Detection of Diabetic Retinopathy Using Alexnet and Lenet CNN Models

Abstract— **Diabetic Retinopathy is a disease, which is caused by high blood sugar level. Sometimes, it is difficult to distinguish the Diabetic Retinopathy disease from fundus images. It is necessary to distinguish in order to avoid the complications. By Using Convolutional Neural Networks, we can detect the multiple Diabetic Retinopathy diseases. It also capture the colors and textures of lesions specific to respective diseases upon diagnosis, which resembles human decision-making. This model is deployed in Django web framework. By experimenting with different Diabetic retinopathy features as input to convolutional neural networks is done to find out the effective and precise classification of Diabetic retinopathy images.**

Keywords- Diabetic Retinopathy, Convolutional Neural Networks Neural network, fundus images, datasets, Detect

I. INTRODUCTION

Generally, it is essential to pinpoint the disease in order to proceed the treatment. In simplified words, confusion leads to complications. It also applies to Diabetic Retinopathy disease. There is a possibility in confusing diabetic retinopathy images with fundus images. So, distinguishing diabetic retinopathy images from fundus images is an important task. By using Convolutional Neural Network, we can succeed this important task effectively.

A Convolutional neural network has the ability to take up images and differentiate one image from another image. Then, we can use the CNN to detect the multiple diabetic retinopathy diseases. It is an added advantage that it can capture the colors and textures of lesions specific to respective diseases upon diagnosis. It resembles human decision making skill.

A Convolutional neural network is an AI. It is because, it mimics the human intelligence. As we know, human intelligence has its limitations. We can say that Artificial Intelligence is refined and upgraded human intelligence. It is convincing enough to trust the AI – A Convolutional neural network.

The goal is to develop a deep learning model for Diabetic Retinopathy image classification by convolutional neural network algorithm for potentially classifying the results in the form of best accuracy by comparing the CNN architectures.

II. RELATED WORKS

A. Ophthalmoscope

Ophthalmoscope is able to acquire the images of fundus. It has the ability of storing and analyzing the fundus images. Based on analog images, retinal image processing occurs and regarded the detection of vessels in fundus images with fluorescein [1]. The fluorescent agent refines the appearance of vessels in the images. It helps the medical professionals to detect and measure. But, fluorescein angiography is an invasive and also time consuming process.

B. Modality Specific Attention Network (MSAN)

Modality specific attention network (MSAN) that used fundus and OCT images simultaneously to diagnose ophthalmology. The noise in the OCT image may disturb the ROI extraction. So, they implement a Gaussian filter with the kernel size for the OCT image denoising and they introduced a deep learning method for fundus image classification based on Diabetic retinopathy nerve fiber layer detection. However, it is not using AlexNet CNN and LeNet CNN for reducing errors.

C. Fundus Photography

Fundus photography provides a color or red-free image of the retina. It is primarily digital, which has many advantages compared with its predecessor, color photographic film. Digital retinal imaging provides rapidly acquired, high-resolution, reproducible images that are available immediately and easily amenable for image enhancement [2]. One of the disadvantages is that the images it provides can be distorted

III. DESIGN THE SYSTEM

A. Features of the Convolution Neural Network

Already, it was vaguely mentioned that Convolution neural network remove diabetic

retinopathy images from data sets and standardize them to size before classification. CNN can be thought of as a twofold operation: Extraction and Classification. Convolution and pooling layers performs feature extraction part. It detects the features that exists in the image and extracts it. A fully connected layer performs as a classifier. It classifies based on the features it extracted.

It explains about the experimental analysis of Samples of images are collected and are comprised of different Diabetic retinopathy types. The primary attributes of the image are relied upon the shape and texture oriented features. An efficient disease detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various Diabetic retinopathy diseases.

B. System Architecture

As we see in "Fig 1". First, we need to input an image into the system. Then, it goes to the feature selection part. Next, it extracts the features and identifies the respective diseases from the disease database. Finally, it returns to the feature selection part to get into deeper learning. Further, it compares the gathered diseases and identify the disease which matches the features. This is how Convolutional Neural Network
works.

