**Automatic Detection and Monitoring of Diabetic Retinopathy**

**Alternate title:** Development and validation for detection of diabetic retinopathy using deep learning techniques

**Aim:**

This paper aim to detect the diabetic disease identification using deep learning methods.

**Abstract:**

Diabetic Retinopathy is a complication of diabetes that is caused due to the changes in the blood vessels of the retina and is one of the leading causes of blindness in the developed world. Up to the present, Diabetic Retinopathy is still screened manually by ophthalmologist which is a time consuming process and hence this paper aims at automatic diagnosis of the disease into its different stages using deep learning. In our approach, we trained a Deep Convolutional Neural Network model on a large dataset consisting of around 35,000 images to automatically diagnose and thereby classify high resolution fundus images of the retina into five stages based on their severity. Within this paper, an application system is built which takes the input parameters as the patient’s details along with the fundus image of the eye. A trained deep Convolutional neural network model will further extract the features of the fundus images and later with the help of the activation functions like Relu and softmax along with optimizer like Adam an output is obtained. The output obtained from the Convolutional Neural Network (CNN) model and the patient details will collectively make a standardized report.

**Existing System:**

It provides a provision for only manual consultation. Patient has to travel longer distance to consult the doctor. It poses greater risks as the traveling may even make the situation of the patient even more adverse. Patient has to wait for hours for the dilation of eyes so as to widen the pupil. After dilation the doctor has to check for abnormal blood vessels, swelling, retinal detachment, test your vision & cataracts. Research shows that it contributes around 5 percent of the total cases of blindness. Usually it takes about two weeks for the diagnosis of the disease, time and money both are wasted. The proposed system aims to eradicate the above problem.

**Proposed System:**

A model is proposed which uses CNN for the automated detection of DR. DR can be classified into several stages such as normal, mild NPDR- small areas of balloon like swellings in the retinal blood vessels, moderate NPDR swelling & distortion of blood vessels, severe NPDR- blood vessels are blocked & causes abnormal growth factor secretion, PDR- growth factors induce proliferation of new blood vessels in the inner retina. Colored fundus images are the input to the CNN model. CNN removes aberrant noise to recognize features like micro-aneurysms & exudates from the fundus images. The model achieves an accuracy of around 95% for a 2 class classification that is the model detects the presence of DR or not & an accuracy of 85% for a 5 class classification that is if DR is present then it’s severity is also determined. DR stage classification has been regarded as a critical step in the evaluation & management of. Deep CNN reduces the complexity of the neural network & so it is widely used in deep learning. This is very essential for the efficiency of stage wise classification. We use web-app for the

**Modules:**

* Data Collection and Preparation
* Convolution Neural network algorithm
* Prediction

**Data Collection and Preparation**

The Kaggle DR Detection mission dataset includes color fundus photographs which can be categorized zero, one, two, three or four for ordinary, slight, mild, extreme and prolific DR, consecutively. We have reduced the DR classification into binary lessons. A smaller subset, of size 3662 fundus images, of the publicly available EyePacs dataset that is uploaded on Kaggle DR Detection challenge was used for model training and testing.

For model training, 2600 images were selected from the normal fundus images dataset for the healthy class, and 330 images were selected from each of the remaining four classes and put in the unhealthy class. For model testing, 732 fundus images were selected from the normal dataset for healthy class and for the unhealthy class.

**Convolutional Neural Network**

Any neural network is divided into three layers. First layer being the input layer, the second as the hidden layer and the third layer is the output layer. Each layer consists of several nodes and this number is generally in the power of 2 to maintain the symmetry of the entire model. The nodes of one layer are connected to the nodes of another layer by means of an edge. And this edge is assigned with a weight which signifies the importance of that node in the outcome of the network. At every node, the outcome is calculated by the summation of the product of the input nodes and the weights assigned to them. And then an activation function is assigned to the summation and the outcome of the node is calculated. Activation functions include Relu, Sigmoid, etc. and based on the outcome, the appropriate activation function is chosen. This process is carried on for every node in the network and the final outcome is assigned. We create a model using the CNN.

**Prediction:**

**Software Requirements:**

* Operating System : Windows 10 (64 bit)
* Software : Python 3.7
* Tools : Anaconda (Jupyter Note Book IDE)

**Hardware Requirements:**

* Hard Disk : 500GB and Above
* RAM : 4GB and Above
* Processor : I3 and Above

**Architecture Diagram:**

Image Pre-processing

Convolutional Neural Network

Diabetic Retinopathy

Detection

No-Diabetic Retinopathy

Diabetic Retinopathy

Data Collection

Retinopathy Images

