ENGINEERING IN ADVANCED RESEARCHSCIENCE AND TECHNOLOGY

ISSN 2352-8648
Vol.03, Issue.01
June-2022
Pages: -281-290

NEURAL NETWORK TECHNIQUE FOR DIABETIC RETINOPATHY DETECTION

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Abstract: The Diabetic Retinopathy (DR) is the application of medical image processing. The retinal images are evaluated to diagnose the DR. It is however, time consuming and resource demanding to manually grade the images such that the severity of DR can be defined. When the tiny blood vessels present within the retina are damaged, only then can one notice this problem. Blood will flow from this tiny blood vessel and features are formed from the fluid that exists on retina. The kinds of features involved here due to the leakage of fluid and blood from the blood vessels are considered to be the most important factors to study this problem. The diabetic retinopathy detection techniques have the three phase which pre-processing, segmentation and classification. In this work, Neural Network (NN) approach is used for the classification of diabetes portion from the image. The proposed model is implemented in MATLAB and results are analyzed in terms of certain parameters

Keywords: Diabetes retinopathy, NN, Optical Disk Segmentation, MATLAB.

I. INTRODUCTION: Diabetic retinopathy is considered the major reason that causes blindness among working-age individuals in developing countries. According to the World Health Organization (WHO), 347 million people are suffering from diabetes over the world and this number will be increased to 552 million people in 2030. The person who has diabetes is at high risk of eyes disease; include DR diabetic retinopathy, Diabetic Macular Edema (DME) glaucoma and cataract. To process this information, the brain needs to light signal to penetrate the eyes through the shape on the retina and lenses. This process can be disturbed easily by different diseases which prevent the correct explication of a visual signal, and this disorder is DR diabetic retinopathy which is an accompanying disorder of diabetes disease. According to early detection of DR diabetic retinopathy, the process of eyes injury might be slow down and even stopped surgically, while without any treatments it will be caused irreversible damage and blindness in advanced stages. Therewith, the process of retinal detection is difficult manually and spend time-consuming, so the system that can be analyzed the retina automatically and observe the development of disease will highly help both patients and ophthalmologists.

Recently, deep learning has been enhanced to the purpose of computer vision in diagnostic and classification of images and is the key device has been used to automate a task in people life. The Convolution Neural Networks CNN consistently have been developed to detect the objects, segmentation and classification. And can by

implementing CNNs to detect the five degrees of retinal damage DR. At last, use the specificity, accuracy of the models.

II. EXISTING SYSTEM

In existing system, they use SVM to classify the given image is whether hemorrhage or exudate.

Flow chart:

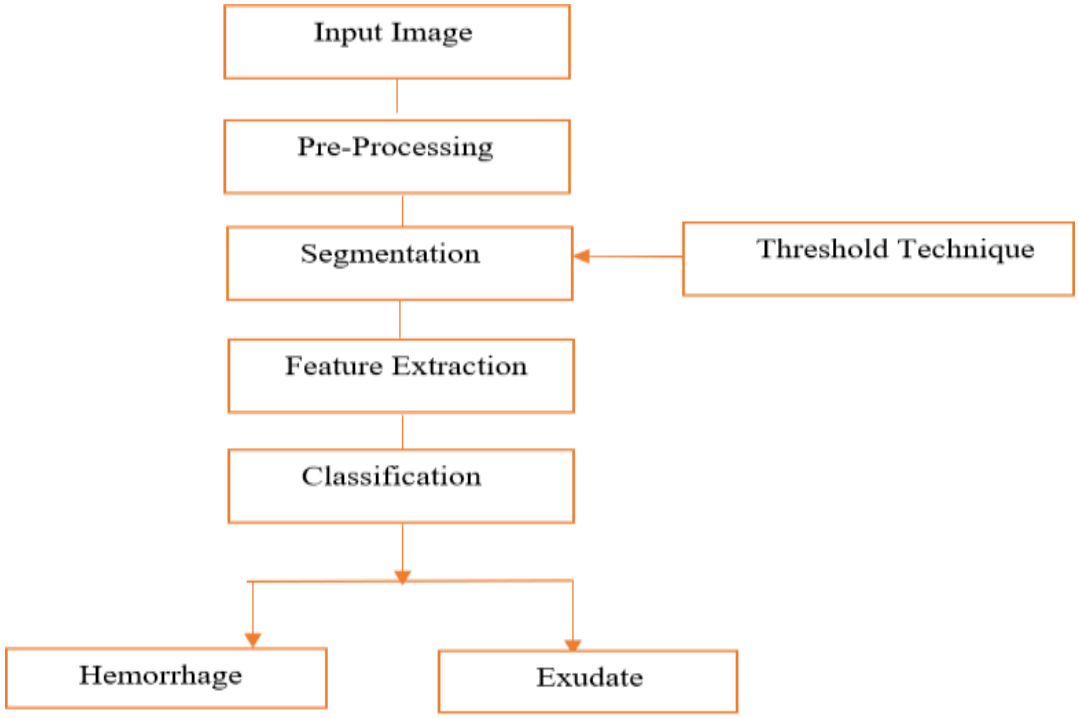


Fig1: Existing system Flow chart

The Image undergoes the pre-processing techniques, which follows the steps like image contrast, image brightness, image resize, and in image noise removal and any other details, which may causes accuracy loss for the prediction of the diseases. Median filter is used to remove the noise and the image the undergoes some threshold technique and the image is displays to user which helps the user to detect the diseases in image

Pre-Processing

Pre-Processing is used to clean the image for improving the quality of an image. Image preprocessing may also decrease model training time and increase model inference speed. If input images are particularly large, reducing the size of these images will dramatically improve model training time without significantly reducing model performance. For example, the standard size of images on iPhone 11 are 3024×4032. The machine learning model Apple uses to create masks and apply Portrait Mode performs on images half this size before its output is rescaled back to full size.

Segmentation

In Segmentation process we apply some threshold techniques to convert the image in to gray color and in to binary format here in the binary image the White color equal to 1, and Black color equal to 0 means the white color indicates the detected part and black color indicates the boundaries of an image.

Support Vector Machine

Support Vector Machine is an algorithm its takes an input image and process the image and produce the output in multi-classes. It is mainly used for classification problems in Machine Learning. And it is used to specializing and process the data to classify whether the input image is Hemorrhage or Exudate.

III Proposed System

Previously we use SVM to classify the image whether it is hemorrhage or exudate. But in proposed system we use both SVM as well as CNN. SVM is used for image classification and CNN is used for better accuracy between the models

Flow chart:

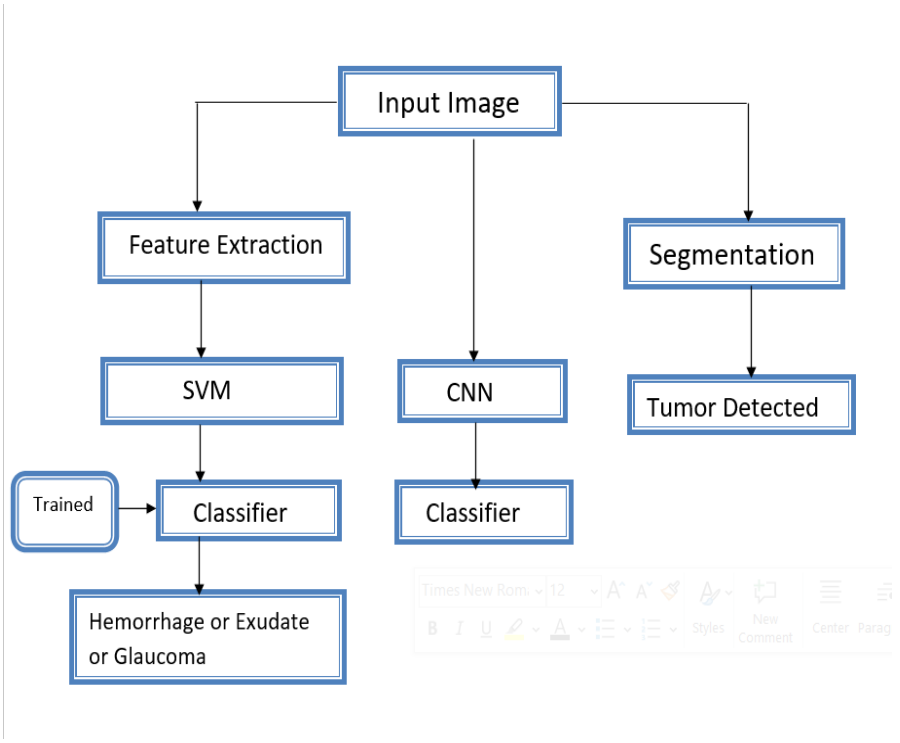


Fig 1: Proposed system flow chart

In Proposed System we under goes same as existing system by SVM but a little bit change here we also use CNN for train the large amount of data with less time and give better accuracy when compared to the SVM.