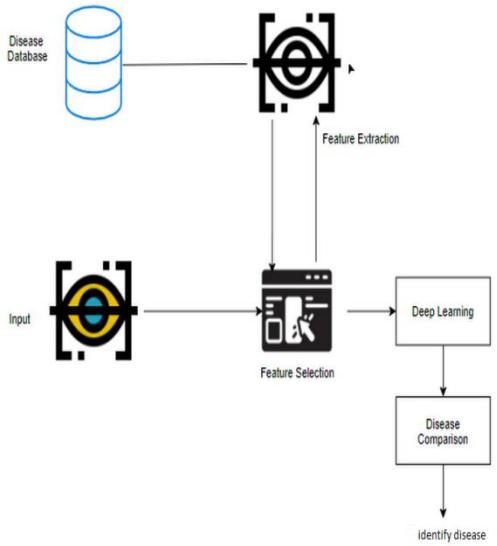

Figure 1

C. Development environment

In terms of hardware, it requires Pentium IV/III processor. It needs minimum 80 GB hard disk and minimum 2 GB RAM.

In terms of software, it needs Windows/Linux Operating system as well as Anaconda with Jupyter Notebook simulation tool.

This twofold requirements is needed to develop the environment for Convolutional Neural Network.

IV. SUMMARY AND FUTURE WORKS

It focused on how the images from given data set (trained dataset) and past data sets are used to predict the pattern of diabetic retinopathy diseases using CNN model. This brings some of the following insights about diabetic retinopathy disease prediction. The major benefit of the CNN classification framework is the ability to classify images automatically.

In this study, we have discussed the overview of methodologies for detecting the abnormalities in diabetic retinopathy images which includes collection of retinopathy image data set, preprocessing techniques, feature extraction techniques and classification schemes.

In the future works, we will satisfy the medical department requirements, that are necessary to automate the detecting of diabetic retinopathy disease for eligibility process (real time). Also, we can deploy it in cloud.

REFERENCE

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2] GauravSaxena, Dhirendra KumarVerma, Amit Paraye, AlpanaRajan & AnilRawat. A study that involves developing an intelligent agent that can find patterns in fundus images and classify the images as "the presence of DR" (BDR Grade 1–4) or "No-DR" (BDR Grade 0). Raja Ramanna Centre for Advanced Technology.

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improve the detection performance of referable DR by deep learning.

4] Mustapha Aatil, Mohamed Lachgar, Hamid Hrimech & Ali Kartit. This work represents an intelligent system of DR classification based on deep learning (DL) tools, especially convolutional neural networks (CNN). Proposed system can assist ophthalmologists to make a preliminary decision, it allows a DR classification considering normal eyes, mild DR, Moderate DR, Severe DR and Proliferative DR.

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7] Sarni Suhaila Rahim, Vasile Palade, Ibrahim Almakky & Andreas Holzinger. This paper investigates the capability of image pre-processing techniques based on data augmentation as well as deep learning for diabetic retinopathy and maculopathy detection. Computer-assisted clinical decision-making is inevitably transforming the diabetic retinopathy detection and management today, which is crucial for clinicians and patients alike.

8] Soumya Joshi, Dhirendra Kumar Verma, Gaurav Saxena & Amit Paraye. The paper summarizes the results of training the deep learning model using CNN on publicly available datasets of cats and dogs. Finally the paper discusses various methods such as data augmentation, regularization, dropout, etc. to prevent the CNN model from overfitting problem. The paper will also help beginners to have a broad comprehension of CNN and motivate them to venture in this field.

9] Gang Hu, Kejun Wang, Yuan Peng, Mengran Qiu, Jianfei Shi & Liangliang Liu. In this paper, a method for feature extraction and identification of underwater noise data based on CNN and ELM is proposed. An automatic feature extraction method of underwater acoustic signals is proposed using depth convolution network. An underwater target recognition classifier is based on extreme learning machine. Although convolution neural networks can execute both feature extraction and classification, their function mainly. relies on a full connection layer, which is trained by gradient descent-based; the generalization ability is limited and suboptimal, so an extreme learning machine (ELM) was used in classification stage.

10] Yann LeCun, Yoshua Bengio & Geoffrey Hinton. Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics.

11] Vijay Viswanathan. In this paper, every physician dealing with people with diabetes should educate their patients about the importance of regular screening for DR to prevent blindness and estimation of the urine albumin concentration by a simple urine albumin/creatinine ratio and calculation of the eGFR.