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Diabetic Retinopathy Detection using MobileNetv2 and PyQT based GUI

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Abstract - *Diabetic Retinopathy is a medical condition caused due to Diabetic mellitus which in later stages can cause retina blood vessels to bleed into vitreous.*

With the advancement of technology and research, the solution to the problem can be optimised to figure out the people with the disease at different attenuated stages.

The proposed framework provides a wide likely similarity of all stages of DR and thus works by inputting the scan from the presented database ,then the image is processed and classified into groups based data segmentation values ranging from normal to severe.MobileNetv2 convolutional network is used for better segmentation results .The detection network is linked to a GUI for better visual appearance and easy to understand results as the final prediction is plotted on a bar graph alongside some precautionary advice to improve the health levels as well.

***Key Words*: Diabetic Retinopathy Detection,, MobileNetv2 network, Data segmentation, Data augmentation, Diabetic retinopathy GUI interface, Computer based diagnosis.**

1. INTRODUCTION

Diabetes which is a morbidity. It has a very common side effect of making people go blind or weakening of their eye side of people less than 50 years. Overtime artery throughout a person weakens including the retina and the tiny arteries tend to leak blood and some fluids which can cause retinal tissues to swell resulting in a blurred or an unclear vision. Dibetic Retinopathy is the term used for it and it tends to affect both the eyes of a person.

It is very unusual that anyone can be cured after getting Dibetic retinopathy and the only treatment is through the early detection of the problem so that a doctor can provide help to the patient. Earlier doctors used to examine the patient's eye condition and stage by physically looking at the eyes image which was not a very successful and accurate prediction. So there were researches done and people used a few algorithms and some learning techniques to develop a system to detect the problem with the help of computers. This increased the accuracy and reduced the time and acted as an assistant to the doctors.

2. RELATED WORK

The purpose of the considered research papers and background work was to deeply analyze and study in order to implement a working model .Articles viewed focused on detection of diabetic retinopathy using neural networks and deep learning.

2.1 Previous work using CNN and Angiography photographs

Convolutional neural networks (CNNs) and noise reducing techniques were used to diagnose the presence and severity of Diabetic Retinopathy from Fluorescein Angiography photographs. Data was occupied from EyePacs consisting of fundus photographs with varying ranges of DR severity labeled by clinicians.[1]

2.2 Previous work using SVM classifiers and K-Means

In this paper, we have a tendency to ascertain a series of experiments on feature selection and exudates classification supported naive Bayes and support vector machine (SVM) classifiers. Methodology involves implementing the naive model to a training set consisting of fifteen choices extracted from each one hundred fifteen,867 positive samples of exudate pixels related to AN equal kind of negative examples. acting SVM on the simplest coaching set of naïve Bayes and keeps on adding the antecedently discarded options [2]

The article includes of usage classified digital body structure pictures in to 2 classes: (i) traditional and polygenic disease retinopathy comprising of delicate non-proliferative diabetic retinopathy, moderate nonproliferative diabetic retinopathy, severe non-proliferative diabetic retinopathy and proliferative diabetic retinopathy victimisation Self Organizing Map (SOM) classifier. The options are extracted from the retinal pictures victimisation K-means formula and fed to a classifier for classification. We've got shown clear separation between the 2 categories victimisation our projected model.[3]

We observed a technique using computer assisted diagnosis based on the digital processing of retinal images in order to help people detect diabetic retinopathy in advance. The main goal is to automatically classify the grade of non proliferative diabetic retinopathy(DRNP) at any retinal image.[4]

2.3 Previous work using Image processing and Machine learning

In this paper, detection of diabetic retinopathy in body structure image is done by image process and machine learning techniques. Probabilistic Neural Network (PNN) and Support vector machines (SVM) area unit the 2 models adopted for detection of diabetic retinopathy in body structure image and their results analyzed and compared.[5]

Class	Training Data	Testing Data	Correctly Classified	%classification
Normal	10	10	6	60
NPDR & PDR	20	15	12	80
Average				70

Figure 1: Results of PNN used [5]

Sensitivity -81.42% and Specificity-100%

3. PROBLEM STATEMENT

Medical conditions that could lead to vision loss needs to be addressed using the latest technological advancements. Diabetic Retinopathy is one such condition caused due to Diabetes Melitus leads to vision loss at the end. While in the beginning stages, the patient may or may not experience any symptoms but the detection at an early stage will prove to be beneficial for his/her health. Our method of detection of such blood vessels in retina fundus images using machine learning will prove to be useful for ophthalmologists to give accurate advice to patients and depiction of the final result using a graphical representation would be helpful as well.

