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# Diabetes detection using segmentation of super pixel in slo images

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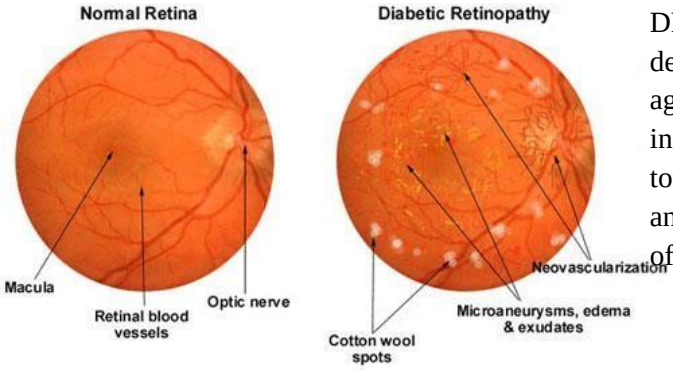
***Abstract*** **-Diabetic Retinopathy (DR) is a disease which is caused by high blood sugar from diabetes. It is associated with damage to the tiny blood vessels in the retina. It causes blood vessels in the retina to leak fluid or hemorrhage, distorting vision. The retina detects light and sent to the brain as a signal through the optic nerve. The early stages of diabetic retinopathy have no symptoms. The disease is unnoticed until it finally affects the vision, even though it is often progressed. In its advanced stage, there are new abnormal blood vessels proliferate on the surface of the retina, which leads to scarring and cell loss in the retina. Floating spots appear because of bleeding from abnormal blood vessels. The spots may sometimes clear on their own, but without prompt treatment, Bleeding often recurs and increase the risk of permanent vision loss. Treatment interventions at early stages of diabetic retinopathy can reduce burden of blindness. During the imaging process, artefacts such as eyelashes and eyelids are also imaged along with the retinal area. This brings a big challenge on how to exclude these artefacts.**

**Excluding the artefacts from true retinal area is important pre-processing step before detection of eye diseases. In computer vision applications Super pixels are becoming increasingly popular because distinguishing the artefacts from true retinal area in SLO images is challenging task. The SLO (Scanning Laser Ophthalmoscope) provides an image of width up to200 degree. In this Paper, a Simple Linear Iterative Clustering (SLIC) is used which is a super pixel generation method used to avoid data redundancy and it was proved to be efficient in terms of region compactness, computational time. Super pixels reduce the computing cost because it is used to represent different irregular regions in a compact way .A classifier has been built Based on selected features to extract out true retinal area. The experimental evaluation results have shown good performance with an overall accuracy of 93%.**

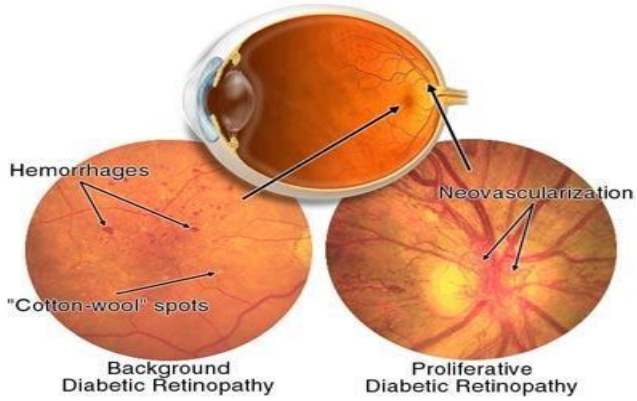
## I. INTRODUCTION

The population of diabetic patients has been expanding against the aggregate total populace. Uncontrolled and delayed diabetes can harm the microvasculature of the indispensable organs of the body, for example, eyes and kidneys. Figure 1.1 demonstrates the harm brought about to the small veins in the retina of the human eye is known as Diabetic Retinopathy. Because of raised measures of glucose coursing through the body, the dividers of veins get to be distinctly harmed and a few inconsistencies, for example, Small scale aneurysms, hemorrhages, Hard Exudates, Cotton fleece spots begin creating at different periods of retinopathy. The patient influenced by Diabetic Retinopathy may not encounter visual disability until the ailment has advanced to a serious stage, when the treatment is less successful. In this way the early location and

the general subsequent meet-ups is important to treat diabetic retinopathy.




