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Retinal Diseases Screening Through Deep Learning

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Abstract: In these days there are many problems related to eyes caused by retina and its surfaces which leads to blindness, insight, far sight and AMD (Age-Related Macular Degeneration). In order to prevent or postpone vision loss, early blindness is not essential. To that goal, several AI algorithms have been presented by researchers and current systems that are able to determine if an eye picture is normal or sick. Using fundus pictures and algorithms like CNN and ANN, this research examines the deep learning approaches used at various stages of detection.

Keywords: Machine-Learning, Deep-learning, Convolutional Neural Network, Artificial Neural Network, Image Processing, Fundus images, Preprocessing.

I. INTRODUCTION

According to the WHO rapidly increase in proportion of AMD and DR is estimated to grow 33%. AMD and DR start with the minor abnormalities which increases the permeability. AMD is severe complications in the aged people which make the retina gets thicker due to leaking in blood vessels.

Retina is a sensitive layer which lies between surface of the eye ball and optic nerve tissue. Vision loss is the irreversible disease caused by retinal damages. Population aging is a significant demographic trend globally, which means that the number of individuals suffering from chorio retinal disorders, such as AMD and DMR, is projected to rise in the near future. Since a result, early identification and treatment is essential, as this reduces the severity of blindness development, and vision loss may be averted in many instances. Retinal screening is a technique that utilizes fundus pictures to identify damaged eyes.

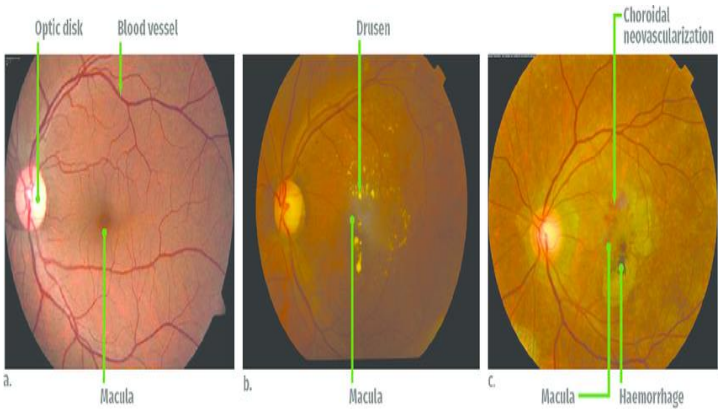

Figure 1: Stages of Retinal Disease Damages

An accurate screening, on the other hand, requires extensive manual inspection of several fundus photographs. With screening technology it is possible to raise accuracy and efficiency by 85-90 per cent, which is considered satisfactory. The aim of this work is to distinguish between AMD and normal fundus pictures at the same time and to avoid the prior segmentation stage of retinal lesions. By pre-processing the fundus image to make it as test and train by splitting it and then apply the CNN algorithm to store in a model.

The recent technology which helps in detecting the fundus images to determine easily if it is diseased or not using deep learning techniques. Primarily collecting fundus images then pre-processing it. Next splitting up of the fundus images to test and train after this we apply the CNN algorithm to make a

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model of the fundus images to store. Finally, by creating a web application to give the fundus image as input to detect if the fundus image as diseased or not.

II. LITERATURE REVIEW

- Gauri Ramanathan, Diya Chakrabarti [1] A machine learning technique, such as logistic regression or random forest, may accurately predict eye illness with 89 percent and 86 percent accuracy, respectively.
- Deepak R Parashar, Dheeraj K Agarwal [2] To classify glaucoma using retinal fundus pictures and a supervised machine learning framework based on support vector machines, Zernike moments, and chip histograms, we created an automated approach that achieved an accuracy of 89.45 percent.
- Yi Biao Rong [3] Classifying retinal OCT pictures using Convolutional Neural Networks and the findings of the suggested technique is highly promising, with an accuracy of 97.83 percent (CNNs).
- Devid Romo-Bucheli [4] talks about the proposed model out performed previous machine learning strategies that relied on a set of spatio-temperal image features with the accuracy of 85% using Deep learning and recurrent neural network.
- Sadaf Malik, Nadia Kaval [5] estimates that the accuracy of the Random Forest and decision tree algorithms, as compared to more complicated approaches like neural networks and the Naive Bayes algorithm, is more than 90% when employing a data-driven strategy for ML-based categorization of eye diseases.
- Rubina Sarki, Khandakar Ahmed[6] Deep learning and machine learning algorithms for automated identification of diabetic eye disease in a fundus picture give a complete summary of diabetic eye disease detection methods used in the survey.
- R Priya, P Aruna [7] SVM has a precision of 95.38 percent, while the accuracy of the basic classifier is 90.76 percent, and the precision of the probabilistic neural network (PNN) is 87.69 percent utilizing Bayesian classification and SVM methodology for diabetic retinopathy diagnosis employing ML approaches.
- Rachana Devanaboina [8] which gives the results of the confusion matrix have shown that there was 945 prediction accuracy which was higher than the predictive values of other algorithms using Convolutional Neural Networks (CNNs) for Ocular Eye Disease Prediction using ML.

