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# DETECTION OF DIABETIC RETINOPATHY

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**Abstract**: The rising situation in the developing world suggests diabetic retinopathy may soon be a major problem in the clinical world Hence, detection of diabetic retinopathy is important Diabetes is one of the main reasons for blindness in working age of adults The retinal tissue swells, blood veins in retina change which results into their bursting and bleeding. All of this results into blurry vision and loss of eyesight in humans. Early detection of this condition helps in early treatment and prevention of Diabetic Retinopathy (DR).This project aim A computerized screening system can be useful for fully automated mass screening. Such system screens a large number of retinal images and identifies abnormal images

## 1. Introduction

The rising situation in the developing world suggests diabetic retinopathy may soon be a major problem in the clinical world Hence, detection of diabetic retinopathy is important. This project focuses on Multi Layer Perception Neural Network (MLPNN) to detect diabetic retinopathy in retinal images. Diabetes is a disease that affects blood vessels throughout the body, particularly in the kidneys and eyes. When blood vessels in the eye are affected, the condition is referred to as diabetic retinopathy (DR) Diabetic retinopathy is a major public health problem and a leading cause of blindness in the World. Diabetic retinopathy is a micro vascular complication that may occur in patients with diabetes he occurrence of diabetic retinopathy will result in the disturbance of visual capability and can eventually leads to blindness.. There is more chances for development of diabetic retinopathy if the diabetic person is not treated for long period of time.

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Diabetic retinopathy becomes symptomatic in afterwards stages. In the first stage, diabetic patients may not be aware of having infected by the disease. Therefore early detection of diabetic retinopathy is very important to avoid further circumstances. A computerized screening system can be useful for fully automated mass screening. Such system screens a large number of retinal images and identifies abnormal images. These identified images are provided to an ophthalmologist for taking decision for further treatment. A necessary tool for reliable evaluation and comparison of medical image processing algorithms is a database including a selected set of high quality medical images which are representatives of diabetic retinopathy and have been verified by experts.

**2. Literature Survey**

[1] KAGGLE, “DIABETIC RETINOPATHY DETECTION,” 2015.

“The US Centre for Disease Control and Prevention estimates that 29.1 million people in the US have diabetes and the World Health Organization estimates that 347 million people have the disease worldwide. Around 40% to 45% of Americans with diabetes have some stage of this disease. however this can be difficult as the disease often shows few symptoms until it is too late to provide effective treatment”.

[2] P. PORWAL, S. PACHADE, R. KAMBLE, M. KOKARE, G. DESHMUKH, V. SAHASRABUDDHE, AND F. MERIAUDEAU,

“Indian diabetic retinopathy image dataset (idrid),” 2018. “Diverse and representative retinal image sets are essential for developing and testing digital screening programs and the automated algorithms at their core. To the best of our knowledge, the database for this challenge, IDRiD (Indian Diabetic Retinopathy Image Dataset), is the first database representative of an Indian population”.

[3]N. WEBER, M. WAECHTER, S. C. AMEND, S. GUTHE, AND M. GOESELE,

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"Rapid, detail-preserving image downscaling," ACM Trans. Graph., vol. 35, no. 6, pp. 205:1–205:6, Nov. 2016. "Image downscaling is arguably the most frequently used image processing tool.In a user study we verify that users prefer our results over related work. Our efficient GPU implementation works in real-time when downscaling images from 24 M to 70 k pixels. Further, we demonstrate empirically that our method can be successfully applied to videos".

[4] R. ACHARYA U, C. K. CHUA, E. Y. NG, W. YU, AND C. CHEE, "APPLICATION OF HIGHER ORDER SPECTRA FOR THE IDENTIFICATION OF DIABETES RETINOPATHY STAGES," J. MED. SYST., VOL. 32, NO. 6, P. 481–488, DEC. 2008.

"Various image processing techniques have been used to identify the different stages of diabetic retinopathy. The application of non-linear features of the higher-order spectra (HOS) was found to be efficient as it is more suitable for the detection of shapes."

[5] KAHAI, P., NAMUDURI, K. R., AND THOMPSON, H., A DECISION SUPPORT FRAMEWORK FOR AUTOMATED SCREENING OF DIABETIC RETINOPATHY. INT J BIOMED IMAGING. 1:1–8, 2006.

