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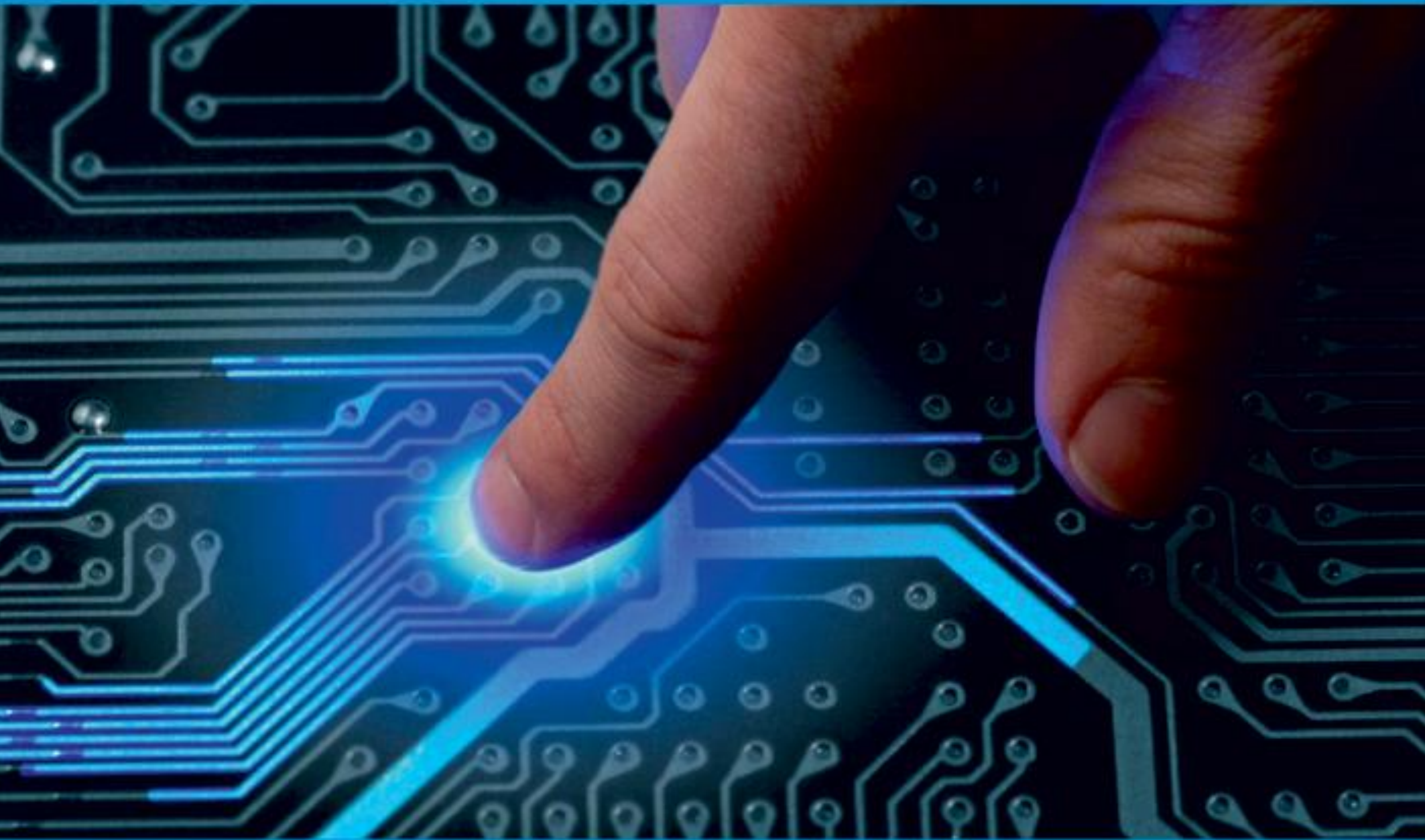

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CNN Based Glaucoma Detection system

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ABSTRACT: A chronic, progressive eye condition called glaucoma is characterised by damage to the optic nerve and a progressive loss of vision. In order to stop irreversible visual deterioration, earlydetection and prompt management are essential. Recent developments in machine learning, namelyin the area of convolutional neural networks (CNNs), have demonstrated potential for automated retinal image analysis-based glaucoma identification. In this paper we implement a comprehensive framework for the identification of glaucoma that combines state-of-the-art CNN architectures, statistical approaches like Design of Experiments (DOE), and picture enhancing techniques like Retinex. Retinex is used to enhance fundus images in terms of quality and contrast, which in turn improves CNN-based feature extraction that follows. CNNs are optimised with DOE to achieve improved detection performance. CNNs are meant to recognise unique patterns and features suggestive of glaucoma.

