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AUTOMATIC IDENTIFICATION OF GLAUCOMA USING MATHEMATICALY MORPHOLOGY

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Abstract: The main objective of medical image processing field is to design computational tools which will assist quantification and visualization of remarkable pathology and anatomical structure . A medical condition known as diabetic retinopathy occurs when fluids from blood vessels seep into there in a of the human eye , causing damage to the retina. The detection of the optic disc in pictures of the retinal fundus quantitative study of the evolution of its figure the next entplaya significant part in diagnosing different pathologies, and the abnormalities related to the retina of human eye. Maximum of there abnormalities which are related to optic disc may leads to a structural changes in theinner and the outer area the optical disc. The precise border of the optical disc is obtained by calculating the region of interest and applying an in no vative morphological transformation based adaptive thresholding. The presented technique helps to reduce the process area needed for segmentation techniques leading to a distinguished performance enhancement and reducing the amount of the needed computational cost for each retinal fundus image. The proposed technique has been evaluated on publicly available data sets of retinal images which are DIARETDB1, DRIVE, HRF, DRIONS-DB, IDRiD and STARE, and a remarkable improvement has been found over the existing techniques in terms of accuracy and processing time.

Keywords: Retinal image analysis, Regionof-Interest, CLAHE, optic disc, morphological operation, segmentation, and classification.

I. INTRODUCTION

Diabetic Retinopathy (DR) is a medical condition in which damage occurs to ward there corneadue to diabetesmellitus and this is the leading cause for blindness. Eye abnormality in which an increase in blood insulin levels hasan impact on the humanretina. For diabetic people to preserve their eye sight, early DR detection and diagnosis are essential. Early DR symptoms that show up on the retina's surface include microaneurysm, haemorages, and exudates(seeinfig1). Inthisstudy ,we present a method for detecting retinal lesions that consists of a new hybrid classifier. Preprocessing, candidatelesion extraction, featureset creation, and classification makeup the proposed system. The method preprocesses the digitised retinal picture by removing background pixels and separating the blood vesselsand optic disc. All locations that might potentially haveany formo flesionare extracted during the candidatelesion identification phase utilising filter banks. For each potential candidate area, feature set based on several descriptors —such as shape, intensity, and statistics — is developed; this further aids in categorising that region. Although DR is aprogressive condition, the fundamental problem with the illness is the variety of lesions that may appear on the retina's surface.

In this work, deep learning is used to demonstrate that DR patients initially show essentially no evidence of visual impairment.

The automatic classification of fundus pictures with diseaseis suggested, and these verity of DR is established by the approach based on numbers that isinspired by the human ophthalmologists' diagnostic procedure. In order to determine which stage of diabetes the patient has, fundus photos are given into the model in this study. Those binocular fundus pictures have been paired and pre-processed appropriately in order to be better fitted to the model before being input into the network. The suggested binocular models are assessed using the AUC score, which demonstrates that theyper

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for much better than the existing model. In addition, to further demonstrate the efficiency of the binocular design, a binocular model for the four-class DR detection task is also trained and assessed. The out come demonstrates that the binocular model out performs the previous non-emsemble model with a kappa score of 0.829 on a 10% validation set. In conclusion, a comparison of confusion matrices from model with pair and unmatched inputs is conducted, showing that the binocular design does really enhance the classifi-cation performance. In this research, authors are precisely focussing on the outcome of diabetes on retinaloptic disc of human eye. Optic disc is the brightest part of a retinal image where there bodyfluid containers are merging and from where fovea contain erremainorig inateoutata fixed distance. Optic disc identification can be used to identify the blood vessels and fovea. Moreover, optic disc, share's similar characteristics with different features like exudates and cotton wools pots of diabetic retinopathy disease. special filtering, contrast limited advanced histogram equalization More than 382 million people globally suffering from the disease diabetes are aged in between 40 to 59 years. While India, China, and USA are in Use is only permitted at Imperial College London. Downloaded from IEEEX plore on June 20, 2020 at 04:47:38 UTC. There areconstraints. the top considering to other countries and to screen such a large population, a large no of the ophthalmologist is essentially required. Thus, it is very advantageous to designan automatic diabetic retinopathy detection algorithmto support the ophthalmologist. This research presents an advanced technique for the fast and accurate identification and segmentation of optic disc in different and different morphology based techniques. First thered component of the input image has been considered asit provides the brighter share of there image moreclearly. Special filters remove unwanted frequency components from the applied signal and enhance want edones. Histogram of red part of the input fundus image provides the differentintens it characteristics.

