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OCULAR EYE DISEASE PREDICTION USING MACHINE LEARNING

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Abstract: The eye is the most important sense organ which enables us to see the world. Ocular eye diseases are some of the major problems for vision. In this ocular eye disease comes the most common disease, Cataract. Cataract is a misty form that affects the vision of the eye which causes blurriness. It is mostly found in elderly people due to their age. Computer-aided diagnosis is a bit complicated task for the detection of ocular eye diseases. In the present paperwork, we predict the ocular eye diseases based on Machine Learning algorithms which include Convolution Neural Networks (CNN) and image pre-processing. The accuracy of the outcome is displayed through the confusion matrix.

Index Terms **- Cataract; Detection; Convolution Neural Networks (CNN); Image pre- processing; Confusion matrix**

I. INTRODUCTION

Cataract is a cloudy area in the lens that impacts the vision of the eye and leads to decrease in vision. It mostly appears in growing individuals due to age, trauma, radiations, and genetics.Cataracts don't show any symptoms in the earlier stage, but as they develop they cause differences in your vision. Cataracts are mostly observed during the evenings. This makes us look at normal lights which appear to be more bright. Cataract surgery involves in the removal of the cataract which is present in the eye to improve the vision.

The present paperwork focuses on the detection of cataracts with the help of Machine learning techniques by using the Convolution Neural Network algorithm with Tensorflow. Initially, normal and cataract images are extracted. The dataset is created using Image pre-processing and the images are sent to the CNN model for detecting the cataract. More than 4500 images were examined.

II. LITERARY SURVEY:

- In October 2002, Thomas Walter, Jean-Claude Klein, Pascale Massin, and Ali Erginay proposed work on "Image Processing to the Diagnosis of Diabetic Retinopathy--Detection of Exudates in color Fundus Images of Human Retina". They focused on the Detection of Optic Disk and Detection of Exudates by using Morphological Techniques that help us to find the Candidate Regions and Contours.They also concluded that it is not an easy task if a human observer does not agree with the algorithm that may be due to the error in the observation.
- In the year 2013, Preethi and Jyothika Pruthi performed a work "Image processing Technique for Glaucoma Detection" by using various algorithms like curvelet transform, active contour model, artificial intelligence, KNN regression, Edge detection. There is an Image processing Technique that includes feature extraction, Pattern matching , Classification. Other Techniques applied to detect optic Disk after preprocessing image is obtained to find the defect in the eye.
- In November 2015, Li Tang, Meindert Niemeijer, Michael D. Abramoff proposed work on "Splat feature classification: Detection of the presence of large retinal hemorrhages". This mainly focused on splat segmentation where the image is split into homogeneous colors with two steps, splat feature space analysis which uses algorithms to detect hemorrhages by KNN regression, and Image level Haemorrhage where the goal is to develop a large retinal hemorrhage detector to indicate whether the image is normal or not. The results show that the developed algorithm is expected to assign a high index number without generating a large number of false positives.
- In the year 2016,Mr.Langade Umesh, Ms.Malkar Mrunalini, Dr.Swati Shinde proposed work on "Review of Image Processing and Machine Learning Techniques for Eye Disease Detection and Classification".The proposed work focused on classifying and detecting the different eye diseases like glaucoma using image processing techniques like image

segmentation,feature extraction,statistical analysis, and so on.They also used machine learning techniques such as KNN,NB, etc to detect the disease.

- In the year 2017, Abbas Q proposed work on "Glaucoma-Deep: Detection of Glaucoma Eye Disease on Retinal Fundus Images using Deep Learning".They first used an unsupervised convolution neural network to extract features, then a deep belief network for selecting deep features.They also used a softmax linear classifier to separate images with different features.The outcome of the work has an accuracy of 99% as they used advanced deep learning algorithms. This method will make the experts work more easily in detecting glaucoma.

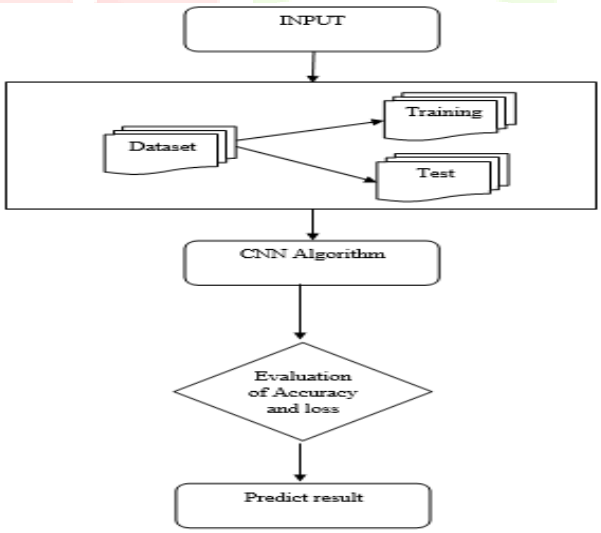
III. DATASETS

The dataset contains age,patient size,labels,target and filename which describes about the retinal fungus.