KEYWORDS: Eyes, Dataset, Neural Network, Detection, Supervised learning by classification, Retinex

I. INTRODUCTION

A common, long-term eye condition that affects millions of people of all ages and demographics, glaucoma is one of the primary causes of permanent blindness globally. Early detection and care are crucial for maintaining eyesight and improving the quality of life for those affected with glaucoma, which is characterised by progressive degeneration of the optic nerve andconcomitant visual field loss. Glaucoma frequently goes undiagnosed in its early stages. Comprehensive clinical tests, such as measurements of intraocular pressure (IOP), evaluations of the optic nerve head, and visual field exams, are crucial to the traditional diagnosis of glaucoma. These techniques, however, are laborious, subjective, and might not identify glaucoma until the disease has progressed to the point where irreversible damage has already been done. The field of glaucoma detection has undergone a radical change thanks to developments in medical imaging technology, especially the use of fundus photography and optical coherence tomography (OCT). Fundus photography has become a useful diagnostic tool for the early detection of problems associated to glaucoma because it provides high-resolution images of the retina.

In order to obtain reliable and efficient automated glaucoma identification utilizing fundusimages, this study presents a thorough overview and analysis of glaucoma detection strategies, with a primary focus on leveraging machine learning techniques, specifically CNNs. We examine the difficulties in diagnosing glaucoma, the potential of CNNs in distinguishing characteristics related to glaucoma from fundus pictures, and the incorporation of cutting-edge methods to improve the accuracy and efficiency of automated glaucoma detection systems. We hope to offer important insights into the changing landscape of glaucoma detection by synthesising the state of the art research and developments in the field. This will help with better screening, early diagnosis,and management of this sight-threatening condition.

II. LITERATURE SURVEY

In this study, they have studied a CNN semi-supervised learning system for glaucoma detection in fundus pictures was described. The current methodology showed promising performance when compared to existing approaches by applying the self-learning strategy to expand the training Samples using the unlabeled data and fine-tuning a pre-trained CNN to construct a glaucoma-specific classifier. As part of their ongoing study, the scientists are working to improve the framework's generalisation so that it can identify additional eye disorders[1].

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This paper they provided a 3DCNN-based, totally automated glaucoma diagnosing approach. BecauseOD segmentation and/or data augmentation phases were not included in the suggested technique, it varies from previously described procedures. The 100% accuracy we were able to attain served as a strong indication of the results' promise, which reached levels compared to the finest researchcurrently accessible in the associated literature. Compared to conventional designs, our volumetric analysis technique produced more favourable results; these results open up new research avenues. Last but not least, we think that our approach has value and contributes meaningfully to the medicalcommunity and, subsequently, to the computer community, particularly in the interpretation of medical pictures[3].

In this research ,they have studied a unique Disc-aware Ensemble Network (DENet), which incorporates four deep streams on various layers and modules, for automated glaucoma screening. The inclusion of several levels and modules is advantageous for incorporating hierarchical representations, and thedisc-aware constraint ensures that the optic disc region's contextual information is included for glaucoma screening. Our technique outperforms state-of-the-art glaucoma screening algorithms, according to trials on two glaucoma datasets (SCES and recently gathered SINDI datasets)[4].

In summary, this work proposed a novel AI-based method for glaucoma identification that integrates temporal (dynamic vascular) and spatial (static structural) characteristics. Our suggested strategy showed good performance in differentiating glaucoma from healthy compared with models that just used spatial information as their input while tackling the video classification issueof glaucoma[5].

In this study ,they have studied a glaucoma detection model for fundus pictures is proposed. It makes use of graphbased saliency and convolutional neural network ensembles. We start by identifying the opticdisc on the fundus pictures using graph-based saliency. Then, using four distinct ways, we combine the output of an ensemble of three potent CNN architectures to identify glaucoma. The results reveal that our model performs better than a comparable study from the literature that makes use of the same dataset. The results further demonstrate that they are on par with or superior to those reported by current glaucoma detection studies[6].