TABLE I : ACCURACY TABLE

Methods	**Accuracy**
DT	73.97
Bayesian Network	73.97
KNN	70
SVM	100
ANN	99.99

The above table shows the accuracy of various Machine Learning techniques used in liver disease prediction.

III. METHODOLOGY

MACHINE LEARNING

Machine Learning is a subfield of Expert Systems, this helps a system to think like humans to make its own decisions without the involvement of humans. The rapid growth of Artificial Intelligence and machine learning has many advances in the diagnosis of different types of diseases. In addition, the machine learning algorithm provides performance and accurate predictions. Machine Learning is widely categorized into various types as shown in below Figure 2.

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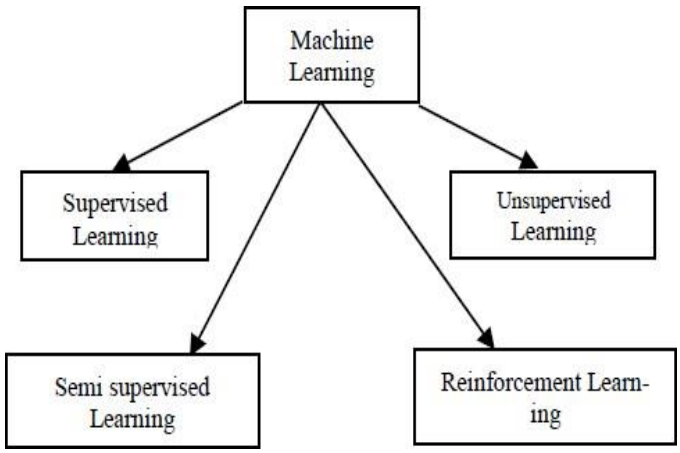

Figure 2: Types of Machine Learning Techniques

A. SUPERVISED LEARNING

It is a method of creating artificial intelligence, in which an algorithm is trained for input data with an output label. The model is trained until it can detect the basic patterns and relationships between input data and output labels, enabling it to produce accurate labelling results when presented with unprecedented data. Some of the various supervised learning are KNN, NB, SVM, DT, RF.

B. UNSUPERVISED LEARNING

Unsupervised learning machine training uses information that is not segmented or labelled and this allows the algorithm to work on the information without supervision. Here the function of the machine is to collect unfiltered information according to similarities, patterns, and differences without prior data training.

C. SEMI SUPERVISED LEARNING

Semi-Supervised is a type of machine learning that uses a combination of a small amount of labelled data and a large amount of non-label data to train models. This machine learning approach is a combination of supervised machine learning, using labelled training data, and unsupervised learning, using non-labelled training data.

D. REINFORCEMENT LEARNING

This type of intelligence is based on agent, execution, status, benefits, and location. A software agent and machine that automatically defines behaviour in a specific relationship based on their reward response.

IV. CONCLUSION

This study gives us a vital overview of the newly issued studies on the discovery of retinal disorders in light of an alternative AI calculation, which are discussed in the paper. During this investigation and exploration, it was discovered and realized that AI computations such as Decision Trees, CNN, NB, SVM, and PNN are the most accurate in recognizing and foreseeing retinal disorders and alternative displays in different conditions. The most important need is that informative indexing and element extraction provide better results. All AI strategies that have both good and negative repercussions based on informational indexes and the selection of components are included in the research. After doing this research, we observed that using a different mix or combination of AI calculations may increase accuracy and execution, and that we can also deal with an additional boundary that aids in preferred execution over the present technique.

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