GLACOUMA OPTIC CUP SEGMENTATION TECHNIQUE FOR FUNDUS AND CT SCAN IMAGES

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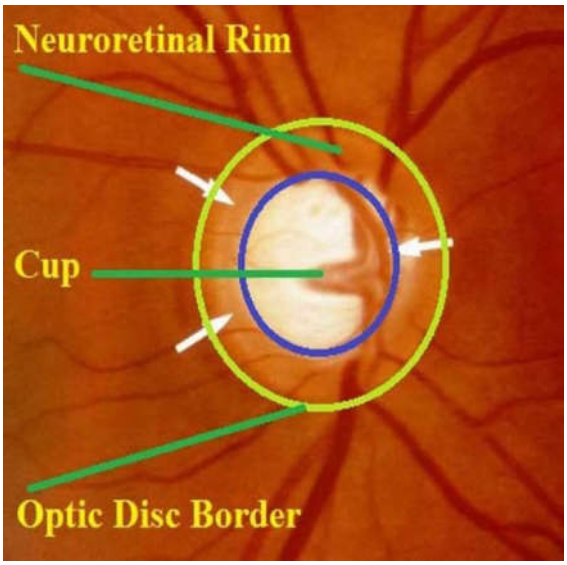
ABSTRACT
A chronic eye condition called glaucoma is the main global factor in permanent vision loss. Glaucoma is a chronic condition of the eyes that, if untreated, can lead to blindness. According to the World Health Organization, glaucoma is the second- leading cause of blindness worldwide, accounting for 15% of all occurrences of blindness, or 5.2millionpeopleworldwide (ThyleforsandNegrel1994).By2020,that figure is projected to rise to 80 million (Quigley and Broman 2006). This particular eye ailment causes gradual damage to the optic nerve. It is the primary global cause of unavoidable and permanent blindness. Glaucoma develops as a result of a rise in intraocular pressure brought on by the eye fluid known as aqueous humor. The abnormality in the human eye causes glaucoma and renders a person permanently blind. The only approach to identify glaucoma at an early stage is by looking at the eye's structure so that the internal alterations raised may be noticed since there are no symptoms of glaucoma that are evident at a nearly stage. Atleast five times are performed by the eye doctor to certify the presence of this illness in human eyes. With the extraction, this study focuses on the Optic Disc (OD) and Cup and Disc Ratio to detect glaucoma at an early stage using the optic disc and cup disc images from the fundus images of the eye (CDR).

INDEX TERMS:
Convolutional neural networks (CNN), cup-to-disc ratio (CDR), optic disc (OD), and intraocular pressure are all terms related to glaucoma (IOP).

INTRODUCTION:

Globally, glaucoma is the most common cause of permanent blindness. Glaucoma causes irreversible vision loss; as a result, early detection is crucial to protect vision. Clinical glaucoma screening primarily involves the measurement of intraocular pressure (IOP), function-based visual field testing, and evaluation of the optic nerve head(ONH).IOPisasignificantriskfactor, but it isn't specific enough to be a reliable diagnostic method for the majority of individuals with normal tension glaucoma. Medical clinics do not typically have the specialised equipment required for function-based visual field assessments. On the other hand, ONH evaluation is a practical method of glaucoma screening and is frequently carried out by qualified glaucoma specialists. Clinicians frequently employ as a clinical measurement in fundus imaging, the vertical cup-to-disc ratio (CDR), which is determined by the ratio of the vertical cup diameter (VCD) to the vertical disc diameter (VDD), is used. Based on the Segmentation approach for CDR measurement has first been presented for automated screening; it segments the primary structure (such as the Optical disc (OD) and optical cup (OC)) and then determines the CDR value to find glaucoma cases. A persistent eye condition called Glaucoma gradually harms the optic nerve and impairs vision. By2020, it is expected to impact around 80 million individuals. It is one of the most frequent causes of blindness. The optic nerve head, the nerve fibre layer, and concurrent functional failure of the visual field are all signs of glaucoma, which is characterised by the slowdegenerationoftheopticnervefibres. Asindicatorsdon'tdevelopuntilthedisease is quite far along, the "quiet thief of sight" is a common description of glaucoma. Therapy can slow the progression of glaucoma even though it cannot be cured. So, it's critical to establish a timely diagnosis for this ailment. The structural aspect of the OD changes due to the loss of optic nerve fibres, resulting in cupping, which is an expansion of the cup area and thinning of the neuro retinal edge. To better identify the significant hidden patterns connected to glaucoma,we design a unique deep-learning architecture in this study. The chosen DL structure consists of convolutional layers that convolve the input using multilayer perceptrons. These layers might better simulate the local patches. We create a contextualising training technique, in contrastto standard

CNN, which isused to discover deeply hidden aspects of glaucoma. By using the results of one as the context, and CNN for the other, the context in the proposed deep CNN assumes responsibility for dynamically changing CNN model learning and successfully boosting glaucoma detection. We also use response normalization layers and overlapping-pooling layers to lessen the overfitting issue. The suggested DL architecture also uses dropout and data augmentation algorithms to further improve performance.



