Research Article

Diabetic Retinopathy Analysis Using Machine Learning

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Article History: Received: 11 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 20 April 2021

Abstract: Diabetic Retinopathy is a sickness of membrane that affects patients with diabetes, and it is a main reason for vision defect. It is a sickness within which the retinal blood vessels swell. These damage the membrane of eye and should cause vision defect if the extent of diabetes is high. In this project are going to the information's are collected as dataset that feed into a Machine learning model which can classify the patient's detail and analyses whether they have retinopathy or not, just in case if the having retinopathy python with image processing, we are going to analyse the kind and stage of the sickness.

Keywords: Dataset, Machine Learning Model, Image Processing

1. Introduction

Diabetes has become one in all the speedily increasing health threats worldwide. We are able to see that there's a really high increase within the prevalence of polygenic disease in Republic of India from the year 2010 to 2030. No. of patients are expected to extend to the figure of ninety million in year 2030 from fifty.6 million in 2010. In term of share of prevalence of polygenic disease can increase from four.3 you tired of 2016 to five.82% in 2030. Correct and early treatment of polygenic disease is price effective since the implications of poor or late treatment are terribly pricey. Fundus imaging has a crucial role in polygenic disease observation since occurrences of retinal abnormalities are common and their consequences serious. However, since the attention structure is sensitive to vascular diseases, structure imaging is additionally thought-about as a candidate for non-invasive screening. The success of this sort of screening approach depends on correct structure image capture, and particularly on correct and reliable image process algorithms.

The main contribution of this work is to report individuals concerning their diabetic retinopathy earlier, the information's are collected as dataset that feed into a deep learning model which may classify the patient's detail and analyses whether or not they have retinopathy or not, simply just in case if the having retinopathy python with image process, we have a tendency to are progressing to analyze the sort and stage of the illness.

2. Related Works

Darsini et al. (2018) IOT based mostly health watching for the polygenic disease patients. We will often monitor and maintain our health. IOT based mostly health watching approach to polygenic disease with the goal of multi-dimensional aspects to support a polygenic disease care that facilitate in restraint and maintain diabetic level often.

Deshkar et al. (2017) web service that has low value world property, web portal, AN automatic update is distributed by a telephony or AN SMS Automatic update to doctor via SMS Drug reminder. This mobile health (m-Health) approach permits for multiple care dimensions of polygenic disease by means that of remote.

Nithin et al. (2019) using CNN, The datasets square measure pre-processed and increased victimization three coaching method (VGG16, VGG19, InceptionV3) sleuthing DR with accuracy. All models were developed by victimization Keas deep learning framework on a Tensor Flow backend. VGG16 provided United States with AN accuracy of seventy one.7%, whereas constant for VGG19 seventy six.9% and origin v3 was seventy.2%.

Chen et al. (2019) Convolutional neural network model with a design is trained with transfer learning technique. Digital image process improves sensitivity for delicate category detection. The System will simply classify pictures of the tissue layer among Diabetic and Healthy patients, reducing the amount of reviews of doctors.

Keain et al. (2019) Pre-processing techniques like inexperienced channel extraction, bar chart feat and. distinction restricted accommodative bar chart feat (CLAHE), morphological method, averaging filtering are used. SVM has nice success in classification. The sensitivity and specificity of DR detection system square measure determined as ninety six and ninety two severally.

Barath Kumar et al. (2018) Dataset is pre-processed and fed to the generative model supported a deep continual design. It combines convolution neural network (CNN) for beholding and detection with long short-term-memory

(LSTM) for AI. Medical image caption will build the condition of wellness easier to be understood. Give a powerful regard to doctors. The inevitable trend of future development. The accuracy of identification for individual abnormal discoveries is up to eighty eight.53%. The identification accuracy is quite ninetieth.

Wan et al. (2017) Deep learning technique. Dataset is pre-processed and inexperienced channel extraction is completed. Ensuing step is Recognition of Diabetic options, by victimization Matched Filtering. The extracted options square measure fed to CNN for classification purpose. Higher detection accuracy. Expeditiously observe and classify the severity of DR. This technique reducing the work of AN oculist with AN accuracy of around ninety eight.

Maya (2019) Convolutional neural network system supported deep learning technique. All coaching pictures were one by one standardized by subtracting mean and dividing by variance that were computed over all the pixels in a picture. CNN is trained for classification. Highlights regions on retinal pictures that square measure indicative for diabetic retinopathy to help diagnosis. Facilitate diagnostic scrutiny and be a great tool for medical professionals. The accuracy indicative for diabetic retinopathy is almost ninety fifth.

