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Diabetic Detection Using Retina Image

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Abstract: *Diabetic Retinopathy is a disease that affects the eyes as a result of diabetes. This disorder is caused by damage to the blood vessels of the light-sensitive tissue in the retina of the eye . At beginning, diabetic retinopathy may appear normal or very moderate vision changes. It has the capacity to cause blindness. The number of doctors in India is fairly low in comparison to the number of patients, resulting in delayed disease identification. However, if diabetic retinopathy is not detected early enough, it can cause irreversible damage to the eyes, leading to full blindness. To avoid this, we decided to use machine learning to automate the diagnosis procedure. The ability of existing manual testing has been hampered by the rise in diabetes cases. Today, new algorithms for assisted diagnosis are critical. Diabetes can be detected early, which can aid patients and reduce negative health outcomes like blindness. For classification of the extracted histogram, we employ a sequential model technique. It is proposed that features be represented using a histogram binning approach. The testing findings reveal that utilizing sequential mode, LESH is the most accurate technique, with an accuracy of 0.904.*

Keywords*- Diabetic Retinopathy, Eyes, Blindness, Diabetes, Accuracy*

I. INTRODUCTION

Handwritten In recent years, the entire world has seen a surge in age-related and society-related disorders such as diabetes. According to a recent survey, diabetes has been diagnosed in 4% of the country's population, and it has been identified as one of the leading causes of blindness in the country if not adequately treated and controlled. One of the strategies to reduce the proportion of visual impairment caused by diabetes has been identified through routine medical checkups and the use of special facilities for diagnosis and monitoring of the condition. The impact on medical workers cannot be exaggerated; greater burden for employees and facilities, as well as increased diabetes screening efforts, are just a few examples. Many approaches have been presented and recognized as ways to alleviate the stress produced by this frequent check-up and screening-related tasks, one of which is the use of medical digital image signal processing for diabetic retinopathy diagnosis utilizing retinal pictures. Diabetes is a disease of the metabolism.

A. *Scope of the project:*

Diabetic retinopathy is becoming more common by the day. If no action is taken, the number would increase from 126.6 million to 191.0 million by 2030, with 37.3 million people suffering from vision-threatening diabetic retinopathy (VTDR). Despite mounting evidence 2 demonstrating the effectiveness of routine DR screening and treatment, it frequently leads to poor vision and is the major cause of blindness. It has been mostly ignored in health care and in many low-income nations due to insufficient medical services. We are inspired to work on this topic after researching these aspects. Because there are now insufficient methods for detecting diabetic retinopathy, we will develop a system that will predict diabetic retinopathy. As a result, we choose to apply Machine Learning Algorithms to anticipate disease vehicles.

B. *Aim and Objectives of the project:*

The aim of systematic diabetic retinopathy is to reduce the risk of vision impairment and blindness among people with diabetes through the prompt identification and effective detection using SVM.

Pre processing:

The photos must be pre-processed in order to correct difficulties such as uneven illumination, insufficient contrast between exudates and image backdrop pixels, and the existence of noise in the input fundus image when detecting abnormalities connected with it.

- It color convert grey scale image.
- Resize the image.
- Image convert in to array.

II. RELATEDWORKS

Diabetic Retinopathy patients may not notice visual impairment until the condition has progressed to a severe degree, at which point treatment becomes less effective. Early detection and regular follow-ups are therefore essential in the treatment of diabetic retinopathy.

Many people struggle with early diagnosis because they are unaware of DR, especially in its early phases. Currently, diagnosing DR is a time-consuming and inconvenient process. Furthermore, the diagnosis necessitates a specific clinical visit. To tackle this problem, the following algorithms were used to detect diabetic retinopathy, however they were ineffective.

Automatic diabetes detection employs a variety of algorithms. Except for the final layer, a deep neural network (DNN) comprises 28 convolutional layers with batch norm and ReLU nonlinear functions after each layer. The last layer produces a class label, either DR or no DR. The model's final accuracy is 73.3 percent.

On a data set of 80,000 photos, the convolutional neural network algorithms (CNN) utilized for diabetic retinopathy obtains a sensitivity of 95 percent and an accuracy of 75 percent on 5,000 validation images.

