Diabetic Retinopathy Detection

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Abstract - *One of the most prevalent complications of Type 2 diabetes is diabetic retinopathy. Diabetic Retinopathy is a vision loss syndrome that affects people aged 20 to 64. Diabetic retinopathy causes the normal flow of fluid out of the eye to be disrupted, exerting pressure on the eyeball and possibly injuring nerves, which can lead to glaucoma. Early detection and treatment of diabetic retinopathy minimises the risk of vision loss.*

Diabetic Retinopathy is a kind of diabetic retinopathy that can be treated manually. Ophthalmologists' diagnoses take time, effort, and money, and if computer-aided diagnosis tools aren't implemented, they can result in misdiagnosis. Deep Learning has lately risen to prominence as one of the most popular approaches for achieving high performance in a range of domains, including medical picture analysis and classification. The goal of this study is to predict diabetic retinopathy in advance so that future complications might be avoided. The suggested classifier is based on the Mobile Net architecture, which is a mobile-friendly, lightweight design that was trained using retinal fundus images from the Aptos 2019 challenge data set.

The proposed improved model is 96% accurate, with precision, recall, and f-1 scores of 0.95, 0.98, and 0.97, respectively. The presented results show that this model produces good results and that it may be used for clinical testing.. This study aims to predict the diabetic retinopathy consequences ahead of time. The goal of the project is to ensure that practitioners do not take the place of ophthalmologists.

***Key Words*: Diabetic Retinopathy, MobileNetV2, CNN, Retinal fundus images, Deep Learning, Binary Classifier, Vision Loss**

1.INTRODUCTION

Diabetes is the best disease to apply deep learning principles to. There are numerous specialists chipping away at forecast of diabetes sickness and intricacies emerging from diabetes. There are many applications available which help the practitioners to study the disease and complications but many applications have their own advantages and flaws. According, Indian peoples are more prone to diabetes because of lots of reasons including lifestyle, consumption of type of food and inadequate physical activities. Diabetic Retinopathy is one of the major complications that affects the human eye of diabetic people. Damage to the blood vessels of light-sensitive tissue of the retina causes this disease. Diabetic Retinopathy (DR) is a compilation of diabetes that causes the blood vessel of the retina to swell and leak fluids and blood. It is the leading cause of blindness for people aged 20 to 64 years. Diabetic Retinopathy (DR) is the most common cause of visual loss in people across the world.. According to the article presented in the claims that approximately one-third of the 285 million population having diabetes mellitus worldwide intimates signs of diabetic retinopathy.

2. LITERATURE REVIEW

Sanskruti Patel[1] has applied pre-trained Convolutional Neural Network (CNN) models VGG16 and MobileNetV1. The test by VGG16 is 89.51% and MobileNetV1 is 89.77%.

Sarah Sheikh, Uvais Qidwai[2] have proposed lightweight mobile network and tested the performance of our classifier built using MobileNetV2 – a lightweight, mobile friendly architecture, which is trained using retinal fundus dataset. They have achieved an accuracy of 91.68% the macro precision, recall, and f1-scores are

They suggested a computationally efficient classification approach based on efficient CNNs by Jiaxi Gao et al. [3]. It can be seen that the proposed Model Ensemble achieves a QWK score of 0.852

Shorav Suriyal et.al[4] they have focused on detection aspects of a mobile application developed to perform DR screening in real time. A tensorflow deep neural network architecture is used to power the app, which was trained and tested on 16,798 fundus photos. The model's ultimate accuracy is 73.3 percent.

Kanika Verma et.al[5] their analysis revealed that TP=14, FP=0, TN=9, FN=2, value (PPV)=1, and value (NPV)=0.8181. The unknown test cases were by 88.46%. This shows that the of classification based on area and perimeter of blood vessels and hemorrhages produce motivating results. Sinthanayothin et al., (2003) reported sensitivity of 80.21% and specificity of 70.66% while differentiating diabetic retinopathy from normal images. Here, the we preprocessed using adaptive, local, and they adopted a neural network based classification.

Azar and Valentina E. Balas[6] their paper presents new auto matic approach for detecting retinal abnormalities. The developed algorithm helps in deciding whether the patients with potential sight and needs or patients not

A deep learning ensemble approach for diabetic retinopathy detection has been developed by Qummar, S., Khan, F. G., Shah, S., Khan, A., Shamshirband, S., Rehman, Z. U.,... & Jadoon, W. et.al[7].