"In this paper, we propose a decision support system (DSS) for automated screening of early signs of diabetic retinopathy. Classifications schemes for deducing the presence or absence of DR are developed and tested. The detection rule is based on binary-hypothesis testing problem which simplifies the problem to yes/no decisions".

[6] NIEMEIJER, M., VAN GINNEKEN, B., STAAL, J., SUTTORP-SCHULTEN, M., AND ABR'AMOFF, M., AUTOMATIC DETECTION OF RED LESIONS IN DIGITAL COLOR FUNDUS PHOTOGRAPHS. IEEE TRANS. MED. IMAG. 24:5584–592, 2005.

"In this paper, a novel red lesion detection method is presented based on a hybrid approach, combining prior works by Spencer et al. (1996) and Frame et al. (1998) with the important new contributions. The contribution are new red lesion candidate detection system based on pixel classification.Using this technique, vasculature and red lesions are separated from the background of the image".

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[7] TAN, T. G., ACHARYA, U. R.,NG, E. Y. K., AUTOMATED IDENTIFICATION OF EYE DISEASES USING HIGHER ORDER SPECTRA. J. MECH. MED. BIOL., 8(1):121–136, 2008.

"The method proposed in this study is based on higher-order spectral (HOS) features that capture contour and shape information, while providing robustness to shift, rotation, changes in size, and noise".

[8]NICOLAI, L., JANNIK, G., MICHAEL, G., HENRIK, L. A., AND MICHAEL, L., AUTOMATED DETECTION OF DIABETIC RETINOPATHY IN A FUNDUS PHOTOGRAPHIC SCREENING POPULATION. INVESTING. OPHTHALMOL. VIS. SCI. 44:767–771, 2003.

"This was a retrospective cross-sectional study of 260 consecutive non photocoagulated eyes in 137 diabetic patients attending routine photographic retinopathy screening. Mydriatic 60 fundus photography on 35- mm color transparency film was used, with a single fovea-centered field".

[9]WONG, L. Y., ACHARYA, U. R., VENKATESH, Y. V., CHEE, C., LIM, C. M., AND NG, E. Y. K.,

Identification of different stages of diabetic retinopathy using retinal optical images. Inf. Sci. 178:106–121, 2008. "As diabetes progresses, the vision of a patient may start to deteriorate and lead to diabetic retinopathy. Classification of the difference stages of eye diseases was achieved using a three-layer feed Sforward neural network. The features are extracted from the raw images using the image processing techniques and fed to the classifier for classification. We demonstrate a sensitivity of more than 90% for the classifier with the specificity of 100%".

[10]IMAGE MODELING OF THE HUMAN EYE R ACHARYA, YKE NG, JS SURI - 2008 - BOOKS.GOOGLE.COM.

"This groundbreaking resource gives you full details on state-of-the-art 2D and 3D eye imaging and modeling explore in depth a new generation of computational methods that combine image

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processing, simulation, and statistical discrimination tools in efforts to improve early detection of cataracts, diabetic retinopathy, glaucoma, etc"