Exudate detection is crucial for machine based diabetic retinopathy (DR) assessment and advancement tracking. A deep convolutional neural network (CNN) is employed in this paper to conduct pixel-wise exudate identification. Before being saved as an off-line classifier, the CNN classifier is constructed using expert-labeled exudates image patches. To obtain pixel-level accuracy while lowering computing time, potential exudate candidate locations are first retrieved using the morphological ultimate opening approach. The trained CNN model is then used to classify and identify the candidate points' local region (64 64). The suggested CNN architecture yields pixel-wise accuracy of 91.92 percent, sensitivity of 88.85 percent, and validity of 96 percent on the test database.

The images utilized in training came from Malaysia's Hospital Serdang, while those used in testing came from the DIARETDB1 database. The images were categorized into four Diabetic retinopathy stages: mild NPDR, moderate NPDR, severe NPDR, and Proliferative Diabetic Retinopathy (PDR). The photos were taken in various lighting conditions. In the tests, the proportion of blood vessel and haemorrhage identification, as well as exudates, was 98 percent and 100 percent, respectively.

Diabetic retinopathy is a devastating eye disease caused by diabetes mellitus, and it is the leading cause of blindness in the developed world. The use of image processing and deep learning to diagnose diabetic retinopathy from retinal fundus pictures is described in this article. A realistic method containing HSV, V transform algorithm, and histogram equalization techniques was applied to enhance retinal fundus images. Finally, the retinal fundus picture was processed with a Gaussian low-pass filter. The categorization was done using the Convolutional Neural Network after the image processing. Using 400 retinal fundus images from the Kaggle Diabetic Retinopathy Detection database, the proposed method's performance was evaluated. For each stage of image processing, classification work has been done in experiments. After image processing, a classification study was conducted. For each stage, twenty trials were conducted and average values were determined. The accuracy was 97.3%, the sensitivity was 96.67%, the specificity was 93.33 percent, the precision was 97.78%, the recall was 93.33 percent, and the Fscore was 93.33 percent in this trial. The results suggest that the proposed method for diagnosing diabetic retinopathy from retinal fundus images is very efficient and effective.

Diabetic retinopathy (DR) is one of the leading causes of blindness among the world's working-age population. Diabetic Retinopathy is an eye condition caused by untreated diabetes for a long time. If DR is diagnosed early enough, the progression to vision impairment can be delayed or stopped; automatic approaches can help in DR identification and screening. In this study, we present a unique approach for accurately detecting hard exudates at the lesion level. Using the back ground subtraction methodology, we first identified potential candidate exudate lesions in the current method. Following the subsequent steps, we used the de-correlation stretch based method to remove the false exudate lesion detections in the final stage of the algorithm. We tested our method on the DiaretDB database, which provides the ground truth for all photos and is open to the public. In comparison to existing state-of-the-art approaches, we acquired outstanding performance results such as sensitivity of 0.87, F-Score of 0.78, and Positive Predict Value (PPV) of 0.76 for hard exudate lesion level identification.

III. PROPOSEDSYSTEM

In this study, we provide an automated technique for classifying the illness diabetic retinopathy using fundus images. An autonomous evaluation system for diabetic retinopathy utilizing Support Vector Machine has been addressed in this research, along with several preprocessing techniques such as post filtration and the extraction of various attributes such as color, shape, intensity, entropy, energy, texture, and so on. Different classifiers can be used to classify anomalies in normal fundus retinal pictures. Support vector Machine appears to be the most successful classifier for extracting and identifying abnormalities in the retina such as microaneurysms, hard exudates, soft exudates, neovascularization, and macular edema.

They outperform LBP extracted features, as demonstrated. For the classification of the extracted histogram, Support Vector Machines (SVM) are utilized. For feature representation, a histogram binning approach is given. The automatic detection of diabetic retinopathy utilizing the Support Vector Machines (SVM) method has a 97.608 percent accuracy.

All of the classification systems utilized performed well, although the results show that SVM is more efficient than CNN and DNN. As a result of this effort, an effective Diabetic Retinopathy Diagnosing method has been developed, which aids in the early detection of the condition and thereby lowers manual labor.