Special filters remove unwanted frequency components from the applied signal and enhance wante dones. Histogram of red part of the input fund us image provides the different intensity characteristics. The most the image with the highest intensity has been considered as the opticdisc. Experimental evaluation shows proposed technique is computationally fast in processing, robust to the variationin image contrast and illumination and comparable with the state of the art methodologies in terms of quantitative performan cemetrics.

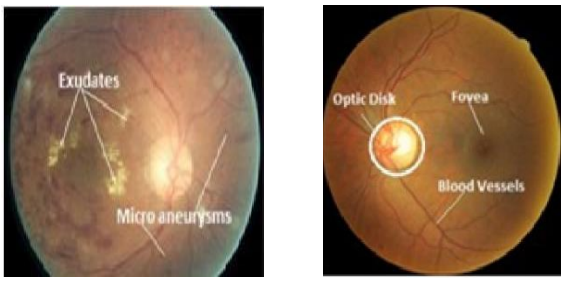

Figure 1&2: (a) A healthy fundus image showing optic disk, fovea and bloodvessels (b)f undus image showing exudates and microaneurysms.

II. LITERATURESURVEY

Literature survey is important in identifying the approaches used in earlier research on the same or related issues. When deciding which methods could be most helpful in advancing a subject, it is of ten helpful to evaluate the sorts of studies that earlier researchers have conducted. Like wise, a study of earlier findings may help researchers come up with a fresh approach to their current line of inquiry. In paper[1] the difficulty level of identifying the micro aneurysms are made easy by dividing colour retinal fundus images into two categories. This paper focuses on a unique Siamese-inspired convolution neural network model that was trained via transfer learning. Binocular image is taken as input and learn their correlation to help in making prediction. It has AUC 0.011 higher than that existing model it is also evaluated withthe10% validation set. long-termdiabetes causing an anomaly in the eyes those results in blindness before age50. Microaneurysms contribute to the loss from blood vessels the retinal. Here,the database extracted 25*25 pixel patches from the fundus images.We use extracted patches that represent the classifiers as direct inputs: the support vector machine (SVM), random forest (RF),and neural network (NN).The efficiency of all three and there accuracy performed improved then there traditional method of machine learning.

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A In the publication[4], aunique approach is presented that explicitly incorporate esnumerous characteristics and dictionary learning into a single framework. It is called automated micro aneurysm identification using multifeature vocabulary learning in diabetic retinopathy. There were four phases used to complete the procedure. Results from experiments comparing s tate-of-the-art approaches to our proposed method for MA detection show that it has a higher average sensitivity when Several common machines learning techniques to detect diseases in fundus image for the diagnosis of diabetic retinopathy using publically available data base DIARETDBI. Itin- cludes RF (RandomForest), NN (Neural Network) and SVM (Support Vector Machine) is in detail discussed in paper [5].The results yield apromising step towards automated early detection of micro-aneurysm and diabetic
retinopathy.

A new convolutional neural network based multimodal disease risk prediction (CNN- MDRP) algorithm using structured and unstructured data from hospital. To the best of their To our knowledge, no previous effort in the field of health care big data analytics specifically addressed both kinds of data. The suggested method's prediction accuracy was 94.8%, and its convergence time was quicker compared to that of the CNN-based single-modal disease risk prediction algorithm. given in Paper[6].