Convolution Neural Network

Convolution Neuarl Network (CNN) is a class of Neural Network that specializes the data and process the data and form a grid like topology. And in CNN they have two main layers one is Hidden Layer Another one is Classification Layer. And in Hidden layer they contain two convolution layers and two rectified layers (ReLU), and 2 Pooling Layers. And in classification layer contains Flattered Layer, Fully Connected Layer, SoftMax

IV RESEARCH METHODLOGY

This research work is based on the diabetes retinopathy detection. The diabetes retinopathy detection has the various phases which are the image pre-processing, segmentation, feature extraction and classification. The phase of the proposed work is described below:-

Data Pre-Processing:- In this phase, the diabetes retinopathy image is taken for the detection. The input image in the RGB format which need to convert into thegray scale format. The gray scale image is further processed for the detection

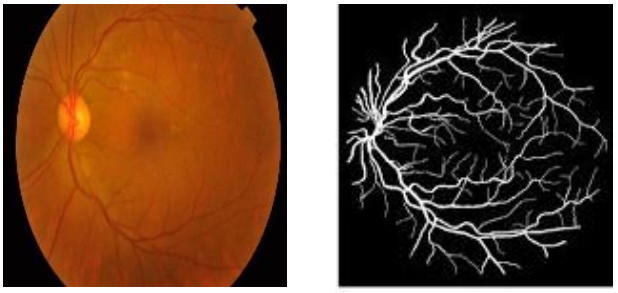


Figure 1: Data Pre-processing Phase (a) Input Image (b) Gray scale Image

Optical Disk Segmentation: - The OD is seen as a bright yellowish or white area within the colored fundus images. For the optic disc, high and similar intensity values areavailable for exudates. Thus, the removal of optic disc from the retinal image is very important. The region properties and area identification are used for masking and removing this brighter optic disc. The optic disc and blood vessels are detected by applying edge detection algorithm after preprocessing. The counter detection is performed using canny edge detection algorithm. All the local maxima known as the gradient is preserved for improving the blurred edges by the canny edge detection algorithm. Blood Vassal Extraction:- This is due to the fact that their concentration levels are similar. The high levels ofcontrasts vessels present in the blood are removed by applying dilation on the intensity image. Further, the dilation operation is used to fill the small holes presentwithin the images along with the help of structuring element. There aredifferent shapes in which structure elements (SE) exist. The optical disc and blood vessels are removed here using the flat disc shaped structure.

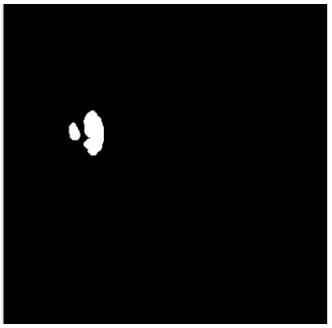


Figure 2: Optical Disk Segmentation

As shown in figure 2, the optical disk technique is applied which can segment the input image. The segmentation technique will segment the highlighted part of the image

Classification: - The last phase is of classification which is applied with the NN (Neural networks). The NN approach is the unsupervised approach for the diabetes retinopathy detection The training set is prepared based on the color

features of the input image. The system can train itself until error gets minimized in the network. The stage at which error gets minimized at that stage system is considered as maximum trained. The test image is taken as input for the diabetes retinopathy detection. The test image will be matched with the training image and it generate final classified imagewhich is shown in figure 3