Fundus image

LITERATURESURVEY

ROI Extraction

Agarwaletal. Found the square region with radius "r" and the geographic location of the optic cup's centre. [3] ROI from the extraction. Early approximations of the optic disc's coordinates are made before the precise coordinates are obtained. Although [14] employed four different types of images processing techniques, including geometric modifications, limited and region of the processed image pixel brightness alterations and resume operating at standard stage to find the return on investment. The ROI is manually cropped using a non- automated method[15]. The RGB fundus's G-plane image was used by Narasimhan and Vijayarekha [16] to derive an approximate region surrounding the brightest point. The intensity weighted centroid approach was also used to determine the OD centre. Instead of locating the brightest region, ROI was found by scrutinising the OD's OD intensity values in the RGB colour space [18].

OD And OC Segmentation

The optic disc was allegedly extracted by Hatanaka et al. [23] using the fundus image's shape and colour. In all three channels of an RGB image, the P-tile thresholding approach was used. By combining the three images, an approximativeopticdiscwasproduced,and a clever edge detector was used. By applying a blue component in a profile analysis, the optic cup was discovered.Last but not least, glaucoma was diagnosed using the verticalCDR. While the location of the optic cup in Reference [24] was carried out utilising a component labelling algorithm-based ROI-based segmentation technique and a contour method based on morphological processes. Using the segments of the optical disc and cup were made using the red and green channels of an RGB colour display. With the aid of Laplace, Sobel, and Canny contour detection techniques, Soltani et al. [19] sought to segment the optic disc in their work. In terms of disc localization and detection, Canny detector produced good results. The Laplacian operator has the lowest accuracy, however, and is most susceptible to visual noise. By choosing the best outcome from the three methods— maximum difference technique, maximum variance method, and low pass filter method—OD localization was carried out in the study by Aquino et al. [20].

Glaucoma Identification in Fundus Images Using Deep Learning Network
JUN CHENG , YANWU XU, HUAZHU
FU, JIANG LIU – 2018

A chronic eye condition called glaucoma causes permanent vision loss. Clinical glaucoma screening primarily involves the measurement of function-based visual field, intraocular pressure(IOP), The optic nerve head (ONH) isbeing tested and evaluated . IOP is an important reason for glaucoma, however not at all a reliable technique for early identification in the vast majority of patients with normal tension. The specialist equipment needed for function-based visual field evaluation is uncommon in medical offices. Moreover, early glaucoma frequently has no visible symptoms. Whereas on the other hand, ONH evaluation is such a practical method of glaucoma screening and is frequently carried out by qualified glaucoma experts. Clinicians frequently utilize and accept by dividing the vertical cup diameter (VCD) by the vertical disc diameter, one can calculate the vertical cup to disc ratio (CDR).as one clinical criterion for the fundus imaging (VDD).

Using Deep Learning, predicting the onset of glaucoma
Michael Goldbaum, Anshul Thakur, SiamakYousefi – 2020

Two separate readers from the OHTS's reading centers for the visual field and optic disc thoroughly evaluated the fundus photos likewise visual fields. When the readers found an irregularity, similarly patient might have been summoned come back for more testing to validate it and for approval by an end point committee 66721 fundus photos were used, of which 85% were used to train and validate deep learningmodels.Theremaining15%ofthe fundus photos were held out for further testing and validation. The model's sensitivity to onset of glaucoma was 0.95 (95% CI, 0.94e0.96). Model Deep learning can reasonably forecast the start of glaucoma before the disease develops. Deep learning algorithms demonstrated a higher propensity to miss eyes with aberrant visual fields but not glaucomatous optic neuropathy.

Glaucoma Level Analysis Using the Cup to Disc Ratio
Sharmila Chaudhari and Jyoti Patil*– 2021

The glaucoma suspect is determined by the vertical cup/plate proportion (CDR). Although studies have shown that the vertical C/D percentage advances more quickly in the early and transitional stages of glaucoma, the even C/D proportion is often larger for normal eyes than the vertical C/D proportion. Glaucoma is thought to be present on the off chance that the C/D ratio is 0.4 or higher and >0.5mm. If the cup to disc ratio is 0.5mm, and the eyes are in normal condition.