In our project we will gather diabetic data set which feed into a SVM Machine learning algorithm which will classify the patient's detail and analyses whether they have chance to get retinopathy or not , In case if the having retinopathy using python working with image processing, we will classify the type and stage of the disease.

3. System Architecture

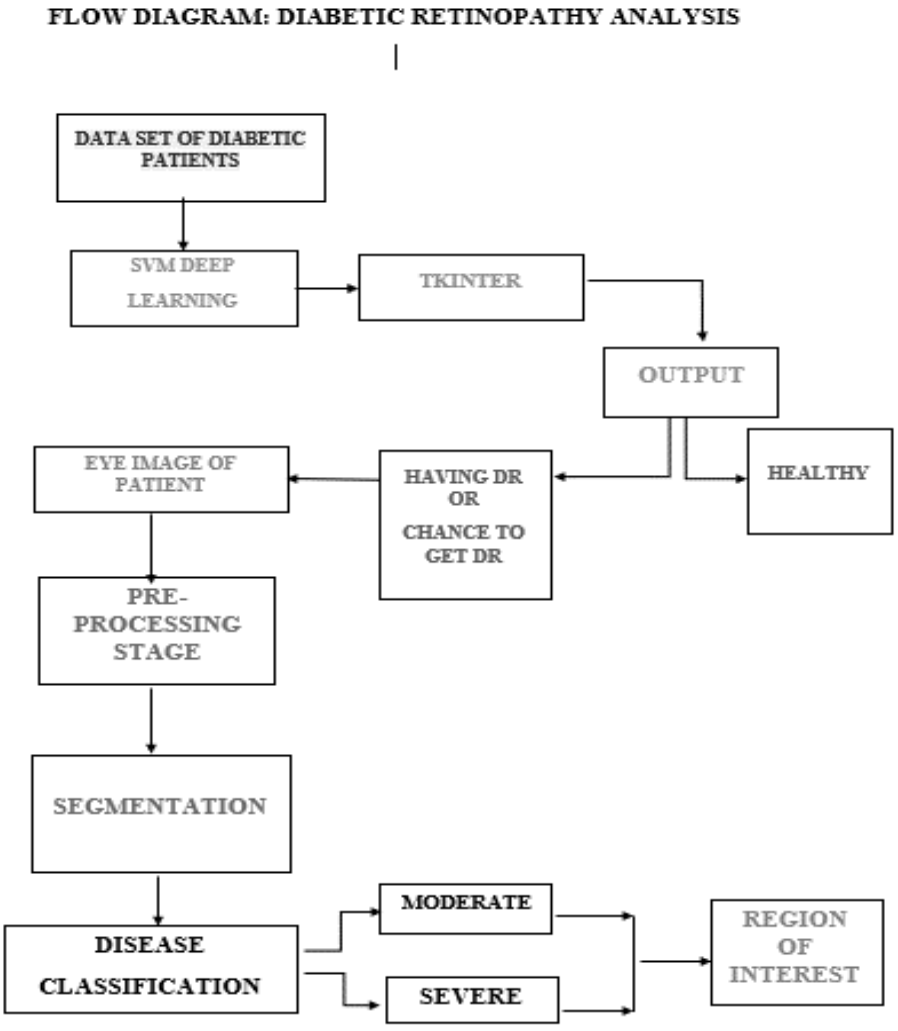

Figure 1: Proposed System Architecture

4. Proposed Methodology

- Retinopathy prediction
- Retinal analysis
- Disease Classification

4.1. Retinopathy Prediction

4.1.1. Algorithm

Diabetic dataset of the diabetic patients are getting to be feed into a SVM Machine learning formula that classifies whether or not or not the patient is laid low with retinopathy or they have chance to induce affected.

4.1.2. TKINTER

The result are typically checked at intervals the programmed by giving distinctive user id that's appointed for each patients to check their results.

