IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86133

Detection Of Diabetic Retinopathy Using Artificial Intelligence

Dhakshith N K [1], Lakshan N S [2], Manoj E [3], Manoj Kumar R [4]

Student, Electronics and Communication Department, K S Institute of Technology, Bengaluru[1-4]

Abstract: The number of diabetic patients is increasing rapidly every year all around the world and these patients suffer from a wide range of physical conditions directly associated with long-term diabetes. Diabetic Retinopathy DR affects the eyes of majority of diabetes patients to some degree. Starting from blurred vision, the effects of DR can extend to permanent blindness. The traditional detection process of DR involves an ophthalmologist who takes enhanced pictures of the retina and looks at it for any kind of abnormalities within them, which by description is a time consuming and error-prone procedure. To avoid this we can employ machine learning techniques that will automate the detection process as well as provide fast and reliable results. Using a deep learning technique this paper determines the presence and severity of DR in diabetic individuals by analyzing the pictures of their retina.

Keywords: Diabetic Retinopathy (DR), Convolutional Neural Network (CNN),Micro Aneurysms (MA)

1.INTRODUCTION

Diabetic Retinopathy is considered the major and the most prevalent diseases associated with the human eye. Statistical estimation for patients with diabetes in 2030 is 82 million in the developing countries around the world, and 48 million in developed countries. Likewise, if the DR disease which is found in diabetic patients is not treated, then it may lead to blindness. Symptoms of DR may appear as the disease progresses, including floating spots in vision, blurred vision and sudden loss of vision. Ultimately, the retinal blood vessels are affected, and glucose over-accumulation might lead to damage the tiny blood vessels permanently. Micro aneurysms (MAs) are the DR primary symptoms, Hemorrhage, hard exudates, macular edema, spots of cotton-wool, venous beads are some of the other symptoms of DR.

2.LITERATURE SURVEY

The team lead by Tang et.al. [1] developed a novel method of supervisory classification that was dependent on the filtering of the blood vessels using the Gabor Wavelet Transforms. A GL Spatial Corelation concept for how to build the histograms depending on the property of the image locals was put forward by the team of Chanwimaluang et.al. in [2]. The authors proposed Gaussian Filtering scheme which was based on modified 2nd order Filter 1213.The team of Abdallah et.al. [3] proposed novel methods of segmenting of the blood vessels which were of the same size, i.e., similar dimension. Zhang et.al [4] in their research paper studied the preparation of text for classifying the blood veins/capillaries. An hybrid methodology which was depended on the extraction of the features for blood vessel detection was developed by the team of Aslaniet.al.in their research paper in [5]. Hassanaet.al. in [6] proposed the Mathematical models along with clustering using k-means for segmenting of the blood capillaries. FC-means cluster method was used by Vermeer et.al. in [7] for detecting the fine & coarse blood capillaries, from which they could detect the disease. An identification scheme which was based on the characterization of the blood veins was put forward in their research paper by Sinthanayothinet.al.in [8].

3.OBJECTIVES

- To develop a portable device using artificial intelligence algorithm for the detection of signs of DR in diabetic patients.
- To scientifically validate the algorithm to be used as screening tool in primary care.
- To prescribe related medicine for the detected DR and advice the patient to get an ophthalmologists appointment.

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86133

4.DESIGN AND ARCHITECTURE

The Block Diagram of Detecting Diabetic Retinopathy and its implementation model is shown below.