EXISTING SYSTEM:

The majority of OD containment methods now in use are run-based.OD variations are discovered through injuries, making them difficult to detect in epidemiological examinations or screening for retinal or optic nerve infections.

Disadvantages Of Existing System:

As seen from results for traditional styles, there's need of proper discovery ofthe OD edges to detect its abnormality .The primary goal of introducing the proposed methodis to identify glaucoma and determine quickly whether a person has the disease or not.

PROPOSEDSYSTEM:

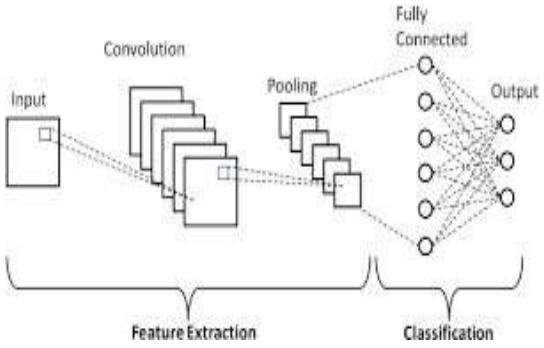
The problems which are passed in the existing applications are overcome in proposed application. This application provides a cost-effective solution for users. We give the images data to input layer in the form of arrays and apply different filters for extract the features from given image. In the existing system, the detection of glaucoma is completely worked on fundus images, but in the proposed system it is been worked on fundus images and as well as CT scanned images.

METHODOLOGIES:

CNN algorithm:

An example of a Deep Learning architecture is the Neural Convolutional Network (CNN), which seems to be frequently employed such as image applications for classification and recognition. This structure is made up of numerous layers, including convolutional, pooling, and fully linked layers. A completely connected layer,

convolution layers, and an input layer make up the CNN model, which receives the pre-processed picture as input. We refer to this technique as feature extraction. These features are then applied to the ReLU activation function, which performs a threshold operation for each input variable with values below zero. The feature mapsare down-sampled as a result of applying the output of the ReLU layer to a max pooling layer with a 2x2 window size. For the second convolution layer, the result of the previous convolution layer is used as the input. Using filters and kernels to produce data on the third layer, which is the top most layer, the same actions are carried out .The image type is then assessed using these features and detect whether if the eye is healthy or glaucoma detected.



3.1CNN Processing

Databases:

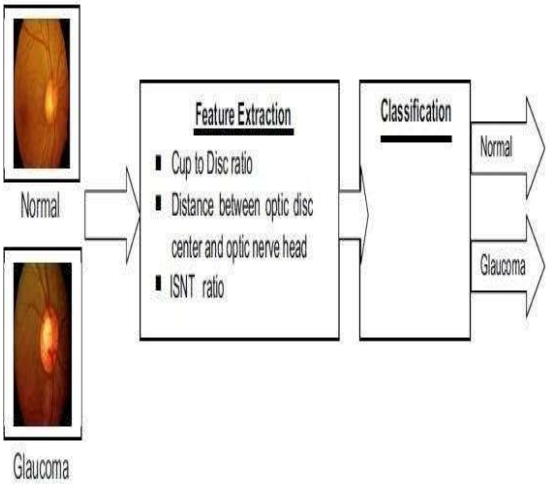
110 eye photos are available for training and testing in the database. Out of 60 pictures, 50 show glaucoma and 50 show healthy eyes(without glaucoma).Allofthe photographs are in various formats and sizes.

Preprocessing:

The noise will be reduced by the picture pre-processing technique, and the data will be converted into a common format for further image classification. To minimise andremove noise, Gaussian Blur isused to fixed size images (256x256 pixels).

SYSTEMARCHITECTURE:

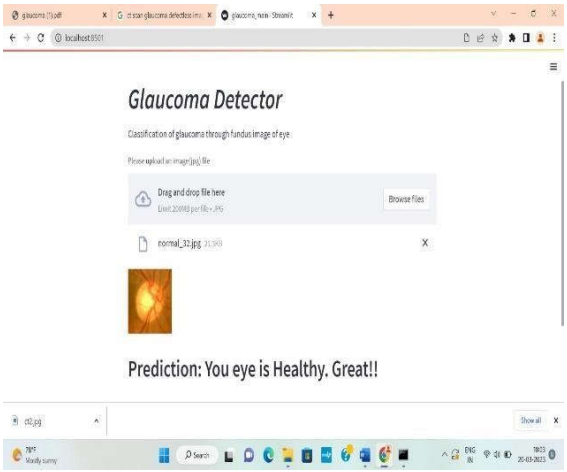
The fundus images of eye retina are collected and are then pre-processed which means the fundus images are extracted through various features without any noise or disturbances. The images which are collected and extracted are classified either the person is normal and healthy or the person is affected with glaucoma.