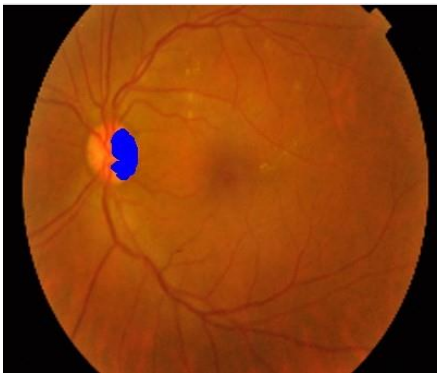
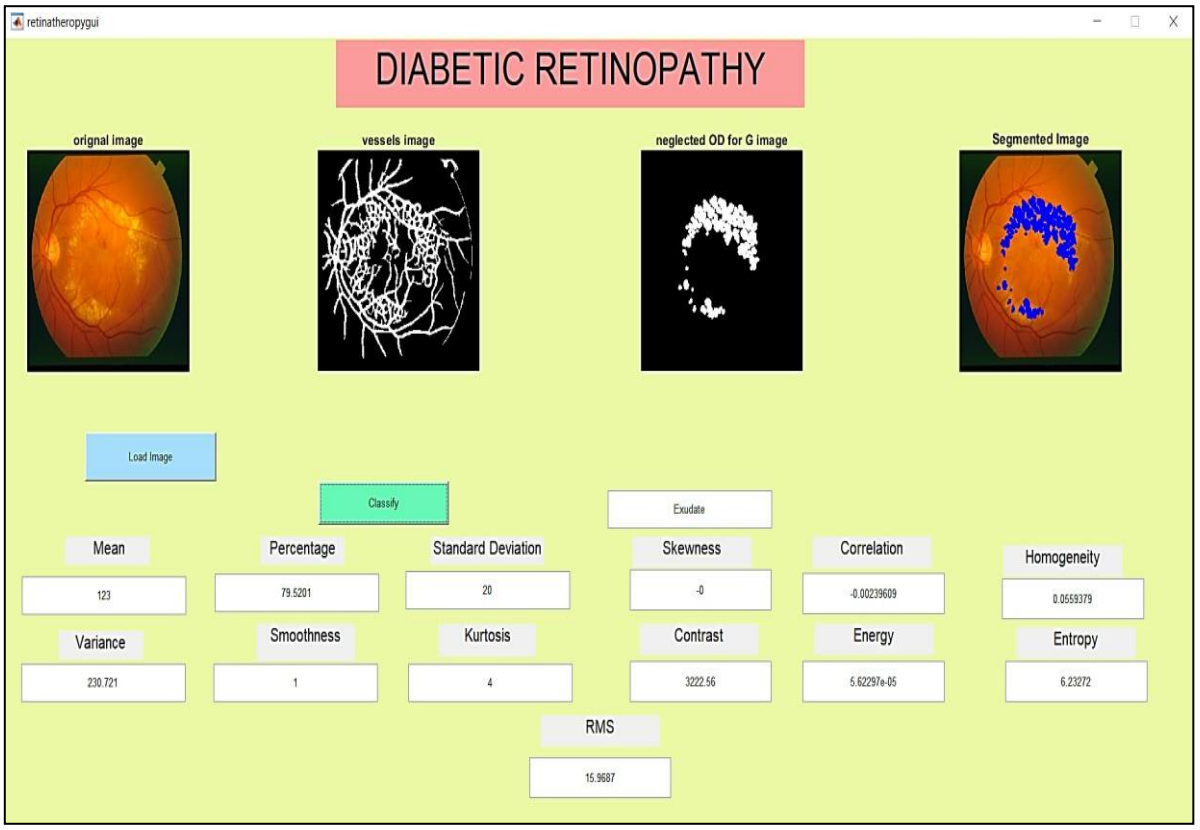