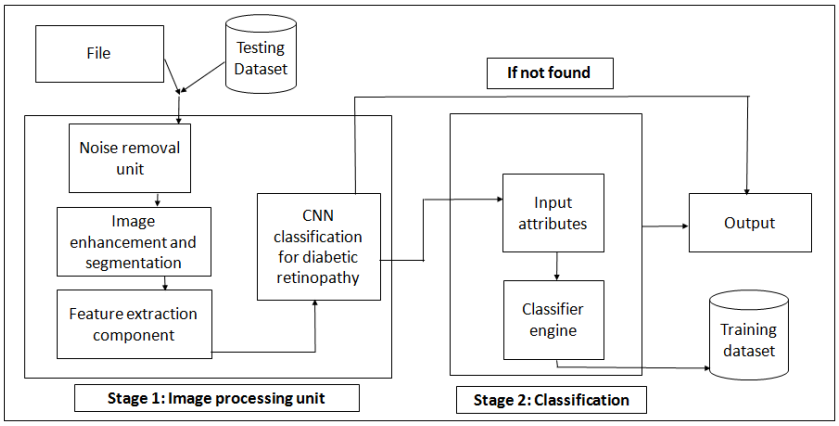

Figure 1: Block Diagram

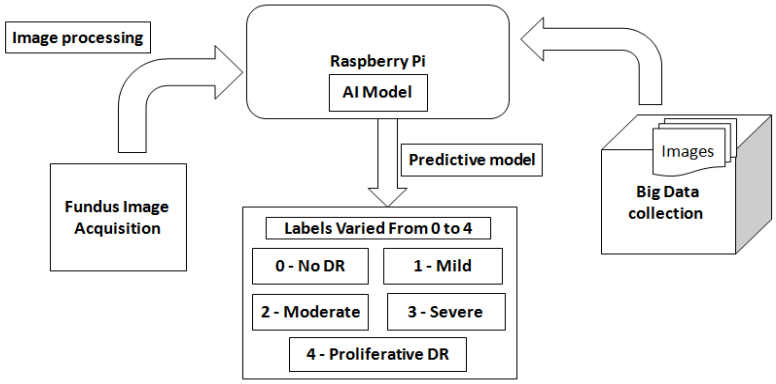

Figure 2: Implementation model

5.RESULTS

The classifications in the network have been defined numerically as: 0-Normal, 1- Mild DR, 2-Moderate DR, 3 - Severe DR and 4 – Proliferative DR. The CNNs classification results have been shown below.