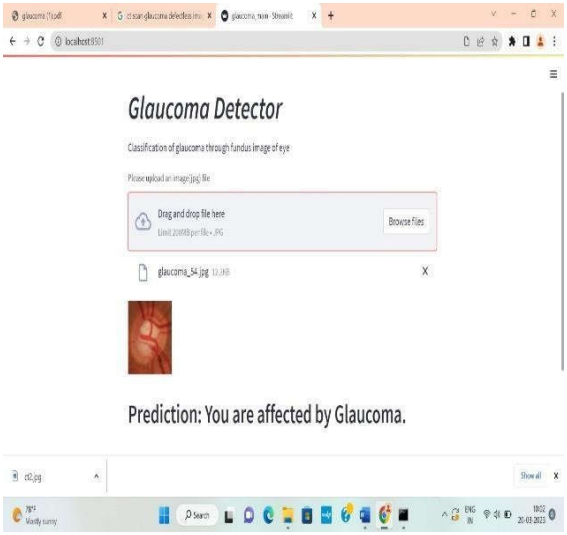


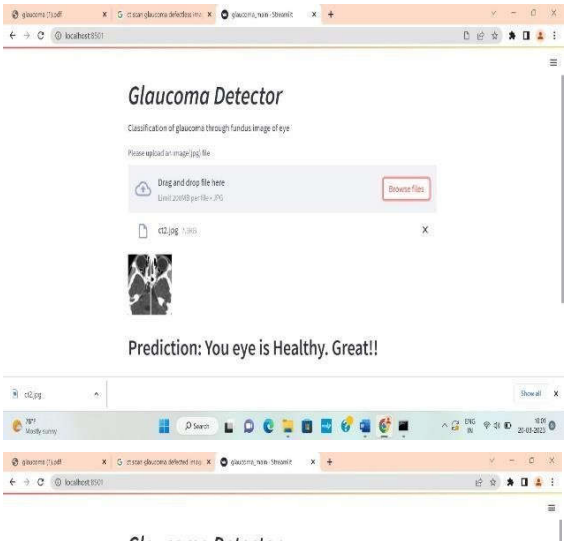
4(a).process Architecture

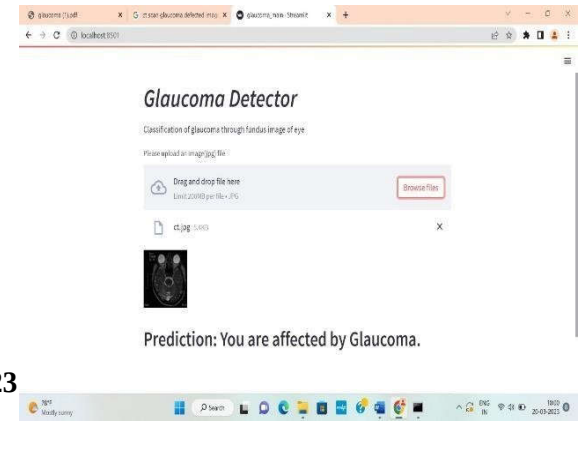
The ISNT rule, which stands for inferior, superior, nasal, and temporal, refers to this pattern of rim width. The ISNT rule is frequently applied in clinical practise to aid in the early detection of glaucomatous optic neuropathy.

RESULT:


Glaucoma Detector
Classification of glaucoma through fundus image of eye
Drag and drop file here
Browse files
normal_32.jpg
Prediction: You eye is Healthy. Great!!


Glaucoma Detector
Classification of glaucoma through fundus image of eye
Drag and drop file here
Browse files
glaucoma_54.jpg
Prediction: You are affected by Glaucoma.


Glaucoma Detector
Classification of glaucoma through fundus image of eye
Drag and drop file here
Browse files
ct2.jpg
Prediction: You eye is Healthy. Great!!


Glaucoma Detector
Classification of glaucoma through fundus image of eye
Drag and drop file here
Browse files
ct.jpg
Prediction: You are affected by Glaucoma.

CONCLUSION

One of the major eye conditions that causes permanent blindness is glaucoma. In order to preserve vision and prevent severe structural damage, early glaucoma diagnosis is essential. The method that has been suggested is a Nobel invention that can help individuals in distant locations where hospitals and skilled medical professionals are hard to come by. That might be beneficial for impoverished nations with a shortage of ophthalmologists. The main concept is to categorise the severityof glaucoma so that the patient can take early action and preserve the vision before going blind. It is been worked on fundus images and as well as CT scanned images.

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