The support vector machine classifier improves the accuracy of diabetic retinopathy identification, making it easier for ophthalmologists to diagnose and screen retinal pictures.

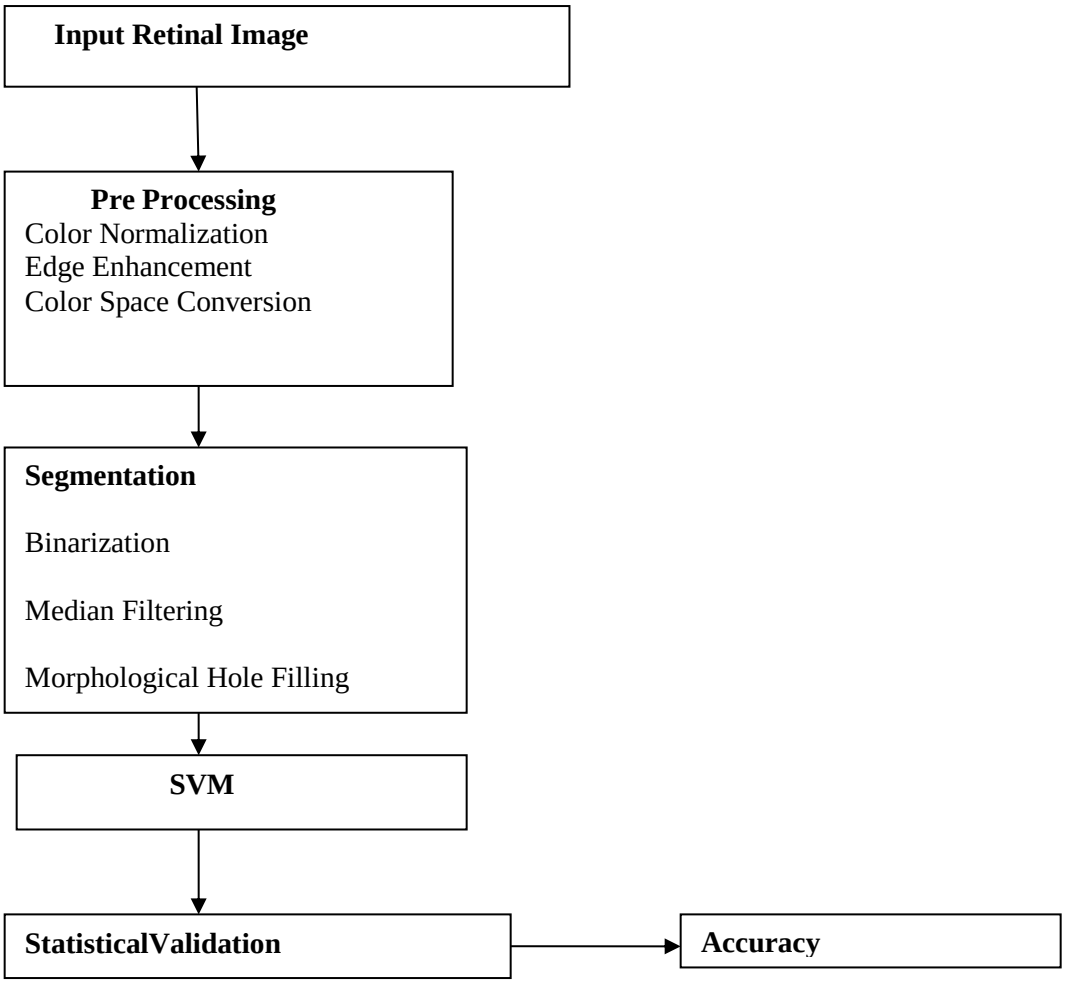

Fig. 1: Architecture Diagram

IV.METHODOLOGY

i. Module Description

1) Pre processing

For detecting anomalies associated with fundus photographs, the photos must be pre-processed to correct issues such as uneven illumination, insufficient contrast between exudates and image backdrop pixels, and the presence of noise in the input fundus image.

2) Segmentation

Segmentation's basic goal is to divide an image into sections with similar properties or attributes. It helps describe anatomical features and other regions of interest, which is useful in image analysis systems.