4. SYSTEM ARCHITECTURE

The objective of the project is to implement a CNN based model which provides an overall based percentage for the segmentation modules of the data.

Below mentioned are the hierarchical structure of the module leading to final outcome.

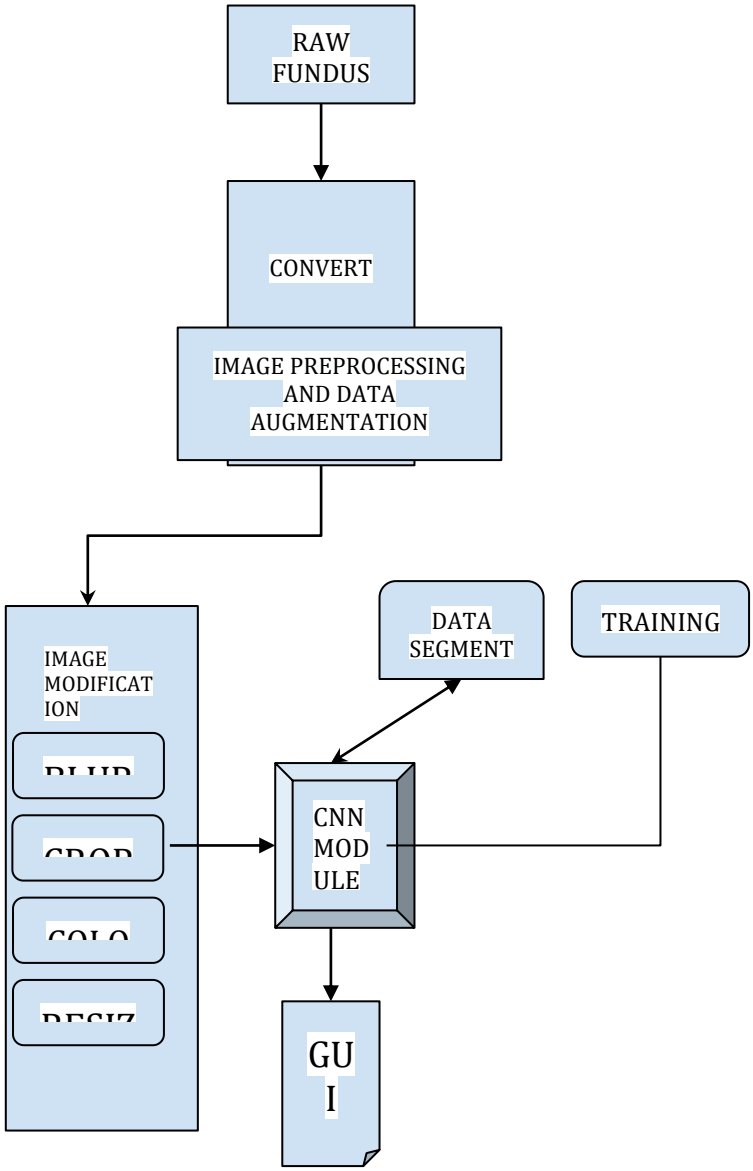

Figure 2: Architectural structure of Framework

Below mentioned are the hierarchical structure of the module leading to final outcome

4.1 Data collection

Large set of high-resolution membrane pictures taken underneath a range of imaging conditions. A left and right

field is provided for each subject. Images area unit labelled with a topic id moreover as either left or right .[6]
A practitioner has rated the presence of diabetic retinopathy in every image on a scale of zero to four, in line with the subsequent scale:[6]

- Zero - No DR
- One - Mild
- Two - Moderate
- Three - Severe
- Four - Severe Most

4.2 Image PreProcessing and Data augmentation

1. Image blurred-A noise reduction technique used for blurring the photographs. The pictures are of blurred exploitation a Gaussian operates.
Where,
a= height of the curve's peak
b= position of the center of the peak
c= Standard deviation
f(x)= function of x
e= Euler's number
x= Integer
The image is convolved with a Gaussian filter which is a low-pass filter that removes the high-frequency components

2. Image Resizing-After applying the higher than operations, we'd like to avoid wasting the new pictures within the folder which will be used later. The initial pictures square measure every of around 5 MB, the whole pictures folder occupies 35 GB area. We are able to cut back this by resizing pictures. victimisation multi core threading / Multi process, we are able to attain this task in short span. Resize train images to 512x512.

3. Image Random flip-This technique helps in achieving more relevant data for the neural network. The images are flipped horizontally, vertically and changed in different aspects such as flip angles, border angles, filter bound to achieve high trained accuracy for CNN.