This presents Automatic microaneurysm diagnosis based on multi feature fusion vocabulary acquisition in diabetic retinopathy is a revolutionary approach that directly incorporates dictionary learning and numerous features into a single frame work. It consists of four phases, the first of which is preprocessing-related. Then, using MSCF, all potential MA candidates maybe found. Extract the MA andnon-MA picture patches after that. Additionally, a multifeature dictionary that combines various characteristics is employed to characterize these picture patches. The last stage includes classifying real MA son paper using the multifeature fusion dictionaries learning approach[8].The experimental results show that the suggested approach for MA detection has better averagesen sitivity.

The new method detecting MAs in the retina, based on template-matching in the wave let domain. The wavelet basis is adapted using the lifting scheme frame work. A new criteria has been proposed in paper [9] to evaluate a lesion detector: it makes it possible to search for the wavelet basis, the relevant sub bands and template-matching parameters in theau-to matic fashion. The results show that individual lesion can be detected with both a highsen sitivity and a high positive predictive value ford if ferent photographic modalities. Thus sensitivity/PPV pair was achieved for photograph. Using microaneurysms may be seen on digital colour fund us images. Is a critical first step in automated screening for diabetic retinopathy (DR), a common complication of dia- betes. The work presented in the context of the Online Challenge for Retinopathy(ROC), Here are 50 training photos with reference standards readily accessible and 50test pictures with organizer-held reference standards. are discussed in paper[10].

This work consists of a system consisting of a brand- new hybrid classifier for spotting lesions in the retina. Preprocessing, candidate lesion extraction, feature set creation, and classification are all parts of this system. The method preprocesses the digitised retinal picture by removing background pixels and separating the blood veins and optic disc. Using filter banks, the can-didate lesion identification phase removes all areas that could contain any kind of lesion. For each potential candidate area, an attribute set based on several descriptors—such as shape, magnitude, and statistics—is created in this study [11]; this aids in further identifying that region. In order to increase the accuracy of the classifier, this study extends the m-Mediods based modelling strategy and mixes it using a Gaussian Mixture Model that operates in an ensemble of the classification. This includes method that indicates significant improvement in MA-detection using reti-nalmonitoring diabetic retinopathy using fundus photosis explainedinthe work[12].The practice of the post processing map obtained from final CNN was extremely noisy, For example when there were two close candidates; they were merged and considered as one. Therefore, to obtain a smoothed probability map it is convolved with a 5-pixel-radius disk kernel.

The local maximum of the new map were expected to lie at the disk centers in the noisy map,i.e., at the centroids of each MA to obtain a set of candidates for each image.

There work focuses on multilevel classification model for diabetic retinopathy. Here the have tested by numerous

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classification models such as Logistic regression model, random forest classifier, Gaussian NB classifier, KNN, Decision tree classifier, Gradient boosting classifier. Results in each phase are validated by 10 fold cross validation method. We compare our results with recently reported literatures. It is found that proposed model presents out performing results with sensitivity equal to 84%for Decision Tree classifier, specificity equal to 82%for Gaussian NB, and accuracy equal to 88% for KNN. The pro- posed model [13] can be effectively used to aid diagnostic decisions of stage of DR.

III. PROBLEMSTATMENT

There detached for this work includes identifying the diseases of Retina using imageprocess- ing techniques. Identifying the disease patterns, facilitating precise disease diagnosis.

- Image Acquisition of Retina images.
- Image pre-processing of acquired database.
- Image segmentation of pre-processed images.
- Feature Extraction of segmented image.
- Image Classification using Convolution neural network.

IV. METHODOLOGY

In the proposed system the approach for detecting microaneurysm is given in the blockdi-agram below. The image to be diagnosed is uploaded to the CONVNet model. The uploaded image is preprocessed first and then classified into one of the five classes A bout diabeticret in opathy through prediction by classs core.

1. Image Pre-Processing And Augmentation:

The picture was taken from the IDRid (Indian Diabetic Retinopathy Image Dataset) collection.Since the majority of the fundus images in the dataset were taken using various pieces of equipment in various settings, there are significant variances in their brightness or resolution. Consequently,anumber of pre-processing techniques were used to standardise these photos, cut down on superfluous information,and remove environmental arte facts.such asfiltering, and padding sapplied.