This study they offers an automated primary glaucoma screening based on quantitative analysis of fundus pictures to help ophthalmologists identify glaucoma illness more quickly and affordably. Two primary processing phases make up the suggested technique. Five different deep semantic algorithms are employed to experiment with OD segmentation, and the characteristics recovered from the clipped OD region are then utilized to train a classifier to predict the existence of glaucoma in the test pictures[7].

III. PROPOSED SYSTEM

Capture detailed retinal images using specialized cameras, often through a non-invasive process. Enhance the quality of the images by reducing noise, adjusting contrast, and normalizinglighting conditions. Extract relevant features from the retinal images, such as optic nerve head parameters, cup-to-disc ratio, and blood vessel characteristics. Utilize trained machine learning models to classify the retinal images into healthy or glaucomatous categories based on the extracted features.

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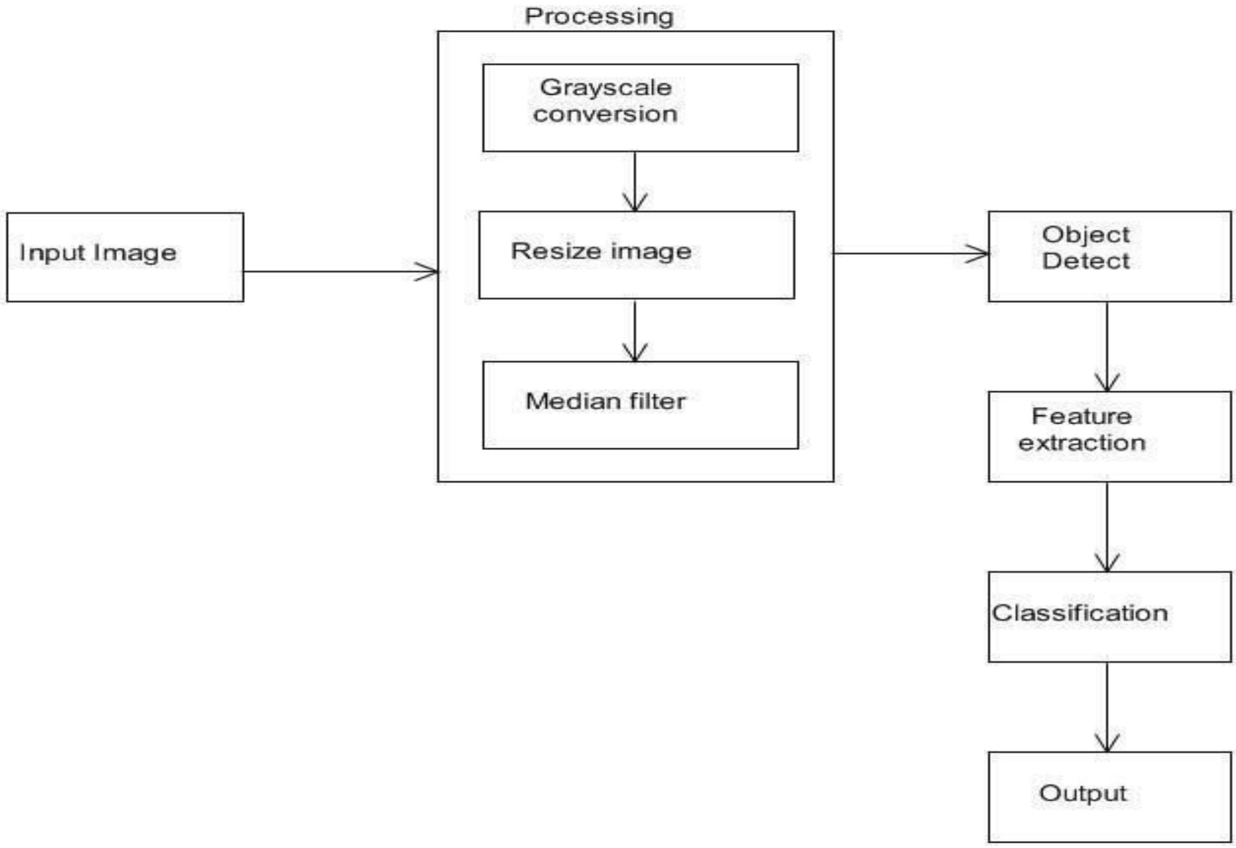