The soonest side effects of Retinopathy are the Smaller scale aneurysms, which happen because of dilatations of the blood vessels and they show up as dim red spots on the retina. Hemorrhages happen when the micro aneurysms burst. Splendid yellow shaded Sores, for example, hard exudates happen as a consequence of liquid spilling into the retinal surface from the vessels or from Micro aneurysms. Another brilliant white hued sores, called the delicate Exudates or cotton fleece spots happen impediments of the nerve fiber layer. Diabetic Retinopathy is a dynamic illness. The principal phase of retinopathy is known as Non Proliferative Retinopathy, amid which the retinal injuries show up and increment as the malady advances. At first, no less than one miniaturized scale aneurysm is seen. With the movement of the ailment, the veins get to be distinctly blocked and are shy of blood supply. Figure 1.2 demonstrates an endeavor to make new ways for blood supply, anomalous and delicate fresh recruits vessels are shaped on the surface of retina in the phase of Proliferative Retinopathy that may spill blood into retina bringing on changeless visual deficiency. Diabetic Retinopathy is a visual indication of diabetes in which vision is ruined because of development in size veins and absence of oxygen in retina. Diabetic Retinopathy is an infection which is created because of long haul diabetes. It is a visual appearance of diabetes and around 80 percent of populace having diabetes for more than at least 10 years has some phase of the sickness. Additionally the more extended a man is in this malady there higher are the odds of having DR in his visual framework. Looks into demonstrates that it contributes around 5% of aggregate instances of visual impairment. As indicated by "WHO" estimation 347 million of total populace is having the ailment diabetes and around 4045% of them have some phase of the ailment.




As per the National Institute of Health (NIH 2009), diabetic retinopathy is the most well-known diabetic eye ailment that is brought about by changes in the veins of the retina. In a few people with diabetic retinopathy, veins may swell and release liquid. In other individuals, unusual fresh recruit's vessels develop on the surface of the retina. The nearness of hemorrhages and exudates in this locale is characteristic of a genuine diabetic retinopathy condition that can soon prompt to visual deficiency. In a word, diabetic retinopathy has four phases:

Mild Non-Proliferative Retinopathy: At this early stage, small scale aneurysms may happen. These appearances of the malady are little zones of inflatable like swelling in the retina's small veins.

Moderate Non-Proliferative Retinopathy: As the ailment advances, some veins that support the retina are blocked.

Severe Non-Proliferative Retinopathy. Numerous more veins are blocked, denying a few ranges of the retina with their blood supply. These ranges of the retina send signs to the body to develop fresh recruit's vessels for food.

Proliferative Retinopathy: At this propelled organize, the signs sent by the retina for support trigger the development of fresh recruits vessels. These fresh recruits' vessels are anomalous and delicate.

They develop along the retina and along the surface of the reasonable, vitreous gel that fills within the eye. Without anyone else, these veins don't bring about side effects or vision misfortune. In any case, they have thin, delicate dividers. On the off chance that they release blood, extreme vision misfortune and even visual deficiency can come about. From a PC vision point of view, there are four particular markers inside the retinal pictures. In the first place, miniaturized scale aneurysms are little red spots in the retinal picture which are early markers of blood clusters. These are hard to identify since they might be caught by at most a modest bunch of pixels in a picture and are in some cases indistinct from foundation clamor or blocked veins. Second, exudates are brilliant yellow spots which are demonstrative of gathered fat stores in the retina that thus prompt to blood clots and spillage.

## II. RELATED WORK

Our system is initiated with screening exudates based on utilized color component, morphology and intensity in retinal digital fundus images. Optic disc detection , Blood vessel detection ,Border detection, Feature extraction are the detecting techniques for DR. [1]To extract the healthy areas such as blood vessels by entropy thresholding method and optic disc using sobel filter method. Thresholding method is used to segment exudates in DR images. Vessel elimination technique, eliminate vessel structures from the retinal image and optic disc detection helps to extract optic disc [2]. Since the visual functional test method has potential to detect DR in early stages. Components of visual function are electrophysiological test of the retina. Multi-focal ERGs and VEK-visual evoked potentials are the techniques used here. ERG data collected from hospitals which is used as dataset. Electro retinogram signal Overcome the possibility of human errors during observation of the ERG signal [3]. For an automated diagnosis of glaucoma using digital fundus images based on Empirical Wavelet Transform (EWT). Least Square-SVM -Radial Basis Function (RBF) and wavelet kernels are used for classification [4]. The correntropy features are computed based on texture of decomposed components of different frequency bands. This idea can be extended to diagnosis of other diseases like DR, fatty liver diseases, thyroid cancer and ovarian cancer [5]. A new approach uses FUZZY c- means for clustering and detect boundary of DR object. FCM algorithm is used for boundary detection and segmentation. Iteration and processing time are the parameters which used for measure performance of the system [6].Ensemble classifier of boot strapped decision trees combined with the dual classification approach is used for detecting PDR. Breiman's bagging is one of the primitive ensemble method. The true comparisons are difficult to make as there exist no standard datasets for testing. The ensemble classifier is fast in training and classification and comparatively requires less number of training samples [7]. Enforces an automated screening system for diabetic retinopathy using kirsch's edge detection algorithm which detects newly formed edges in retina and use threshold values (set and reset) which classify each stage [8]. Morphological operations, dilation technique, thresholding, Median filter are the operations used to segment optic disc and exudates. Detecting the exudates then it must be prior to remove optic disc because the exudates and

