



Diabetic Retinopathy using Thermal Images and Convolutional Neural Network (CNN)

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Abstract — *Diabetic Retinopathy is one of the serious problem around the world. That can make significant debilitation the eyes, including a lasting loss of vision. Early discovery of eye maladies builds the endurance rate by effective treatment. The proposed approach is to investigate AI system to distinguish DR utilizing Thermography pictures of an eye and to present the impact of warm variety of variation from the norm in the eye structure as a finding imaging methodologies which are valuable for ophthalmologists to do the clinical determination. Warm pictures are pre-handled and dependent on surface highlights from dark pictures, factual highlights from RGB and HSI pictures are extricated and arranged utilizing classifier with different blend of highlights. After that we utilize the pictures to our CNN classifier model and recognize the Diabetic Retinopathy.*

Keywords- *Diabetic Retinopathy, Infrared Thermography, CNN.*

1. INTRODUCTION

Diabetic retinopathy is the most widely recognized intricacy brought about by the diabetes, which influences eyes and results in visual deficiency. It's because of harm of the supply routes and veins situated in the fundus of eye (retina) that is made out of light delicate tissues. In spite of the fact that DR can be pervasive now days, its aversion stays testing. Ophthalmologists normally analyze the nearness and seriousness of DR through visual appraisal of the deformity by direct assessment and by assessment of shading photos. There is huge number of diabetes patients universally; this procedure is costly just as tedious. Robotized DR framework is created to anticipate different related sicknesses that are broke down. Advanced Retinal Thermal pictures are broke down for the arrangement of different phases of Diabetic Retinopathy (DR).

This is a visual difficulty of the eye that influences 75% of diabetic patients prompting visual impairment in the age gathering of 20–64. There are various approaches to analyze DR. The World Health Organization reports that around 347 million individuals on the planet are influenced by DR. Around 366 million grown-ups with diabetes is evaluated by International Diabetes Federation. This figure is relied upon to ascend to 552 million by 2030. Assessed event of sort 2 diabetes mellitus and diabetic retinopathy is very high in India, as indicated by the examinations that have been led up until this point. In view of a study in 2000, the best three nations with most noteworthy number of diabetes mellitus are India (31.7 million), China (20.8 million) and USA (17.7 million). Prepared clinicians are required to look at the shading Thermal photos of retina and identify DR.

This is a viable method for identification yet requires the administration of experienced clinicians for investigation of the photos physically, which is tedious. Rustic regions, where the pace of diabetes is normally high, do not have the skill of well-prepared clinicians and advanced gear that are important for recognition of DR. Better framework with robotized identification systems are currently required to handle the developing number of people with diabetes. An early recognition can turn away or decline the spread of DR which generally may cause visual impairment. The proposed venture distinguishes kind of DR dependent on CNN grouping. The calculation recognizes gatherings of harmed pixels in the macula district and assesses the complete harmed territory in the macula from the shading retinal pictures.

2. LITERATURE REVIEW

According to IEEE Xplore Research Paper: - “Classification of Diabetic Retinopathy Images Based on Customised CNN Architecture [1]”:-

The goal of this paper is to detect the Diabetic Retinopathy. To detect Diabetic Retinopathy we need to take input of the image of Eye-Retina. Using that image they detect the Diabetic Retinopathy. For that in this paper CNN algorithm is used after Pre-processing. We know that there are various layers are present in CNN architecture. With the help of that in this paper implements detect DR using Images of Retina and CNN.

According to IEEE Xplore Research Paper: - “Detection of Retinal Lesions Based on Deep Learning for Diabetic Retinopathy [2]”:-

The goal of this paper is to detect the Diabetic Retinopathy. To detect Diabetic Retinopathy we need to take input of the image of Eye-Retina. Using that image they detect the Diabetic Retinopathy. Pre-processing firstly perform blood vessel extraction, green channel extraction in this paper. But here green channel extraction is done to enhance the contrast. Hard Exudates is first to recognize for the purpose of recursive region growing segmentation after the identification of diabetic features and the another one is recognition of Hemorrhages and Microaneurysms by using Matched Filtering, Laplacian of Gaussian Filtering, and Mutual Information Maximization using DE. Using that in this paper Diabetic Retinopathy is detected. After for classification purpose this paper uses the CNN algorithm.

According to IEEE Xplore Research Paper: - “Symptom Analysis of Diabetic Retinopathy by Micro-Aneurysm Detection Using NPRTOOL (Network Pattern Recognition Tool) [5]”:-

The goal of this paper is to detect the Diabetic Retinopathy. Using NPRTOOL here retinopathy of eye is detected. Using that they detect the Diabetic Retinopathy. For that in this paper use MATLAB Neural Network Pattern Recognition Tool (NPRTOOL) to detect Diabetic Retinopathy. After that for classification purpose this paper uses Support Vector Machine (SVM) algorithm.

According to IEEE Xplore Research Paper: - “Support Vector Machine Based Method for Automatic Detection of Diabetic Eye Disease using Thermal Images [3]”:-

SVM based Automatic detection is done here in this paper. Using that they detect the Diabetic Retinopathy. For that in this paper SVM algorithm is used after Preprocessing. With the help of that in this paper implements detect Diabetic Retinopathy using thermal Images of Retina and SVM. After classification this algorithm is find out sensitivity, specificity and accuracy according to output.