ID	Patient Ag	Patient Se	Left-Fund	Right-Fun	Left-Diagr	Right-Diag	N	D	G	C	A	H	M	O	filepath	labels	target	filename
0	69	Female	0_left.jpg	0_right.jp	cataract	normal fu	0	0	0	1	0	0	0	0	../input/o	['N']	[1, 0, 0, 0,	0_right.jpg
1	57	Male	1_left.jpg	1_right.jp	normal fu	normal fu	1	0	0	0	0	0	0	0	../input/o	['N']	[1, 0, 0, 0,	1_right.jpg
2	42	Male	2_left.jpg	2_right.jp	laser spot	moderate	0	1	0	0	0	0	0	1	../input/o	['D']	[0, 1, 0, 0,	2_right.jpg
4	53	Male	4_left.jpg	4_right.jp	macular e	mild nonp	0	1	0	0	0	0	0	1	../input/o	['D']	[0, 1, 0, 0,	4_right.jpg
5	50	Female	5_left.jpg	5_right.jp	moderate	moderate	0	1	0	0	0	0	0	0	../input/o	['D']	[0, 1, 0, 0,	5_right.jpg
6	60	Male	6_left.jpg	6_right.jp	macular e	moderate	0	1	0	0	0	0	0	1	../input/o	['D']	[0, 1, 0, 0,	6_right.jpg
7	60	Female	7_left.jpg	7_right.jp	drusen	mild nonp	0	1	0	0	0	0	0	1	../input/o	['D']	[0, 1, 0, 0,	7_right.jpg
8	59	Male	8_left.jpg	8_right.jp	normal fu	normal fu	1	0	0	0	0	0	0	0	../input/o	['N']	[1, 0, 0, 0,	8_right.jpg
9	54	Male	9_left.jpg	9_right.jp	normal fu	vitreous d	0	0	0	0	0	0	0	1	../input/o	['O']	[0, 0, 0, 0,	9_right.jpg
10	70	Male	10_left.jp	10_right.j	epiretinal	normal fu	0	0	0	0	0	0	0	1	../input/o	['N']	[1, 0, 0, 0,	10_right.jpg
11	60	Female	11_left.jp	11_right.j	moderate	moderate	0	1	0	0	0	1	0	0	../input/o	['D']	[0, 1, 0, 0,	11_right.jpg
13	60	Female	13_left.jp	13_right.j	pathologi	pathologi	0	0	0	0	0	0	1	0	../input/o	['M']	[0, 0, 0, 0,	13_right.jpg
14	55	Male	14_left.jp	14_right.j	normal fu	macular e	0	0	0	0	0	0	0	1	../input/o	['O']	[0, 0, 0, 0,	14_right.jpg
15	50	Male	15_left.jp	15_right.j	normal fu	myelinate	0	0	0	0	0	0	0	1	../input/o	['O']	[0, 0, 0, 0,	15_right.jpg
16	54	Female	16_left.jp	16_right.j	normal fu	pathologi	0	0	0	0	0	0	1	0	../input/o	['M']	[0, 0, 0, 0,	16_right.jpg
17	57	Male	17_left.jp	17_right.j	drusen	drusen	0	0	0	0	0	0	0	1	../input/o	['O']	[0, 0, 0, 0,	17_right.jpg
18	58	Male	18_left.jp	18_right.j	pathologi	pathologi	0	0	0	0	0	0	1	0	../input/o	['M']	[0, 0, 0, 0,	18_right.jpg
19	45	Male	19_left.jp	19_right.j	mild nonp	mild nonp	0	1	0	0	0	0	0	0	../input/o	['D']	[0, 1, 0, 0,	19_right.jpg
21	76	Female	21_left.jp	21_right.j	epiretinal	epiretinal	0	0	0	0	0	0	0	1	../input/o	['O']	[0, 0, 0, 0,	21_right.jpg
23	47	Male	23_left.jp	23_right.j	hypertens	hypertens	0	0	0	0	0	1	0	0	../input/o	['H']	[0, 0, 0, 0,	23_right.jpg

Figure 1) Eye dataset

IV. ARCHITECTURE



V. CONVOLUTION NEURAL NETWORK

A Convolutional Neural Network (CNN) is a Deep Learning calculation which can take in an information picture, allot significance to different angles/objects in the picture and have the option to separate one from the other. The pre-handling needed in a ConvNet is a lot of lower when contrasted with other grouping calculations. While in crude strategies channels are hand-designed, with enough preparing, ConvNets can get familiar with these channels/qualities.

A ConvNet can effectively catch the Spatial and Temporal conditions in a picture through the use of important channels. The planning plays out a superior fitting to the picture dataset because of the decrease in the quantity of boundaries included and reusability of loads. At the end of the day, the organization can be prepared to comprehend the complexity of the picture better.

The goal of the convolution operation is to remove the significant level highlights like edges,from the information picture.ConvNets need not be restricted to just a single convolution layer.Customarily, the principal CovLayer is answerable for catching the low level highlights like edges,shading, slope-direction, and so on with added laters,the developer adjusts to the High-level highlights also,giving us an organization which has the healthy comprehension of pictures in the dataset like how we would.