the optic disc have same color and contrast[9].The distribution of blood vessels in the iris is unevenness, which makes iris surface appear many radiate stripes. It contains many interlaced subtle features which are similar to the spots, filaments, coronary, stripe, and fossae, which constitutes so-call the iris features. The iris recognition uses the rich texture of the iris surface information, as an important identification character. In order to improve the speed of the eyelash detection, the eyelash gray level is lower than the iris gray, which will be used to segment the eyelash of iris area by the adaptive threshold value method[10]. Our methodology is classifying using Artificial Neural Network Approach. we can prepare effortlessly and for preparing we have to group numerous things to given as information, with the end goal that the info is made through the framework regardless of the possibility that it is learn well than whatever other models. The picture is difficult to troubleshoot, they are computationally concentrated to prepare. The conveyed time is need so we have utilized Super pixel division it improves the future assessments that accommodating to test the proposed approach against option smoothing techniques and other spatially touchy endmember detection methods. The particular separation measurements may deliver predominant super pixels with new division techniques, for example, a standardized cuts approach. The subtle elements of the strategies are examined in the following section.made. There are many works related to develop library management.

## III. PROPOSED WORK

Diabetic Retinopathy have inadequacies like restriction, thresholding or limit which may incite to inadmissible results and unavoidable missteps in diabetic retinopathy assurance. Keeping in mind the end goal to defeat these troubles, a computerized finding techniques are favored for DR analysis. Choice of vigorous components are important to build up a strong framework. Discrete Wavelet Change (DWT) energies are used as features for automat recognition.

Image Information Coordination: It includes the mix of picture information with their manual comments around genuine retinal region.

1. Image Pre-processing: Pictures are then pre-processed keeping in mind the end goal to bring the power estimations of every picture into a specific range.

2. Generation of Super pixels: The preparation pictures in the wake of pre-processing are spoken to by little areas called super pixels. The era of the component vector for every makes the procedure computationally effective when contrasted with highlight vector era for every pixel.

3. Feature Generation: We produce picture based components which are utilized to recognize the retinal range and the ancient rarities. The picture based elements reflect textural, grayscale, or provincial data and they were computed for every super pixel of the picture display in the preparation set. In testing stage, just those components will be created which are chosen by highlight choice process.

4. Feature Selection: Because of countless, the element cluster should be lessened before classifier development. This includes highlights choice of the hugest components for arrangement.

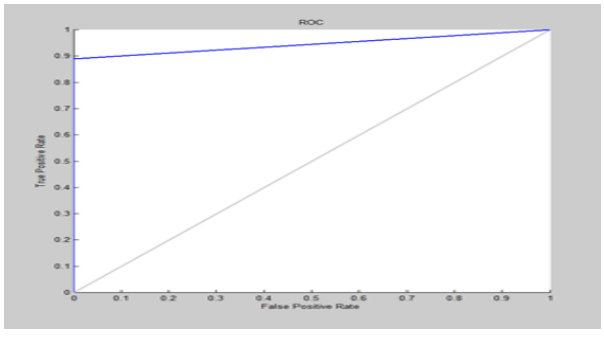
5. Classifier Construction: In conjunction with manual comments, the chose components are then used to build the double classifier. The aftereffect of such a classifier is the super pixel speaking to either the "genuine retinal zone" or the "curios."