## 3. Methodology

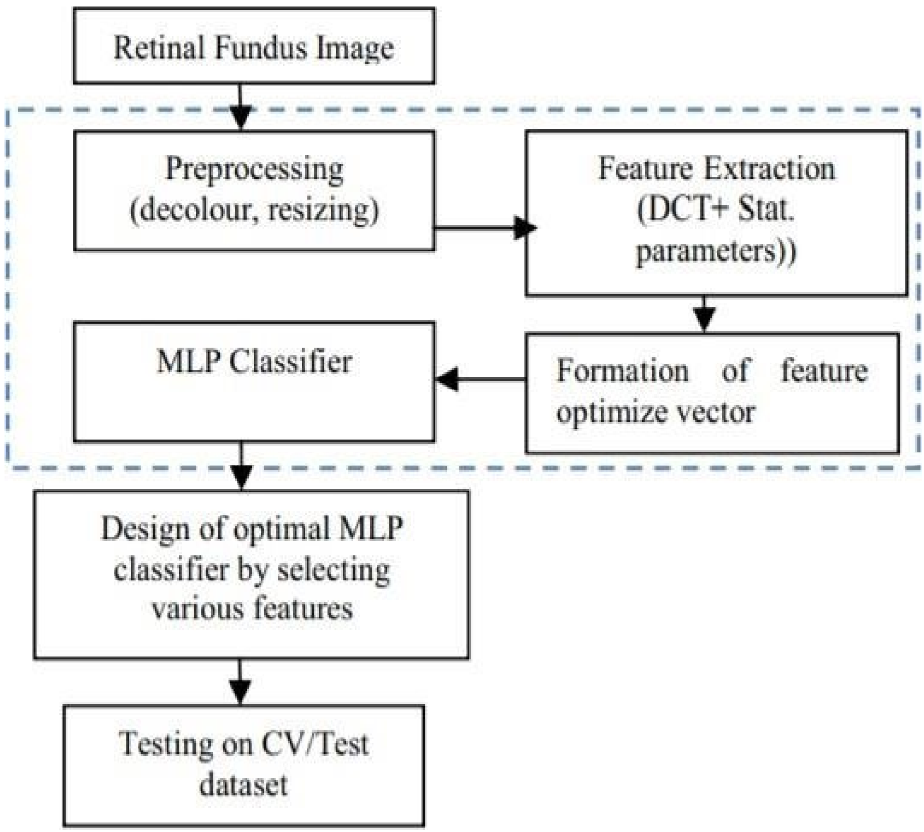


Fig: 3.1 Proposed System

In this proposed system MLPNN (Multi layer perceptron neural network), based classifier for the detection of diabetic retinopathy. Three feature vectors are formed with the help of DCT (Discrete cousin transform), FFT(fast Fourier transform), SVD(Singular value decomposition) and 9 statistical parameters. The MLP(multilayer perceptron) classifier is trained separately for these three feature vectors and their performance is compared. the architecture for proposed MLP based classifier.

It consists of different modules:

1) Retinal Fundus Image input
The fundus is the inside, back surface of the eye. It is made up of the retina, macula, optic disc, fovea and blood vessels. With fundus photography, a special fundus camera points through the

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pupil to the back of the eye and takes pictures. These pictures help your eye doctor to find, watch and treat disease.

2)Preprocessing

Image preprocessing are the steps taken to format images before they are used by model training and inference. This includes, but is not limited to, resizing, orienting, and color corrections.

3) FEATURE EXTRACTION

For detection of diabetic retinopathy the extracted transform domain and statistical features of retinal images. In transform domain features we used DCT, FFT, SVD and for statistical parameters entropy, mean, standard deviation, average, Eulernumber, contrast, correlation, energy, homogeneity are used. Such features can contribute to classify images into normal and abnormal images by using Multi layer perception neural network. Based on above feature extraction techniques three different feature vectors are formed as below:Feature vector I: DCT with statistical parameters

Feature vector II: SVD with statistical parameters

1.1DCT and MLP used classifier

In this case we have used feature vector as an input to MLPNN. The number of hidden layers (HL), number of processing elements (PEs), learning rule, transfer function and percentage of tagging for optimized MLP classifier is designed and tested on CV/test dataset.

1.2 SVD and MLP used classifier

In this case we have used feature vector as an input to MLPNN by varying number of hidden layers (HL),

number of processing elements (PEs), learning rule, transfer function and percentage of tagging for optimized MLP classifier design and tested on CV/test dataset.

4)Formation of feature vectors:

An abstraction of an image used to characterize and numerically quantify the contents of an image. Normally real, integer, or binary valued. Simply put, a feature vector is a list of numbers used to represent an image.specialists increase the work load of physicians and prevent many patients from receiving effective treatment. Automatic detection of clinical signs of DR can help ophthalmologists in the diagnosis of the disease, with the subsequent cost and time saving .In this proposed system MLPNN based classifier for the detection of diabetic retinopathy.

5)Multi layer perception (MLP) based Classifier:

MLP Classifier stands for Multi-layer Perceptron classifier which in the name itself connects to a Neural Network. Unlike other classification algorithms such as Support Vectors or Naive Bayes

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Classifier, MLPClassifier relies on an underlying Neural Network to perform the task of classification.

6)Designing of optimal MLP classifier

The number of hidden neurons should be between the size of the input layer and the size of the output layer.The number of hidden neurons should be 2/3 the size of the input layer, plus the size of the output layer.The number of hidden neurons should be less than twice the size of the input layer.

7)Testing on CV/test dataset.