4.1.3.Implementation

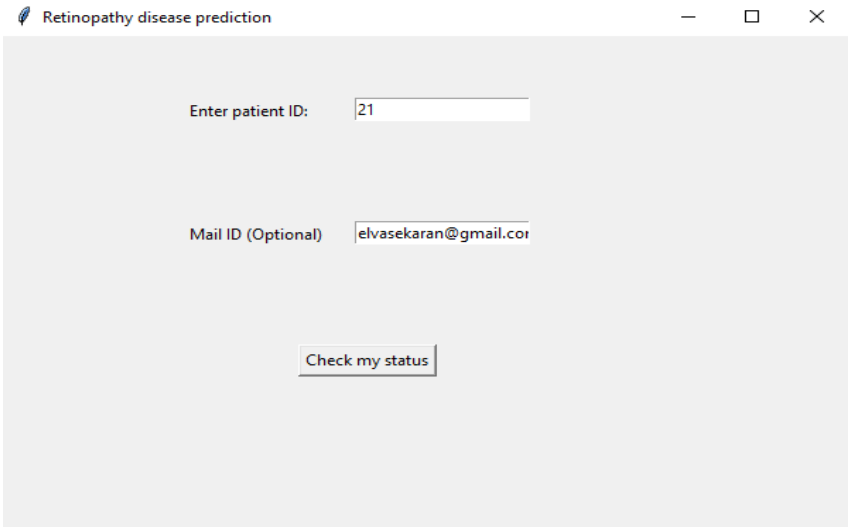

Figure 2: Retinopathy disease prediction

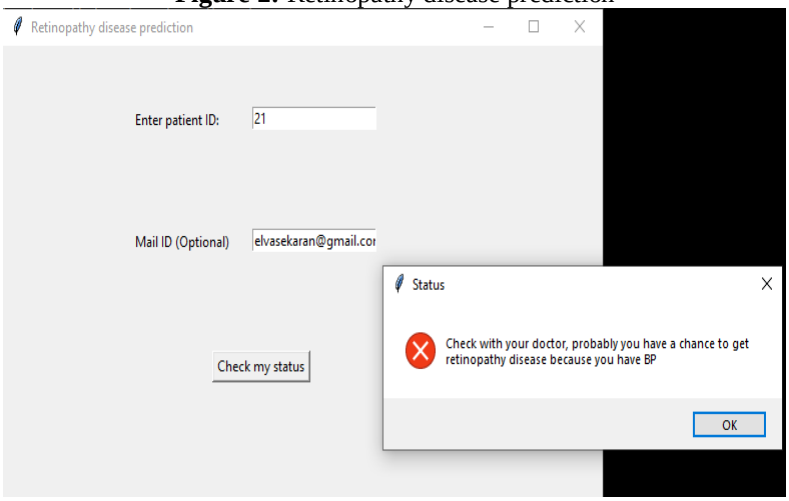

Figure 3: Patient Status

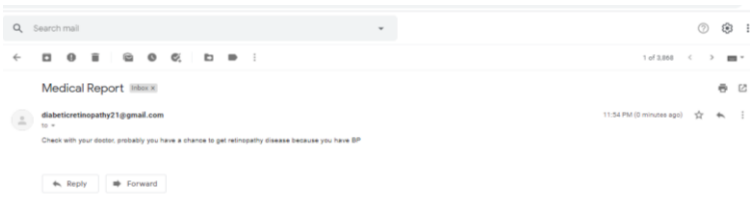

Figure 4: Patient Medical Report Email Notification

4.2. Retinal Analysis

4.2.1. Pre-Processing

a) Gray Scale Extraction

Gray scale photos retain information above the other channel photos. Therefore on boost the excellence of the Image equally across pixels, resizing is finished.

Figure 5: Converted Gray Scale Images

b)Resizing:

All the converted grayscale images are resized to a fixed size of 1000 x 1400pixels.

c) Pixel Rescaling:

For every image, each pixel values square measure rescaled into a value between zero and one by dividing by 255 for easy computation.