Fig 1. System Architecture

IV. ALGORITHM

Convolution Neural Network(CNN) Algorithm:
The structure of CNN algorithm includes two layers.First is the extraction layer of features in which each neuron's input is directly connected to its previous layer's local ready fields and local features are extracted. The spatial relationship between it and other features will be shown once those local features are extracted. The other layer is feature_map layer; Every feature map in this layer is a plane, the weight of the neurons in one plane are same. The feature plans structure makeuse of the function called sigmoid. This function known as activation function of the CNN, which makes the feature map have shift in difference. In the CNN each convolution layer is come after a computing layer and it’s usage is to find the local average as well as the second extract; this extraction of two feature is unique structure which decreases the resolution.
Step 1: Select the dataset.
Step 2: Perform feature selection using information gain and ranking
Step 3: Apply Classification algorithm CNN
Step 4: Calculate each Feature fx value of input layerStep 5: Calculate bias class of each feature
Step 6: The feature map is produced and it goes to forward pass input layerStep 7: Calculate the convolution cores in a feature pattern
Step 8: Produce sub sample layer and feature value.
Step 9: Input deviation of the kth neuron in output layer is Back propagated.Step 10: Finally give the selected feature and classification results.

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V. RESULT AND DISCUSSION

1. Main Page: Here, on this page two buttons are located Login and Registration foruser. User have to login into by there username and password.

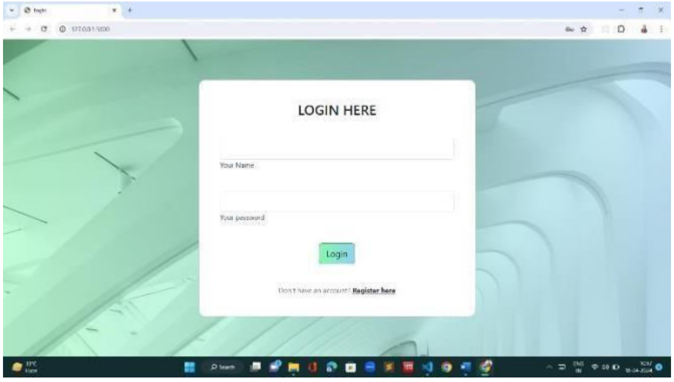

Fig 2. Main Page

2. Registration Page: Here, on this page user can register by filling below information to access or use the application. Without registration it was not able to allow further steps.

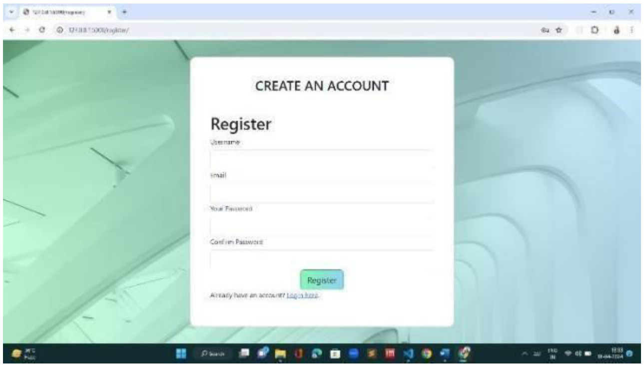

Fig 3. Registration Page

3. Input Data: On this page user have to select image from dataset then click on predict button. Then image is converted into Gray Scale after that resize and filter the image whichis preprocessing step then it turn into Binary Scale in feature extraction then next is CNN prediction once click on that predict button which is classify the Glaucoma or not Glaucoma.

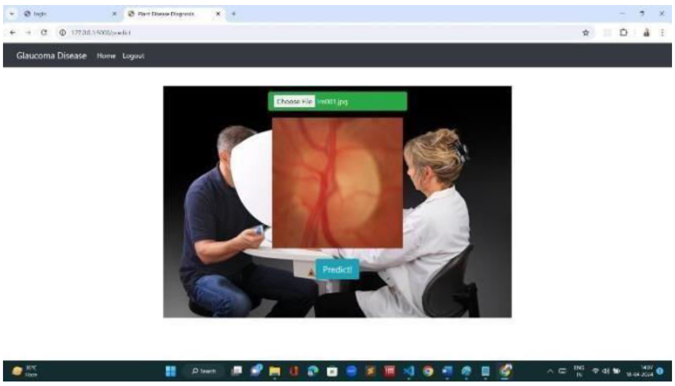

Fig 4. Input Page

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4. Output Data: Result is shown below.

