will then be pre-processed and feature extracted before being compared to the training dataset and assessed. The largest publicly available dataset of retina thermal images (Kaggle dataset) is used to train and evaluate our model, followed by image processing and the application of a Gaussian filter to convolve with the image. This helps in smoothing the image and reducing the effects of obvious noise on the edge

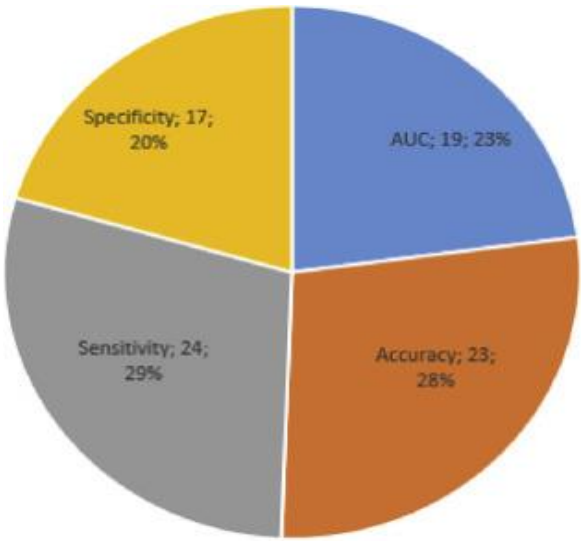
detector. To detect the true sickness, we use the CNN machine learning classification technique. The Convolution Neural Network (CNN) architecture is used to extract features and forecast the class of DR. It is capable of training to better understand the image's complexity. The primary goal of this effort is to develop a reliable and noise-tolerant system for detecting diabetic retinopathy. This paper employs deep learning methodology to detect diabetic retinopathy





II. RELATED WORK

This paper summarizes study of few literatures related to the detection of Diabetic Retinopathy. Explored the potential usage of the CNN in retinal image classification. Due to the manual methods by medical personnel, an automated system can reduce the labor involved in diagnosing large quantities of retinal images significantly. Content/Idea: CNN in retinal image classification [1]. In this paper, focused to classify all the stages of DR, especially the early stages, which is the major shortcoming of existing models. And proposed a CNN ensemble-based frame work to detect and classify the DR's different stages in color fundus images. Content/Idea: Classification of the DR's in different stages [2]. Developed the automatic detection of blood vessel in the retinal images. This paper introduced the automatic detection of the retinal blood vessels and the measurement of the vessel diameter. In which it is important for the detect and the treatment of different ocular diseases including Diabetic Retinopathy, glaucoma and hypertension. The proposed method consists of three main steps: Pre-processing of retinal images, Vesselness filter is used to enhance the blood vessels and Finally Hessian multi-scale enhancement filter is designed from the adaptive thres holding of the output of a vesselness filter for vessels detection. Content/Idea: Automatic detection of the retinal blood vessels [3].



In this paper they introduced system for detecting DR using different machine learning algorithm such as KNN, SVM and Random Forest ad introduce new term voting It is the simplest method of combining the outputs all algorithm to get accurate result from multiple machine learning algorithms. Content/Idea: Learning algorithm such as KNN, SVM, Random Forest [4]. In this paper they proposed the system which is able to detect all 5 stages of DR such as normal mid moderate PDR here they use dataset of rental image to train which is freely available kaggle an ensemble of five deep Convolution Neural Network (CNN) model. Content/Idea: Detect all stages of DR and CNN Use the dataset of rental image which is freely available kaggle[5].

III. PROPOSED SYSTEM

Useful for medical domain to predict the retina base diseases. Many existing systems demonstrated that, it is possible to detect leukocoria in raw digital images of cropped eyes by training using classical algorithm which having low accuracy.

They trained numerous networks for the task, using training images downloaded from various dataset which generate error rate.

To analyze stage wise prediction for retina affected patients

This project presented the development of an automated system for diabetic retinopathy detection in color retina images, through the implementation of machine learning techniques.

IV. CONCLUSION

Diabetes is one of the fast-growing diseases in recent times. According to various surveys, a patient having diabetes has around 30% chances to get Diabetic Retinopathy (DR). DR has different stages from mild to severe and then PDR (Proliferative Diabetic Retinopathy). In the later stages of the diseases, it leads to floaters, blurred vision and finally can lead to blindness if it is not detected in the early stages. Manual diagnosis of these images requires highly trained experts and is time-consuming and difficult. Computer vision- based techniques for automatic detection of DR and its different stages have been proposed in the literature. We focused to classify all the stages of DR, especially the early stages, which is the major shortcoming of existing models. We proposed a CNN ensemble-based framework to detect and classify the DR's different stages in color fundus images. We used the largest publicly available dataset of fundus images (Kaggle dataset) to train and evaluate our model. The results show that the proposed ensemble model performs better than other state-of-the-art methods and is also able to detect all the stages of DR.

V. ACKNOWLEDGEMENT

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