CV just means cross validation. Its a way of using all of your available training data to inform your model, while also using that data to make predictions on how well the model will be able to predict outcomes on new data.

## 4. Results and Snapshots

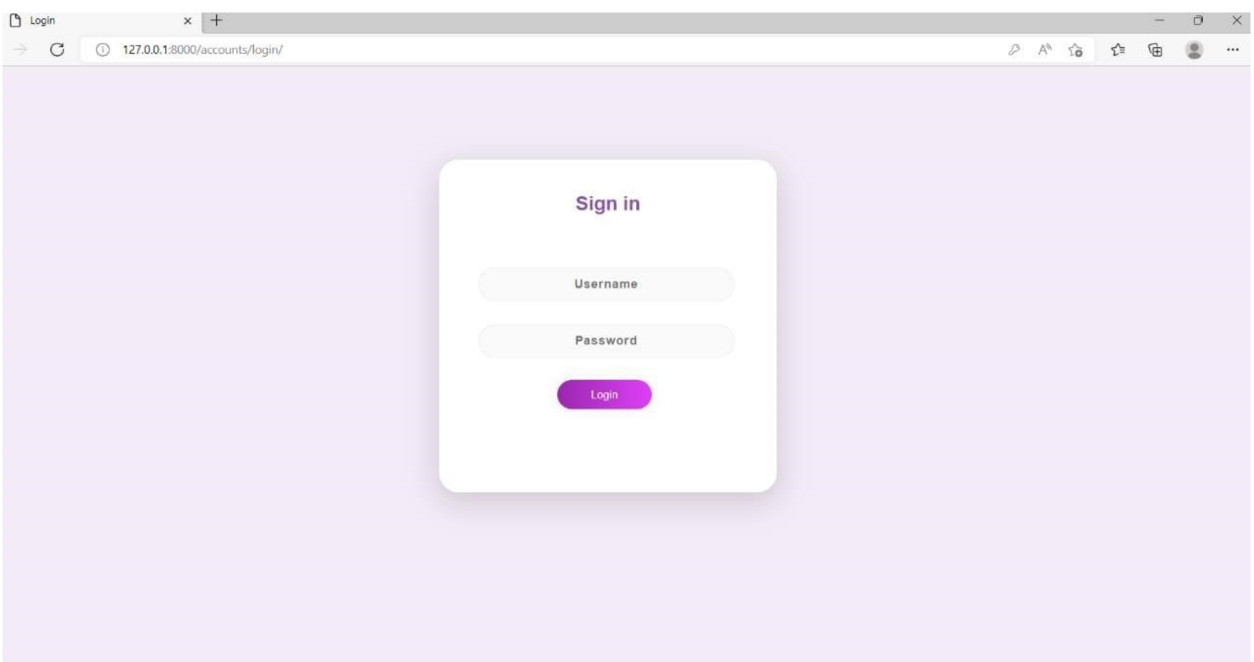


**Fig 4.1: Login Page**

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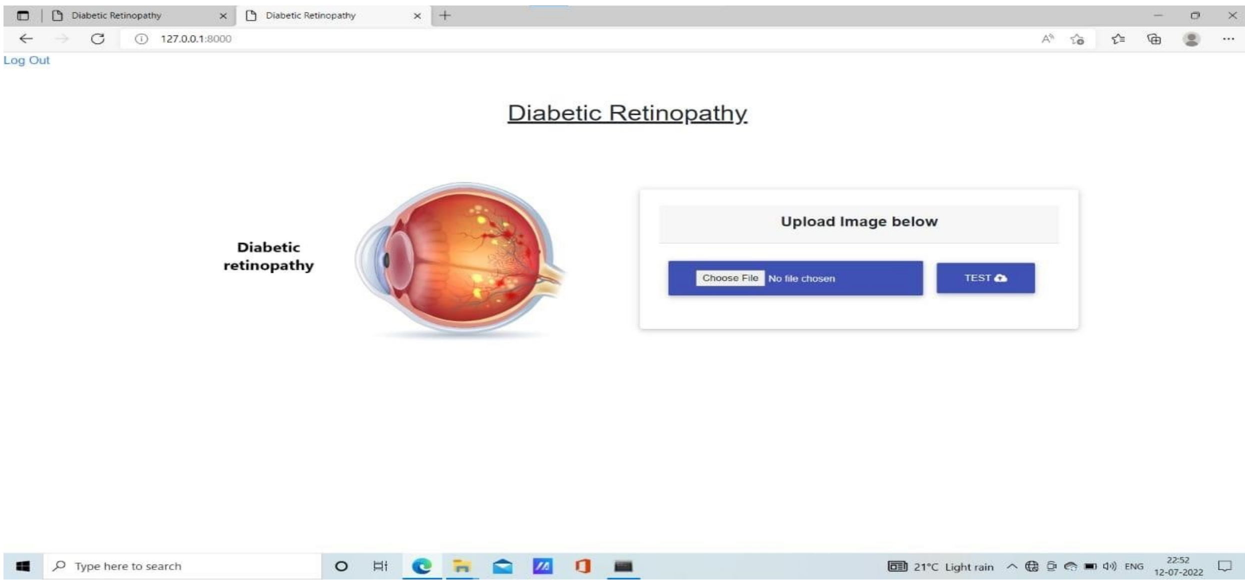