Figure 3: Classifies Image

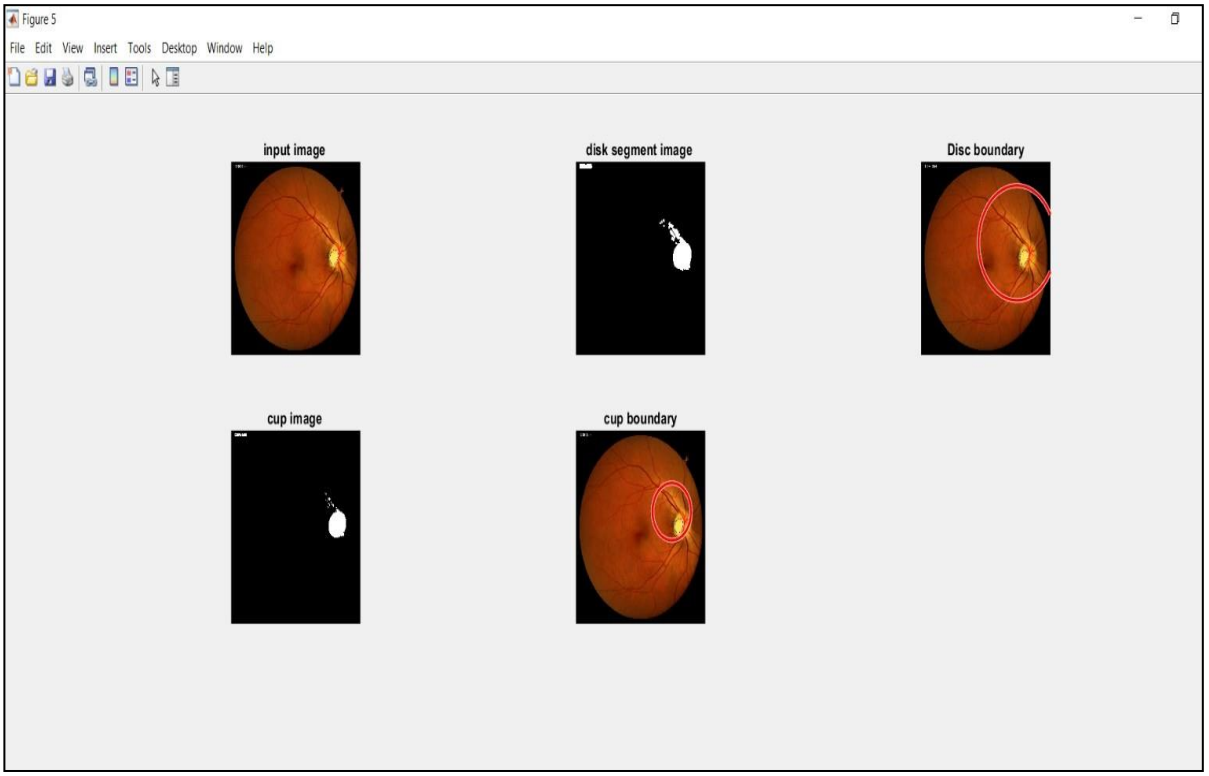
V EXPERIMENTAL RESULTS

The proposed algorithm use NN and optical disk segmentation for the classification of diabetes portion from the input image. The performance of the proposed model is analyzed in terms of accuracy, specificity and sensitivity on different set of image. The performance of proposed modelis compared with existing SVM classification model. It is analyzed that NN give good results for the diabetes retinopathy detection