According to IEEE Xplore Research Paper: - “Micro aneurysm Detection Using Principal Component Analysis and Machine Learning Methods [7]”:-

The goal of this paper is to detect the Diabetic Retinopathy. To detect Diabetic Retinopathy we need to take input of the image of Eye-Retina. Using that image they detect the Diabetic Retinopathy. For that in this paper use the Principal Component Analysis(PCA). In this paper Micro-Aneurysm detection is happening using small 25x25 pixel patches extracted from fundus images in the DIAbetic RETinopathy DataBase-Calibration Level 1 (DIARETDB1) and also here raw pixel strength of extracted patches give out directly as inputs into this classifiers which are random forest (RF), neural network, and support vector machine(SVM). In this paper also use of two techniques which are principal component analysis (PCA) and RF feature for reducing input dimensionality.

3. EXISTING SYSTEM

Identifying and detecting DR is a delayed and manual process that requires a trained clinician to examine and estimate digital thermal photographs of the retina. DR is screened manually by ophthalmologist using fundus images due to inadequately dependable existing automated DR detection systems. However, the manual screening process is the weakest link as it is a complicated and time-consuming process. Also, sophisticated equipment that are necessary for detection of DR.

3.1 Existing System Drawback:

- Existing systems are not perfect. It has also some drawbacks. This method is highly uncomfortable for patient. The physical screening process is the delicate link as it is a tricky and time-consuming process.
- The manual phenomena of DR screening methods support worldwide inconsistency among readers.

4. PROPOSED SYSTEM

The proposed framework uses administered AI procedures to order the warm pictures of an eye into "Typical" or "Diabetic Retinopathy". The shading transformation model is essential to separate the necessary highlights.

In this work, two change, for example, RGB to Gray and RGB to HSI are done and RGB, Gray and HSI shading model are utilized as an info pictures for highlight extraction module. Highlight Extraction is the most significant advance in the examination of pictures. It is a procedure of get-together recognizable data from the picture itself from an article or gathering of items.

Finally step use CNN model and recognize diabetic retinopathy.

4.1 System Architecture:

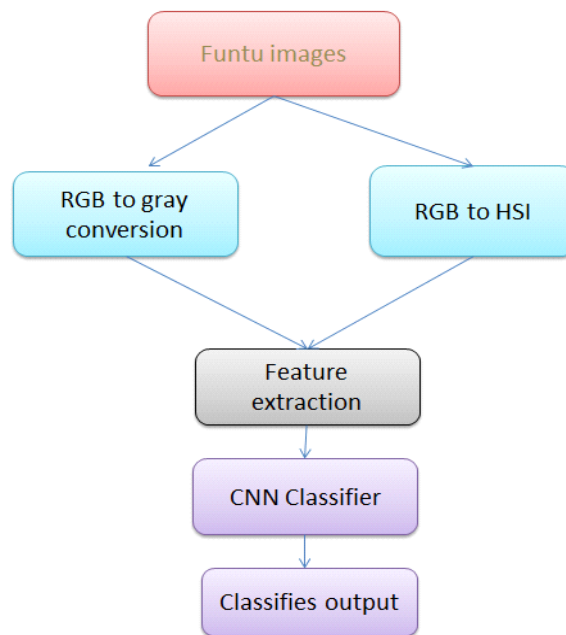


Fig -1: Proposed Methodology

Processing Techniques:

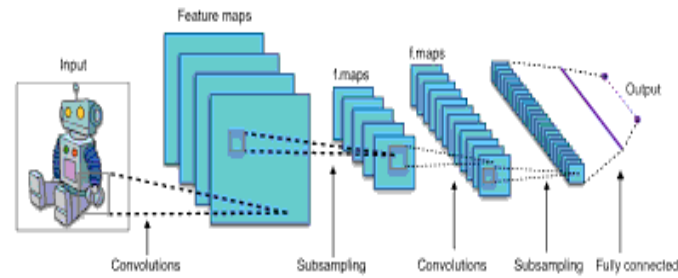
To extract the important features the Color Conversion model is required. For Feature Extraction method, input images are used such as RGB, Grey and HSI Color Models and also here two conversions are done such as RGB to Grey and RGB to HSI.

Feature Extraction:

Feature Extraction is the most essential step in the evaluation of images. It is a process of gathering recognizable information from the image itself from an object or group of objects. CNN model is use at last and detect diabetic eye disease.

4.2 CNN (Convolutional Neural Networks) Algorithm:

In AI, Convolutional Neural Networks (CNN) are uncertain feed forward neural systems. CNNs are employing for view arrangement and acknowledgment in light of its high correctness. Actually it was put forwarded by PC researcher Yann LeCun in the late 90s, when he was roused from the human visual impression of realizing things. CNN chase a different leveled model which takes a shot at structure a system, similar to a pipe, lastly gives out a completely related layer where every one of the neurons is matching with another one and the output is handled.



4.3 Future Scope

- The system could also be extended to detect other retinal diseases like glaucoma, age-related macular degeneration.
- In future, the algorithm could however be developed for the detection of dark lesions such as hemorrhages in addition to micro-aneurysms detection.
- The system could be extended to segmentation of color fundus videos and optical coherence tomographic images.

5. ADVANTAGES

- This methods for to detect Diabetic Retinopathy is mostly User Friendly and very easy to use to detect Diabetes people. This method is very helpful to detect diabetic retinopathy.
- The main purpose of this is to detect Diabetic Retinopathy. And also nowadays traditional Diabetic Retinopathy method is very time consuming in eye clinic. So that this method to detect Diabetic Retinopathy will very high amount of used in Eye clinic.
- This method is to detect Diabetic Retinopathy is also applicable in various Hospital.

6. CONCLUSIONS

In the proposed work, a non-intrusive system has been displayed to assess the nearness of diabetic retinopathy. The order of diabetic sick and typical eye IR pictures is done through CNN(Convolution Neural Network)classifier utilizing different blend of surface and factual highlights. The recreation results show that the classifier in the location of diabetic retinopathy performed in the acknowledged level and give precision, affectability, particularity utilizing CNN classifier.

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