The Convolutional Layer and the Pooling Layer, together structure the I-th layer of a Convolutional Neural Network. Contingent upon the intricacies in the pictures, the quantity of such layers might be expanded for catching low-levels subtleties much further, yet at the expense of more computational force.

VI. ALGORITHM

Step 1: Choose a Dataset

Step 2: Prepare Dataset for Training

Step 3: Create Training Data

Step 4: Shuffle the Dataset

Step 5: Assigning Labels and Features

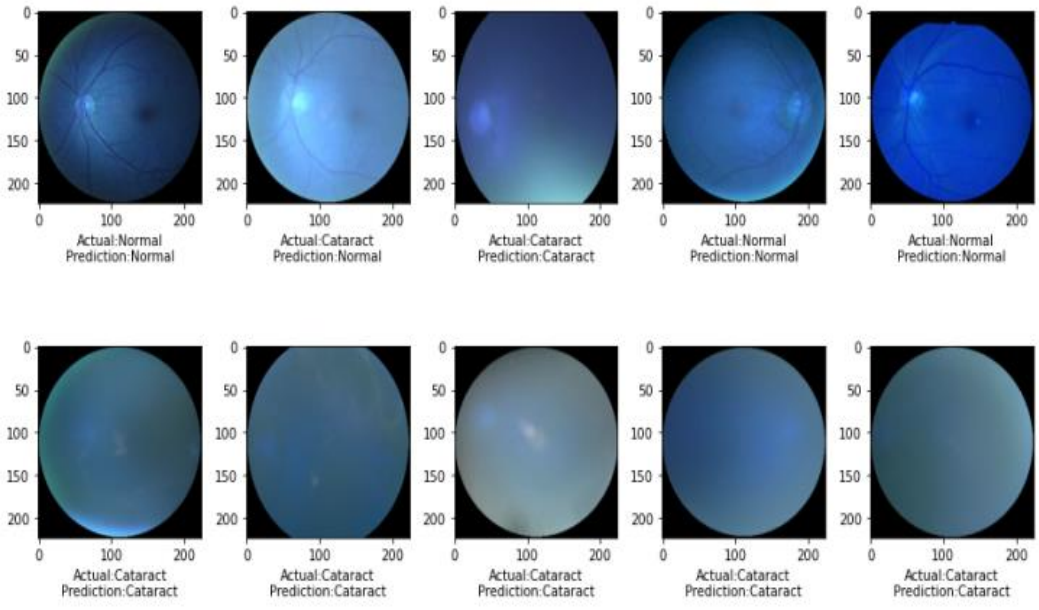
Step 6: Normalising and converting labels to categorical data

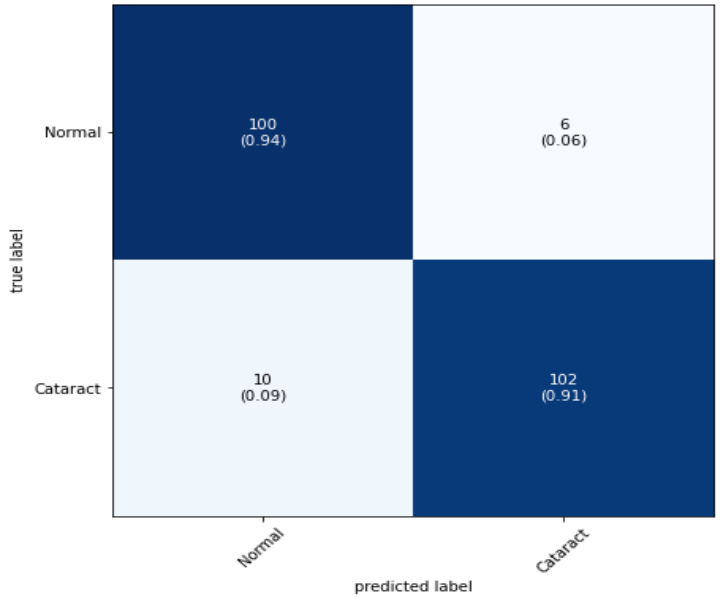
Step 8: Define, compile and train the CNN Model

Step 9: Accuracy and Score of model

VII. RESULTS

The results of the project gives wheather the input contains the cataract or not.It gives the actual and predicted results as shown in the figure.For finding the accuracy of results.confusion matrix is displayed.





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VIII. CONCLUSION

Cataract is a very common disease in aging people. It decreases the vision of people and also makes people color-blind.Detecting at the early stage of symptoms is very crucial. This project provides an effortless way to predict the disease. The images are trained and tested using the CNN algorithm with different modules .The algorithm predicts the cataract present in the left and right fundus.The results of the confusion matrix have shown that there was 94% prediction accuracy which was higher than the predictive values of other algorithms. The above results are discussed with future improvement and application in the clinical field.

IX. REFERENCES

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