Michael D. Abramoff and colleagues [8] have developed an "Automated early diagnosis of diabetic retinopathy." Ophthalmology

Table -1: Literature Review

Sr. No.	Author	Title	Description
1.	Sanskruti Patel	Diabetic Retinopathy Detection and Classification using Pre-trained Convolutional Neural Networks	In this paper, they have applied pre-trained Convolutional Neural Network (CNN) models VGG16 and MobileNetV1. The accuracy of VGG16 is 89.51 percent, while MobileNetV1 is 89.77 percent.
2.	Sarah Sheikh, Uvais Qidwai	Using MobileNetV2 to Classify the Severity of Diabetic Retinopathy	In this paper,They proposed a lightweight mobile network and evaluated the performance of our classifier, which was built using MobileNetV2, a lightweight, mobile-friendly architecture trained on the retinal fundus dataset.. they have achieved an accuracy of 91.68% The macro precision, recall, and f1-scores are 77.6%, 83.1%,and 80.1% respectively.
3.	Jiaxi Gao , Cyril Leung , Chunyan Miao	Diabetic Retinopathy Classification Using an Efficient Convolutional Neural Network	In this paper, they proposed a computationally efficient classification system based on efficient CNNs. It can be seen that the proposed Model Ensemble achieves a QWK score of 0.852
4.	Shorav Suriyal, Christopher Druzgalski, Kumar Gautam	Mobile Assisted Diabetic Retinopathy Detection using Deep Neural Network	This paper focuses on detection aspects of a mobile application developed to perform DR screening in real time. A tensorflow deep neural network architecture is used to power the app, which was trained and tested on 16,798 fundus images. The model's final accuracy is 73.3 percent.
5.	Kanika Verma. Prakash Deep and A. G. Ramakrishnan.	Detection and classification of Diabetic Retinopathy using retinal Images	Sinthanayothin et al., (2003) reported sensitivity of 80.21% and specificity of 70.66% while differentiating diabetic retinopathy from normal images. Here, the retinal images we preprocessed using adaptive, local, and contrast enhancement. They used a classification system based on neural networks.

6.	Ahmad Taher Azar and Valentina E. Balas	Classification and detection of Diabetic Retinopathy	The eye diseases mainly contribute to blindness and often can't be remedied because the patients are diagnosed too late with the diseases. The paper presents new auto matic approach for detecting retinal abnormalities. The developed algorithm helps in deciding whether the patients with potential sight threatening retinopathy and needs further examination or patients not in need of further referral.
7.	SEHRISH QUMMAR1 , FIAZ GUL KHAN 1 , SAJID SHAH 1 , AHMAD KHAN1 , SHAHABODDIN SHAMSHIRBAND 2,3, ZIA UR REHMAN1 , IFTIKHAR AHMED KHAN 1 , AND WAQAS JADOON	A Deep Learning Ensemble Approach for Diabetic Retinopathy Detection	Diabetic Retinopathy (DR) is an ophthalmic disease that damages retinal blood vessels. DR causes impaired vision and may even lead to blindness if it is not diagnosed in early stages. If not detected early on, DR causes vision impairment and may even result in blindness. Normal, mild, moderate, severe, and PDR are the five stages or classes of DR (Proliferative Diabetic Retinopathy).

3. CONCLUSIONS

Diabetic Retinopathy is one of the major complications that take place because of Type II diabetes mellitus where blood vessels swell as well as can even break. Early detection of disease helps to prevent further complications and helps the expert to treat the patient in early stages. The proposed system is based on MobileNet architecture with dense blocks for image classification. Though compression and acceleration of the network model reduces the classification accuracy including dense blocks allows to improve the performance of the Mobile Net. In future, the same architecture can be applied to detect the further other complications taking place because of diabetes mellitus. In Future We are planning to make multi class classifiers that will further classify the image into categories from 0 to 4. The frontend can be made using latest cutting-edge technological advancements like material design and trending design patterns which will help the doctor, eye clinics or appointed authority to easily maneuver the website. They can check details of patients who are suffering from the diabetic retinopathy and get the results quickly.

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