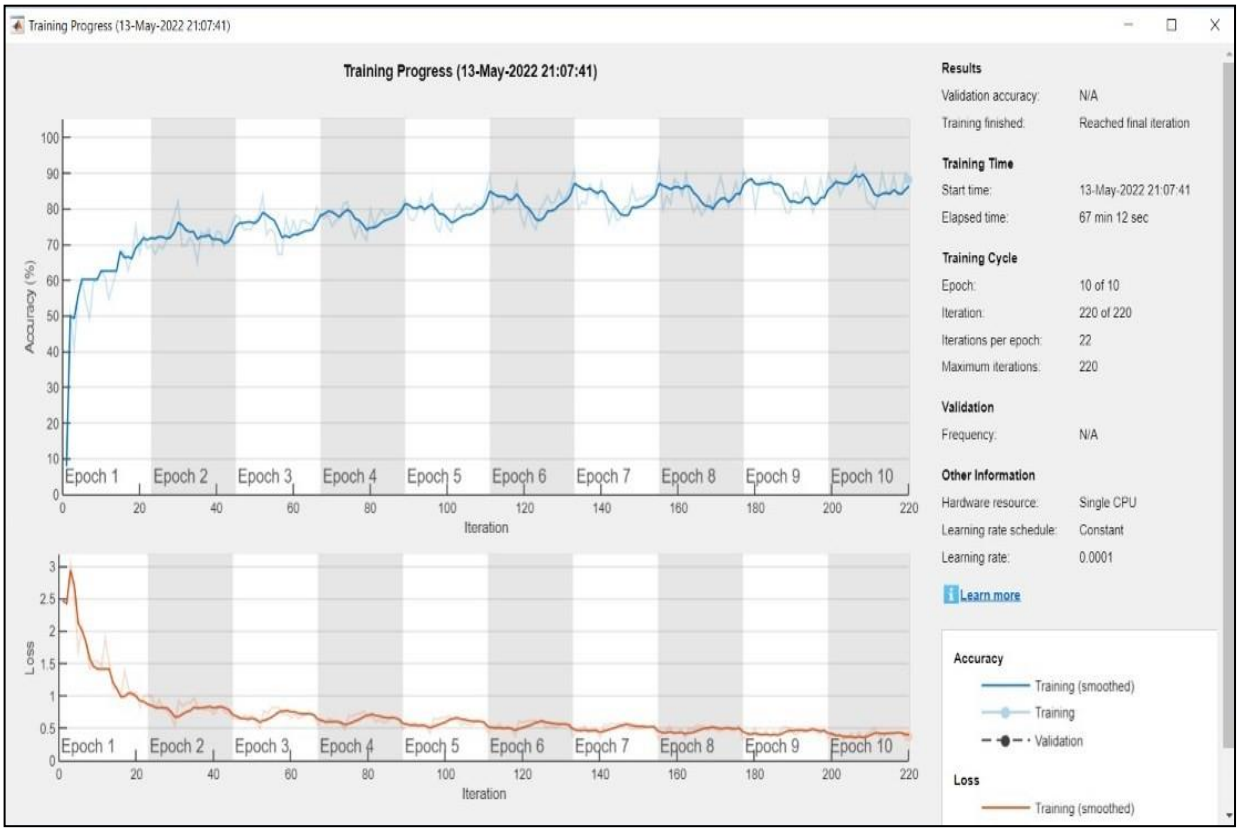
GUI



Glaucoma



CNN:



Command Window

```
Training on single CPU.
Initializing input data normalization.
|=========================================================================================|
|  Epoch  |  Iteration  |  Time Elapsed  |  Mini-batch  |  Mini-batch  |  Base Learning  |
|         |             |   (hh:mm:ss)   |   Accuracy   |     Loss     |      Rate       |
|=========================================================================================|
|       1 |           1 |       00:00:25 |        7.81% |       2.4620 |      1.0000e-04 |
|       3 |          50 |       00:13:18 |       76.56% |       0.6978 |      1.0000e-04 |
|       5 |         100 |       00:28:54 |       75.00% |       0.6627 |      1.0000e-04 |
|       7 |         150 |       00:45:35 |       82.81% |       0.4921 |      1.0000e-04 |
|      10 |         200 |       01:02:17 |       86.72% |       0.4032 |      1.0000e-04 |
|      10 |         220 |       01:07:12 |       88.28% |       0.3702 |      1.0000e-04 |
|=========================================================================================|
```

VI CONCLUSION

The diabetic Retinopathy is regarded as the predominant optic disease thatleads to blindness. Diagnosis and detection at early state is vital for patient. But the identification of retinal identification is really challenging for the ophthalmologists. Several image processing-based techniques are employed for the DR detection. In this work, an identification technique was developed on the basis of digital image processing to obtain the fundus image from the MATLAB based analysis and classification of the fundus into exudates, hemorrhages and glaucoma was done. It was also examining the type and the stage of DR. For the purpose, morphological operations areimplied for the learning of fundus images. Different performance analysis validates the proposed mechanism detected some features and observed 89% accuracy in the detection of type of the disease with in 12 iteration of the neural network approach. We examine that CNN is far better than SVM. In spite of highaccuracy achievement, further6. Lei Zhang, Qin Li, Jane You, David Zhang, "A enhancement promotes the detection rate of the system. For classification of exudate and hemorrhage we are using CNN. Because accuracy of CNN is more when compared to NN

VII REFERENCE

Devvi Sarwinda, Alhadi Bustamam, Aniati M. Arymurthy, "Fundus Image Texture Features Analysis in Diabetic Retinopathy Diagnosis", 2017 Eleventh International Conference on Sensing Technology (ICST)

Arisha Roy, Devastate Dutta, Pratyusha Bhattacharya and Sabarna Choudhury, "Filter and Fuzzy C Means Based Feature Extraction and Classification of Diabetic Retinopathy using Support Vector Machines", 2017, International Conference on Communication and Signal Processing

Ashish Issac, Malay Kishore Dutta, Carlos M. Travieso, "Automatic computer vision-based detection and quantitative analysis of indicative parameters for grading of diabetic retinopathy", 2018, Neural Computing and Applications.

Shailesh Kumar, Basant Kumar, "Diabetic Retinopathy Detection by Extracting Area and Number of Microaneurysm from Colour Fundus Image", 2018 5th International Conference on Signal Processing and Integrated Networks (SPIN)

Carla Agurto, Victor Murray, Eduardo Barriga, Sergio Murillo, Marios Pattichis, Herbert Davis, Stephen Russell, Michael Abramoff, Peter Soliz, "Multiscale AM-FM Methods for Diabetic Retinopathy Lesion Detection", IEEE Transactions on Medical Imaging, 2010, Volume: 29, Issue: 2, Pages: 502 - 512.

Modified Matched Filter With Double-Sided Thresholding for Screening Proliferative Diabetic Retinopathy", IEEE Transactions on Information Technology in Biomedicine, 2009, Volume: 13,
Issue: 4, Pages: 528 -534.