1(a) Edge Enhancement

Each Edge enhancement is a type of image processing filter that improves an image's perceived sharpness by enhancing the image's edge contrast. Most digital cameras include some kind of edge enhancement feature.

1(b)Color Space Conversion

The method of changing a color's representation from one basis to another is termed as color space conversion. When translating an image from one color space to another, the goal is to have the translated image look as near to the original as possible.

2(a)Binarization

Binarization is the process of encoding any item's data properties into binary number vectors in order to make classification methods more effective.

2(b) Median Filtering

A non-linear digital filtering technique known as the Median Filter used for removing noise from images and signals.

2(c)Morphological Hole Filling

Morphology is a set of techniques for processing images based on their forms. Morphological operations apply a structuring element to an input image and produce a similar-sized output image.

(3)Feature Extraction

Feature extraction is a dimensionality reduction technique that divides a vast amount of raw data into smaller chunks for processing. The sheer number of variables in these massive data sets needs a significant amount of computer power to process.

4) support vector machine

SVM is a supervised machine learning method that can do classification and regression issues. Before selecting how to divide your data using the labels or outputs you designate, it performs some very complicated data transformations.

Advantages:

1.SVMs are extremely useful when we have no prior knowledge of the data.
2.Can handle unstructured and semi-structured data such as text, images, and trees.
3.The kernel trick is SVM's main strength. We can solve any complex problem with the right kernel function.
4.In contrast to neural networks, SVM does not solve for local optima.
5.It handles high-dimensional data exits reasonably well.

Data Collection

Data collection is the process of acquiring and measuring information on certain variables in a system, allowing one to answer pertinent questions and assess outcomes. Data collecting is an important part of every research project.
We gathered the data on the Kaggle website.

V. RESULT AND DISCUSSION

In this experiment, results of our implemented system as well as the relevant details can be divided into 6 consecutive parts which work together:

i. Open Anaconda prompt.
ii. And Type Activate Tens.
iii. Type cd .
iv. Add location of Trained Image Folder.
v. Type Python Predict.py .
vi. Copy URL Prompt To Browser.
vii. Choose Image and predict the Result

I. Prediction of Diabetic

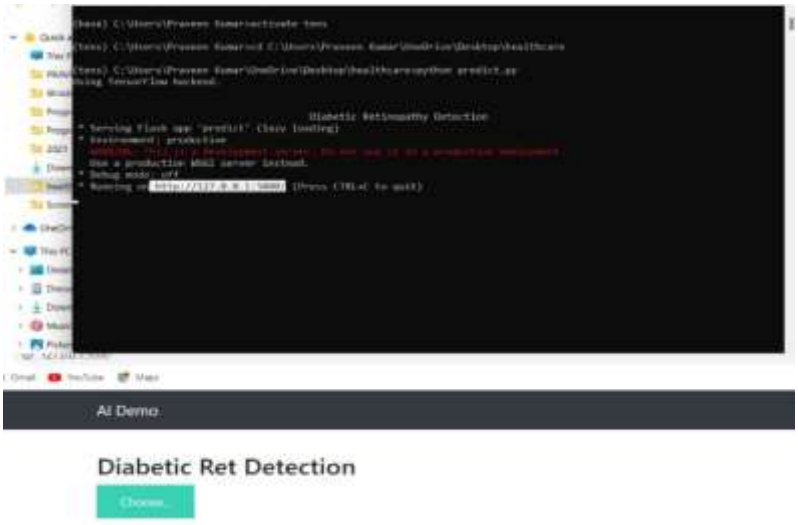

Figure2

II. Choose image and predict the Result

Fig. 3: Result

VI.CONCLUSION AND FUTURE ENHANCEMENT

Diabetic retinopathy can be detected early and prevented from causing visual loss. Thus, in this study, machine learning techniques such as SVM classifier and KNN are proposed, with SVM classifier yielding the level of diabetic retinopathy. It has been proven that early detection and treatment can avoid vision loss and blindness.

In the future, hybrid methods should be used to achieve improved levels in terms of Diabetic retinopathy detection precision and efficacy.

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