- **Filtering:**

In this process, high frequencies in the images are suppressed and the edges are smoothened. Gaussian filtering is employed in the suggested work as it is highly effectivein re- ducing theimagenoise.

- **Padding:**

The size image fed the model should not vary as itproceeds from input to output. To ensure this zeropadding isdone. The steps involved in preprocessing areas follows:

1. To preserve the photos' short sides, the imagesarescaleddowninaccordancewiththeiroriginalaspectratio.pixel 299

2. Each pixel value in the picture is deducted fromthe weighted average of the pixel values aroundit.50%grayscale.

3. Therepelstandardsremaintransformedinterestedincomma-separatedvaluesi.e.from[0,255] to [1,1], before feeding the image as input to the network.

4. To preserve the photos' short sides, the imagesarescaleddowninaccordancewiththeiroriginalaspectratio.pixel 299

5. Each pixel value in the picture is deducted fromthe weighted average of the pixel values

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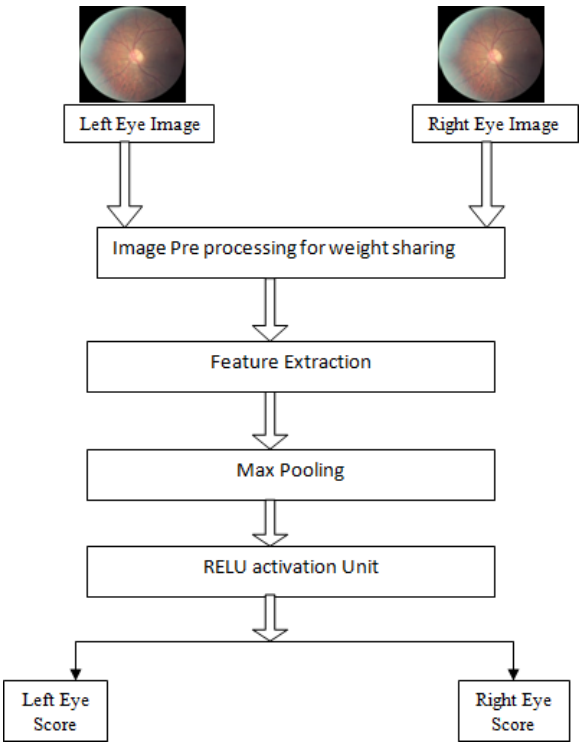

Figure2:Slab Drawing about there future model.

1. ConvolutionNeuralNetwork:

This is a specific kind of deep neural network is also referred to a sCONVNet. Here, the network saremulti-layer preceptrons (MLPs). The input fed to the model flows right through them so, these are called“feed-forward”. The model consists of five hidden layers and each hidden layer performs three operations Con- volution, Activation, and Pooling exposed of the character2.

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The model accepts fundus images corresponding to the left and right eye as input, they are split into Convolution 2D images, where activationis complete through RELU, These are the filters where poolingis done inseveral stages.

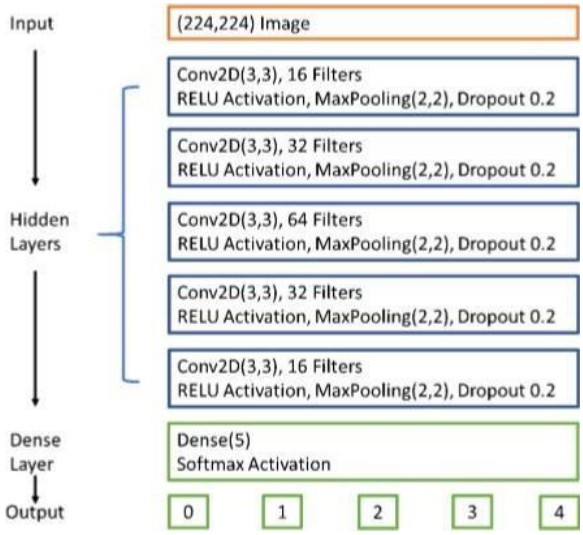

Figure3.:Model implementation diagram with hidden layer

1. Convolution:

It is the dot product between a filter array and aportion about the recontribution the image. The operation is repeated until all fundamentals about there input image have been acted on the filter. A filter is a set 'weights' that takes to been applied to there contribution image. The weights determine the features extracted from the image.