Fig 4.2: Diabetic Retinopathy Detection

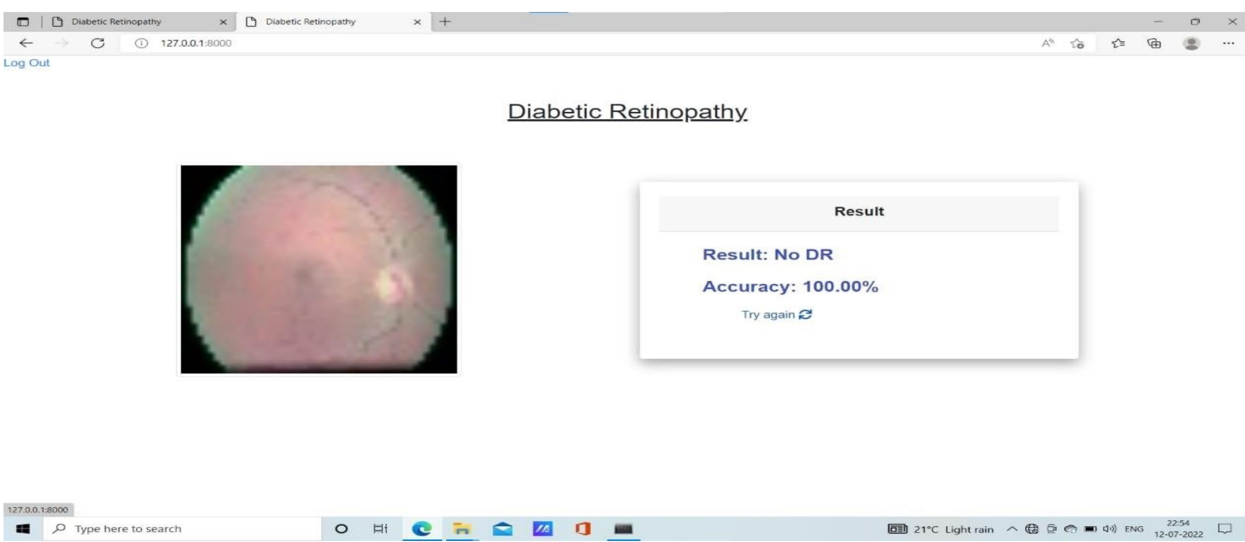


Fig 4.3: Result No DR

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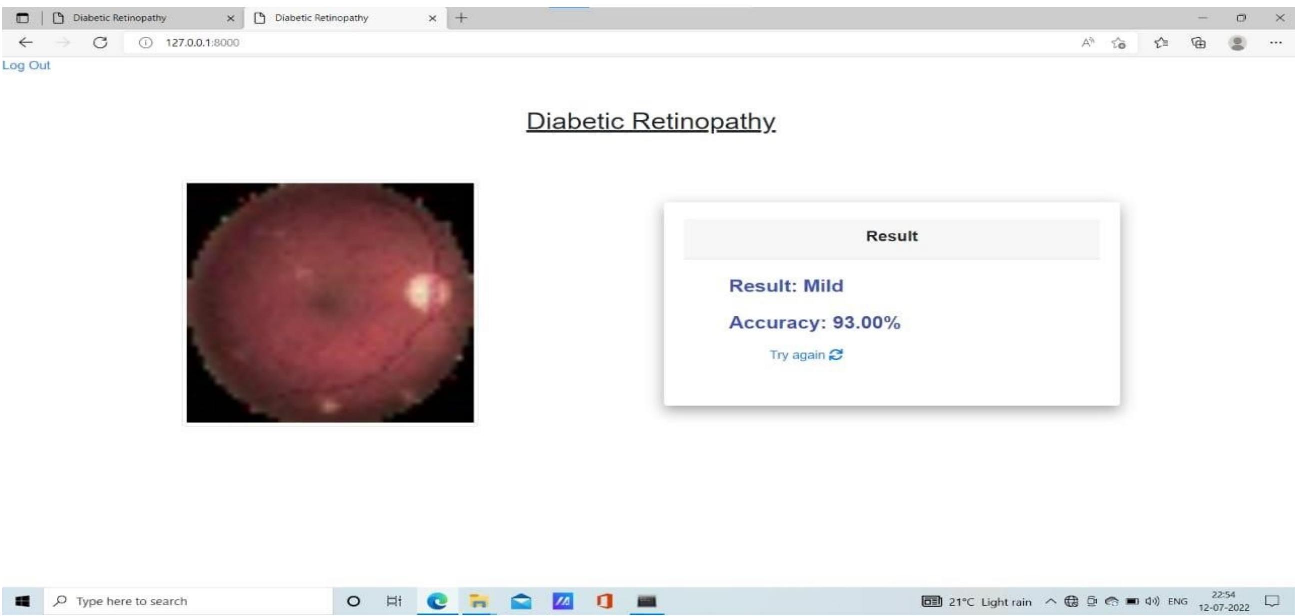


**Fig 4.4: Result Mild**

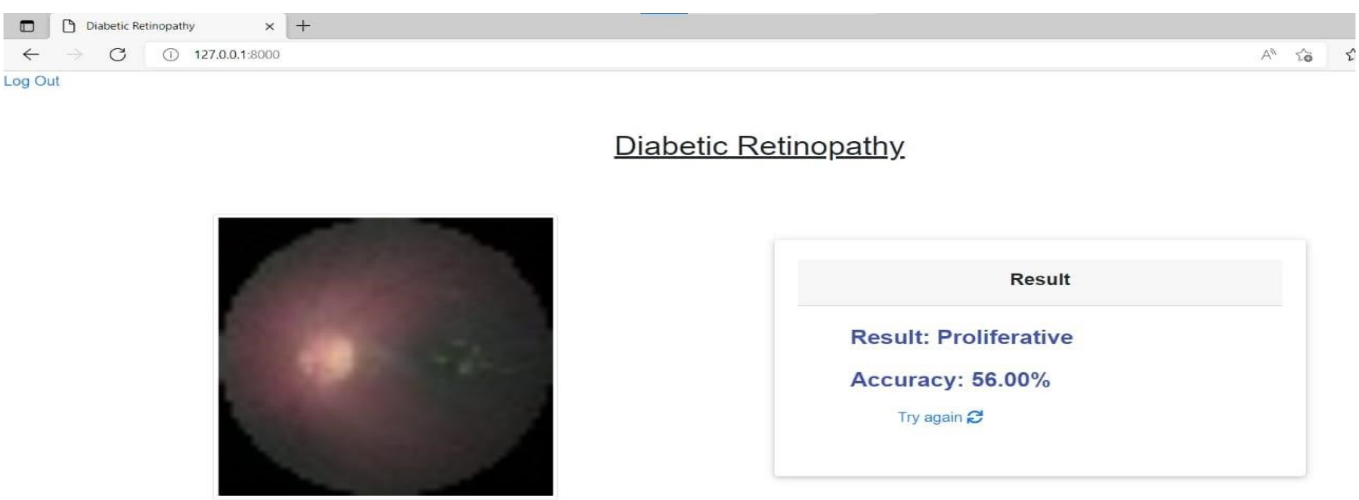


**Fig 4.5: Result Proliferative**

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## 5. Conclusion

Improvements in diabetes and diabetic retinopathy treatments have resulted from better understanding of pathophysiology and clinical trails that show the benefits of aggressive approaches. Feature improvements will build on these successes to further reduce the risk of vision loss and will lead to early diagnosis and less invasive treatments.

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