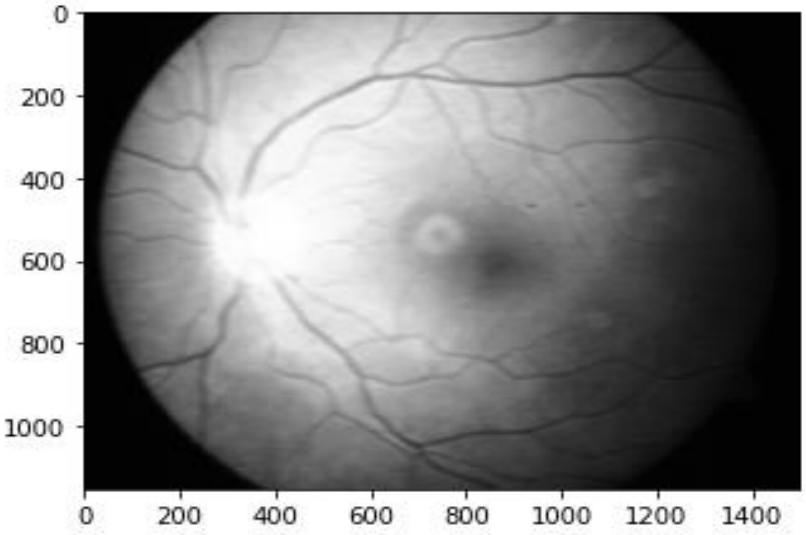

Figure 6: Image resizing

d)Adaptive histogram

To adjust the excellence of an image by modifying the intensity distribution of the bar chart.

```
In [5]: imm_dwt = []
        for equ in immatrix:
            equ = equ.reshape((1152,1500))
            coeffs = pywt.dwt2(equ, 'haar')
            equ2 = pywt.idwt2(coeffs, 'haar')
            imm_dwt.append(np.array(equ2).flatten())

In [6]: np.shape(imm_dwt)
        np.shape(equ2)
        plt.imshow(imm_dwt[78].reshape((1152,1500)),cmap='gray')
        plt.show()
```

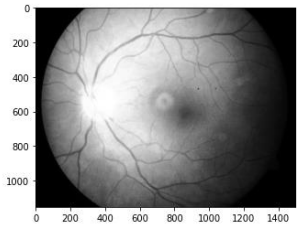

Figure 7: Image resizing

4.2.2. Gaussian Filter

- The Gaussian Filter is cherish the mean filter however it involves a weighted average of the skirting pixels and encompasses a parameter letter.
- The kernel represents a definite approximation of an arrangement.
- While the Gaussian filter blurs the sides of an image (like the mean filter) it'll a stronger job of protective edges than a equally sized mean filter.
- It can also specify the standard deviation for the x and y directions individually. If only one letter worth is like then it's thought-about the letter worth for every the x and y directions.

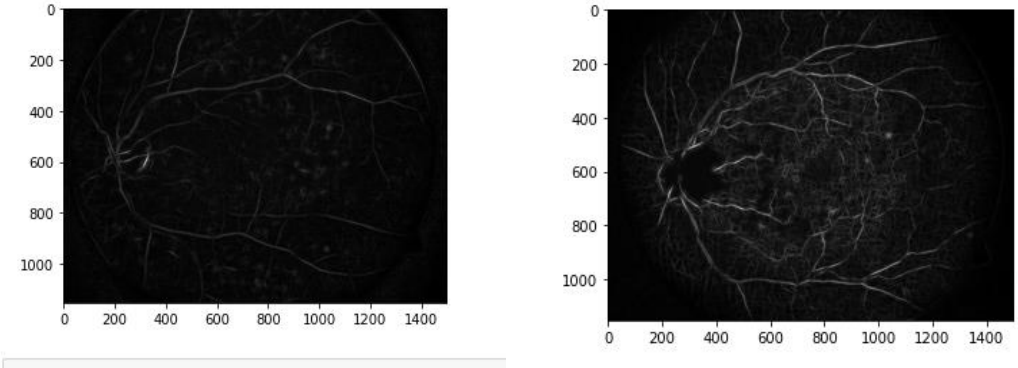

Figure 8: Gaussian Filter Blurs

4.2.3. Segmentation

- Class Segmentation- Dividing the image into segments to make use of the important segments for method the image.
- Class Boundary- Identifies the boundary pixels of the digital region.

4.3. Disease Classification

Retinopathy has three stages:

- Mild and Moderate non proliferative retinopathy – micro aneurysms.
- Severe non proliferative retinopathy- blocked blood vessels.
- Proliferative retinopathy- blood vessels grown on the retina.