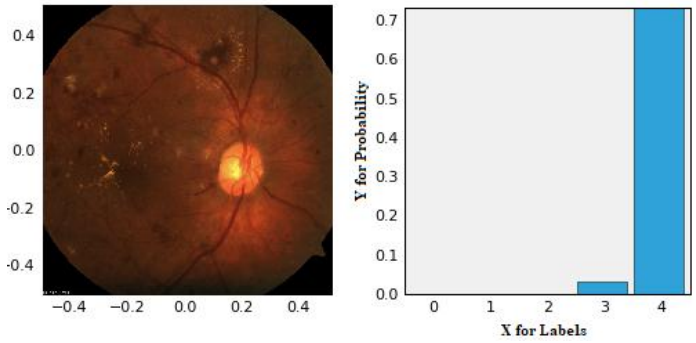

Figure 3: Classification Result of Proliferative-DR

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86133

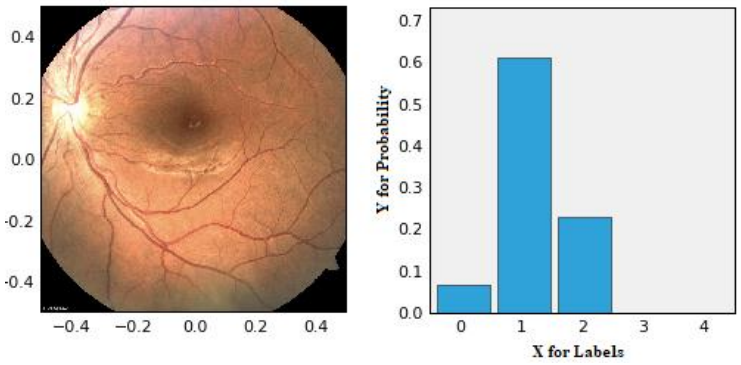

Figure 4: Classification Result of Mild-DR

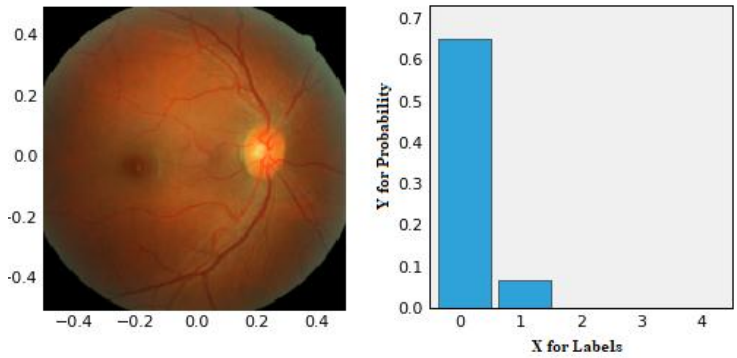

Figure 5: Classification Result of Normal-DR

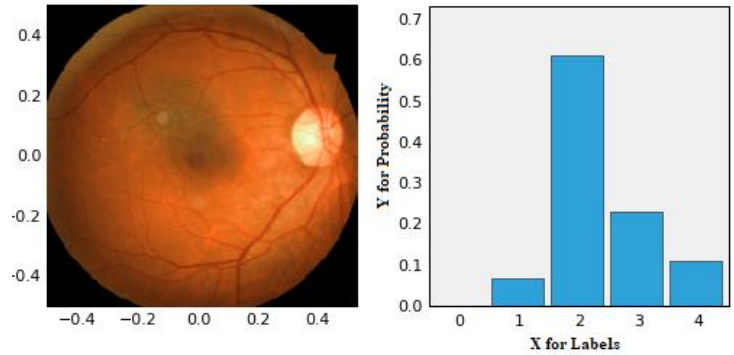

Figure 6: Classification Result of Moderate-DR

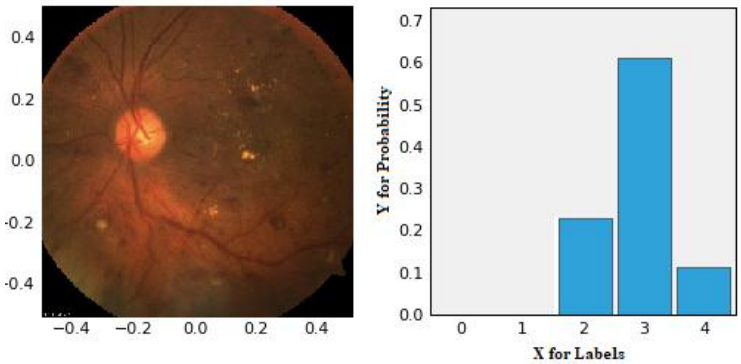

Figure 7: Classification Result of Severe-DR

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86133

6.CHALLENGES FACED

•Dataset Availability: To train deep learning algorithms it requires annotated representative data from a varied set to fundus camera and various geographies.
•Fundus Image Analysis: Image analysis with computer image is a challenge due to the wide and varied set of fundus images with different patterns and colour variations.
•Lack of Diabetic Specialists: Availability of diabetic specialists is very low compared with the number of patients who are tested per month. Moreover it takes several days for the specialist to grade the images and advise next steps to the patients. This clearly shows the need for automation.

7.CONCLUSION

In this project work we have designed a computational model to predict the DR. In case of clinical diagnosis, the prediction of accuracy and other performances measurement must be relatively high. But the performance of a classification model is highly dependent on the pre-processing of dataset as well as feature extraction approach. Hence we have mainly focused on the pre-processing and feature extraction of the obtained retinal images and tried to detect DR.

REFERENCES

1.S. Tang, T. Lin, J. Yang, J. Fan, "Retinal Vessel Segmentation using Supervised Classification based on Multi-scale vessel filtering and Gabor Wavelet", Jour. of Med. Imag.&Health Info.,Vol. 5, pp 1571- 1574, 2015.
2.T. Chanwimaluang, G. Fan, "An efficient algorithm for extraction of anatomical structures in retinal images", Proc. of ICIP, pp. 1193–1196, 2003
3.A.J. Abdallah, P.E. Undrill, M.J. Cree, J.A. Olson, K.C. McHardy, P.F. Sharp, J.V. Forrester, "A comparison of computer based classification methods applied to the detection of microaneurysms in ophthalmic fluorescein angiograms", Computer Biological Medicine, Vol. 28, No. 3, pp 225–238, 1998.
4.L. Zhang, M. Fisher, W. Wang, "Retinal vessel segmentation using multi-scale textons derived from keypoints",Jour. of Comp. Med. Imaging &Grap., Vol. 45, pp 47-56, 2015.
5. C. Aslani, "The Human Eye: Structure and Function", Sinauer Associates, Sunder-land, MA, 1999.
6.C. Hassana, J.F. Boyce, H.L. Cook, T.H. Williamson, "Automated localization of the optic disc, fovea & retinal blood vessels from digital color fundus images", British Journal of Ophthal., Vol. 83, No. 8, pp. 902–910, 1999.
7.K.A. Vermeer, F.M. Vos, H.G. Lemij, A.M. Vossepoel, "Model based method for retinal blood vessel detection", Comps. in Bio.& Med., Vol. 34, No. 3, pp. 209–219, 2004.
8.C. Sinthanayothin, J.F. Boyce, T.H. Williamson, H.L. Cook, E. Mensah, S. Lal, D.Usher, "Automated detection of diabetic retinopathy on digital fundus images", Diabet. Med. Jour., Vol. 19, No. 2, pp. 105–112, 2002.