2. Activation:

The model accepts fundus images of both left and right eyes, but only one image is processed at a time. In the proposed work RELU beginning purpose in used. RELU function retains the positive elements of an array and replaces the negative elements with 0s. Only the features that have been activated are carried over to the next layer.

3. Pooling:

This simplifies the output by performing down sampling, plummeting the amount about parameters that thene two needs to learn. Our modeluses Max pooling, which looks at an area about an input array and selects the maximum value with in that region.

4. Dropout:

Often over fitting issues a rise and hence drop out technique is added to each hidden layer.

V. RESULT

There planned technique for detection and segmentation of optic disc have been extensively tested on below mentioned standard Glaucoma databases. The goal of is technique is to make the initial discovery about diseases related to the fundus. Its main advantage is the full automation of the algorithm since it does not requireany intervention.

Figure4:GUIwindow

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Figure5:Uploadingtheimagetofetchtheresults.

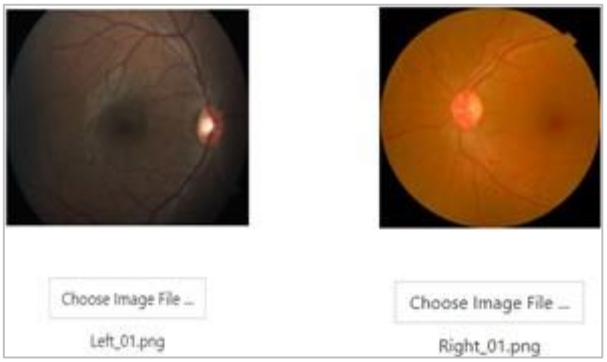

Figure7: Pre-ProcessedImage

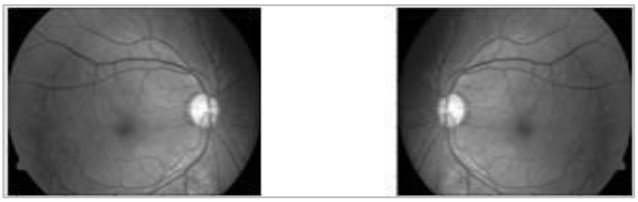

Figure 8: Prediction array generated for Severe DR

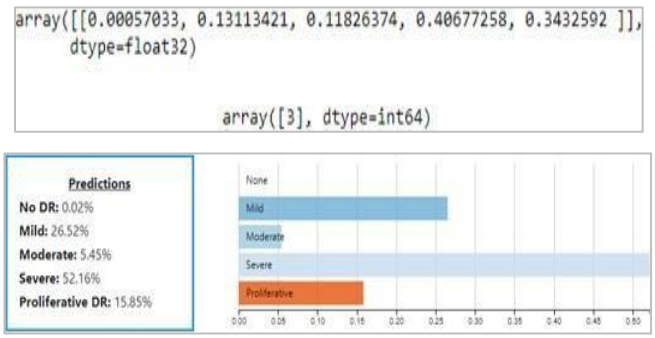

Figure 9: Final output predicted the retina is affected withSevere DR

VI. CONCLUSION

The disease is found in the 5 phases (no DR, mild,moderate, severe, and proliferative) once the photos are uploaded. The enhanced binocular model has achieved moresen-sitivity and sensuality. The precision about there effort is 88% accurate and isvalidated. The novel algorithm implemented in this work accepts the binocular inputs and forecasts thepotential for microaneurysms. This work has higher kappa score compared to the current work happening10% authentication usual. Testing more data than previous approaches has enhanced the model.

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