4.3.1. Implementation

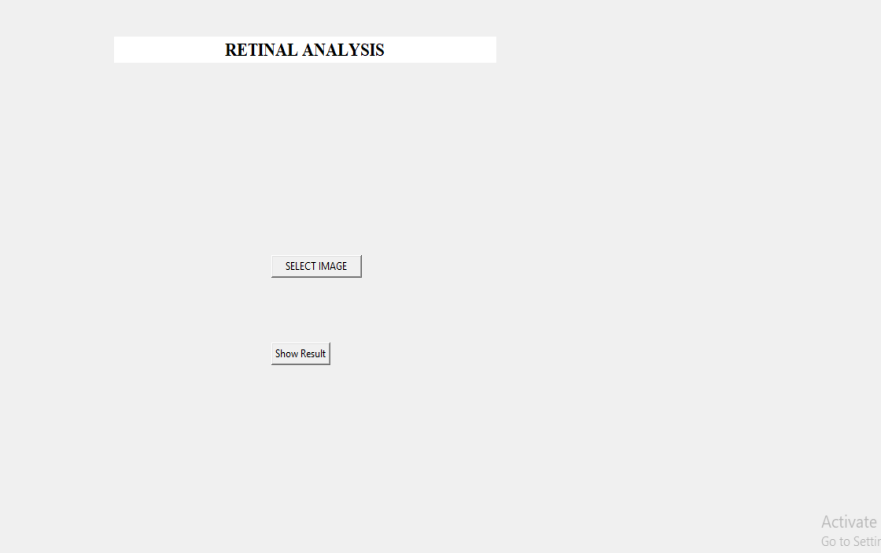

Figure 9: Stage 1-Retinal Analysis

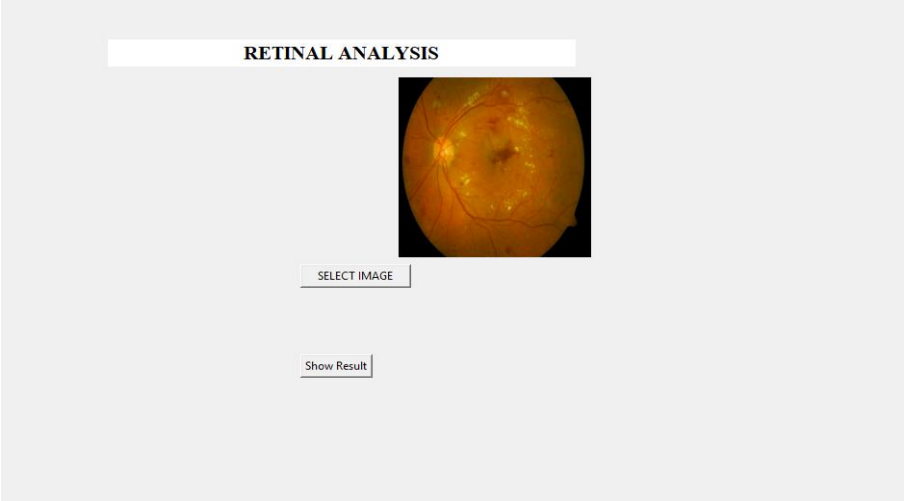

Figure 10: Retinal Analysis Image Selection

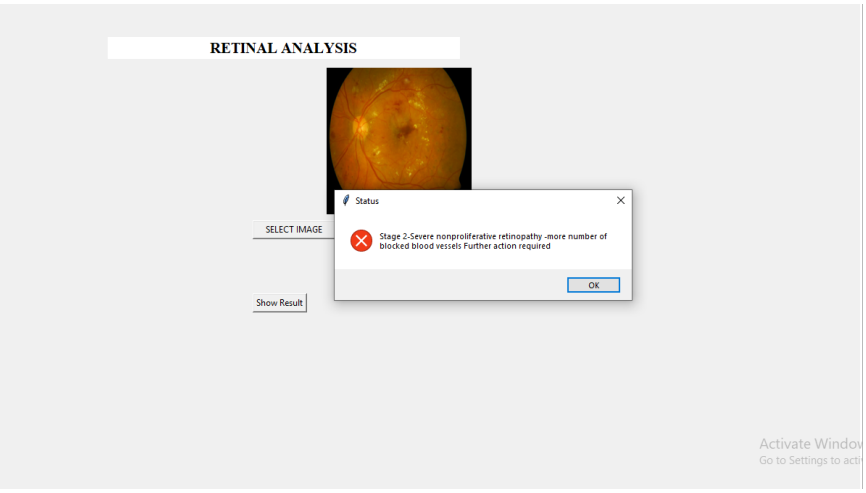

Figure 11: Stage 2-Retinal Analysis

5. Conclusion

Our project main motive is to find whether the person has Diabetic Retinopathy or they have chance to affect by retinopathy in case if they are having DR, we detect the stage and the region where it occurred in retina and this project makes the ophthalmologist work easier by detecting the type in diabetic retinopathy and determine its stage by extracting the exact affected area by this the ophthalmologist can easily treat the patient and cure as soon as possible.

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