Image Post processing: Picture post handling is performed by morphological sifting in order

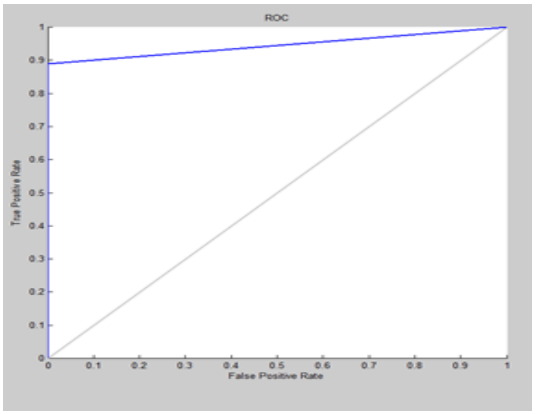
to decide the retinal zone limit utilizing super pixels grouped by the characterization display.

## IV. EXPERIMENTAL EVALUATION

The images for training and testing have been obtained from URI and are acquired using their ultra wide field SLO. Image has a FOV of up to 200◦ of the retina. Each image has a dimension of 3900 × 3072 and each pel is delineated by 8-bit on both red and green channels. The dataset is composed of healthy and diseased retinal images; Most of the diseased retinal images are from Diabetic Retinopathy patients. The system has been trained with 15 images and tested against 20 images. Receiver operating characteristic (ROC), or ROC curve, is a graphical plot that illuminates the execution of a binary classifier system as its discrimination threshold is varied. The curve is created by plotting the true positive rate (TPR) against the false positive rate (FPR) at various lower limit settings. The true-positive rate is also known as sensitivity, recall or probability of detection in machine learning. The false-positive rate is also known as the fall-out or probability of false alarm.




Sensitivity and specificity are statistical metrics of the performance of a binary classification test, also known in statistics as function. Sensitivity also called the true positive rate measures the proportion of positives that are correctly identified as such (e.g., the percentage of sick people who are correctly identified as having the condition).Specificity also called the genuine adverse rate measures the extent of negatives that are accurately recognized all things considered (e.g., the rate of sound individuals who are effectively distinguished as not having the condition). The false positive rate is the percentage of healthy individuals who incorrectly receive a positive test result. The false negative rate, is where a test result betoken that a condition failed, while it actually was successful. I.e. erroneously no effect has been assumed.

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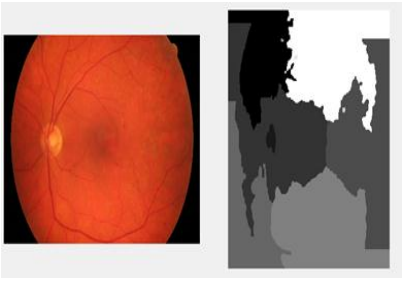

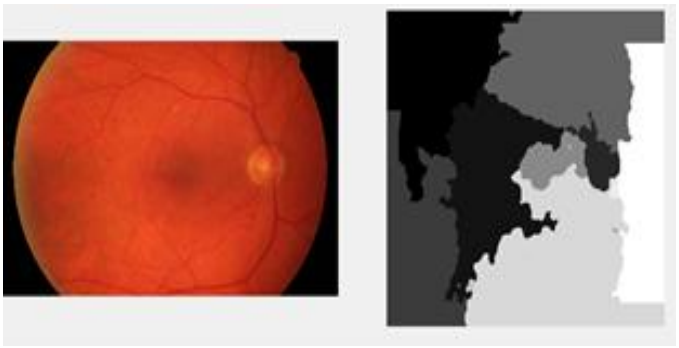

The test assessment result demonstrates that our proposed system can accomplish a precision of 93% in division of the genuine retinal region from a SLO picture. The elements are separated, by degree of components removed, grouping is done, yet unique sorts of classifiers, for example, neural systems, bolster vector machines are having for the characterization than that we have utilize SVM investigation. Effectiveness of the classifier is figured as far as its productivity to arrange ordinary pictures into typical and anomalous pictures as strange. Territory and border of veins were utilized as the information parameters to multilayer nourish forward neural system for characterization into various retinopathy stages.

## V. CONCLUSION

, A few distinctive computational systems have been utilized as a part of endeavors to tackle the issue of computerized diabetic retinopathy. These endeavors have been constrained both by the measure of information accessible to scientists here, and in the assortment of strategies used to tackle the issue. A typical subject in the writing of this territory has been the need to part the issue up into first recognizing the ordinary components or parts of the retina, for example, the veins, fovea and optic circle, and after that endeavoring to distinguish and perhaps restrict exudates and hemorrhages. In this review, we have proposed a novel system for programmed recognition of genuine retinal region in SLO pictures.

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