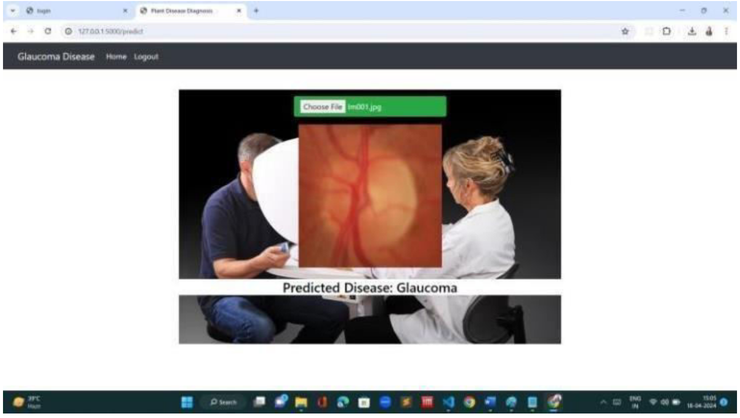

Fig 4. Output Page

Performance Analysis:

The experimental result evaluation, we have notation as follows:TP: True positive (correctly predicted number of instance)
FP: False positive (incorrectly predicted number of instance),

TN: True negative (correctly predicted the number of instances as not required)

FN false negative (incorrectly predicted the number of instances as not required),On the basis of this parameter, we can calculate four measurements

Accuracy = TP+TN÷TP+FP+TN+FN

Precision = TP ÷TP+FPRecall= TP÷TP+FN
F1-Measure = 2×Precision×Recall ÷Precision+ Recall.

Table no1.Method Comparison

	Existing System	Proposed System(CNN)
Precision	60.6	52.70
Recall	75.1	87.64
F-Measure	68.8	74.31
Accuracy	78.29	86.26

VI. CONCLUSION

In this proposed work, an ensemble model was designed for the detection of glaucoma in the early stage. In order to distinguish between normal and glaucomatous fundus pictures, the ensemble model proposes using a convolutional neural network to extract feature information fromthe images. Automating the diagnosis of glaucoma, a prevalent eye illness that can cause vision loss if left untreated, has shown encouraging results when it comes to machine learning,

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especially deep learning algorithms like Convolutional Neural Networks (CNNs). The field of machine learning, particularly CNN-based methods, has enormous potential for the diagnosis of glaucoma. By improving early diagnostic speed and accuracy, these strategies may help improve glaucoma care and therapy, thereby protecting affected persons' vision. But the effective integration of these developments into clinical practice will require ongoing research, strong validation on a variety of datasets, and cooperation with medical experts.

REFERENCES

1. Manal Al Ghamdi, Mingqi Li, Mohamed Abdel-Mottaleb, Mohamed AbouShousha, SEMI-"SUPERVISED TRANSFER LEARNING FOR CONVOLUTIONAL NEURAL NETWORKS FOR GLAUCOMA DETECTION", 978-1-5386-4658-8/18/$31.00 ©2019 IEEE.
2. Yong Yu,Xiaosheng Si, Changhua Hu,Jianxun Zhang, "A Review of Recurrent Neural
3. Networks:LSTM Cells and Network Architectures", Neural Computation 31, 1235– 1270 (2019) © 2019.
4. Nonato Rodrigues de Sales Carvalho, Maria da Conceição Leal Carvalho Rodrigues, Antonio Oseas de Carvalho Filho, Mano Joseph Mathew, "Automatic method for glaucoma diagnosis using a three-dimensionalconvoluted neural network".0925-2312/ 2021 Elsevier B.V. All rights reserved.
5. Huazhu Fu, Jun Cheng, Yanwu Xu, Changqing Zhang, Damon Wing Kee Wong, Jiang Liu,and Xiaochun Cao, "Disc-aware Ensemble Network for GlaucomaScreening from Fundus Image",0278-0062 (c) 2018 IEEE.
6. SoheilaGheisari, Sahar Shariflou, JackPhu, Paul J. Kennedy, Ashish Agar, Michael Kalloniatis& S. MojtabaGolzan, "A combined convolutionaland recurrent neuralnetworkfor enhanced glaucoma detection", 2021 11:1945.
7. Sertan Serte Ali Serener, "Graph-based saliency and ensembles of convolutional neuralnetworks for glaucoma detection", © 2020 The Authors. IET Image Processing published by John Wiley & Sons Ltd.
8. Syna Sreng, Noppadol Maneerat, Kazuhiko Hamamoto and Khin Yadanar Win, " Deep Learning for Optic Disc Segmentation and Glaucoma Diagnosis on Retinal Images", article2020.