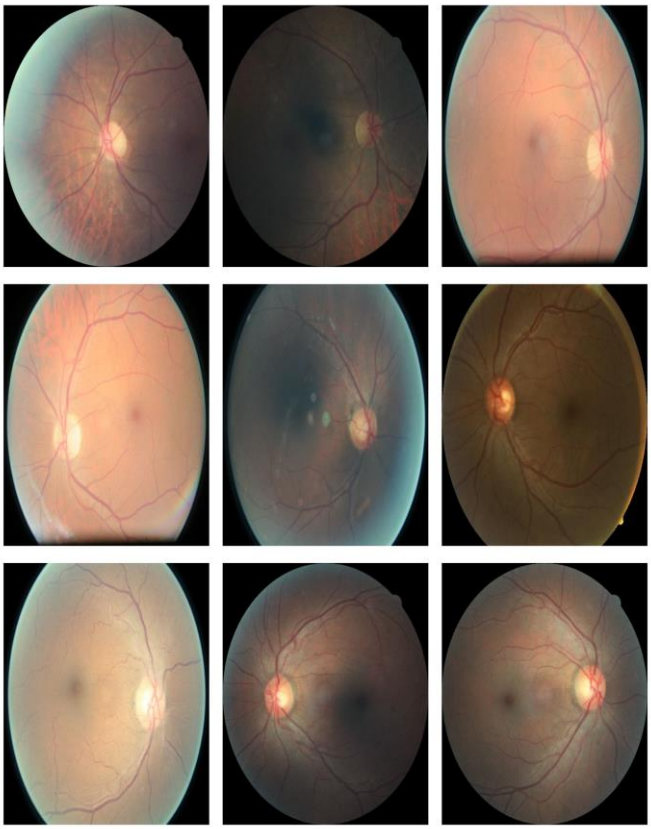

Figure 3:Augmentation of Dataset Images

4.3 Learning of Training Data

The purpose of using MobileNetv2 was [7]:

1. MobileNetV2 has less parameters, due to which it is easy to train.

2. Using a pre-trained encoder helps the model to converge much faster in comparison to the non-pretrained model

3. A pre-trained encoder helps the model to achieve high performance as compared to a non pre-trained model.

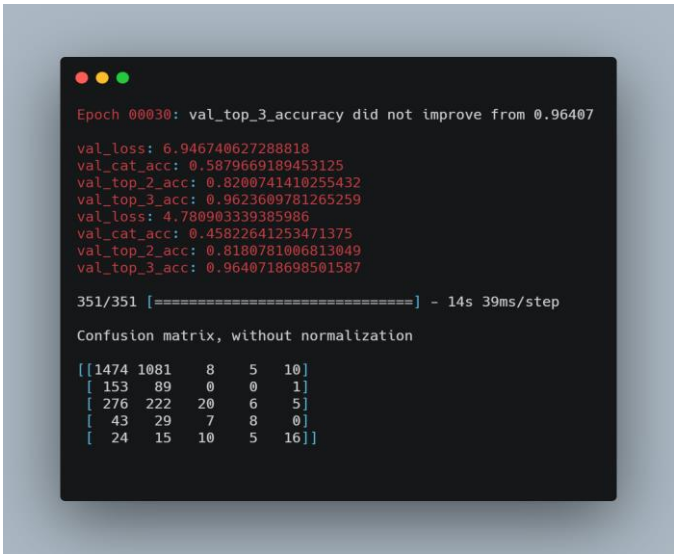

Figure 4: Training Results and CFM

After ripping and process of information, the most necessary step is learning from the coaching information victimisation a MobileNetv2 Convolutional Neural Network (CNN) model, this model helps in correct mapping of the raw pixels from the pictures collected to the dataset or roentgenography scans .The CNN is employed initial for learning the coaching set pictures till the validation set accuracy is achieved .

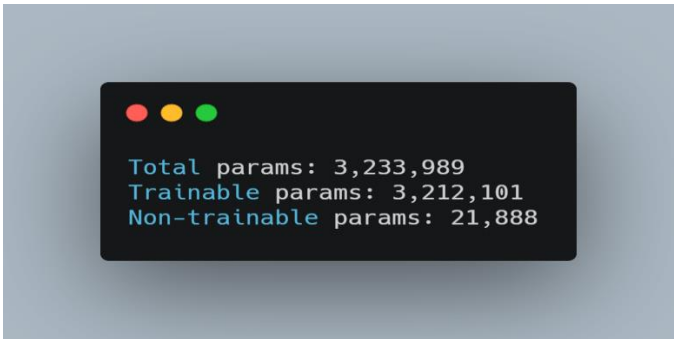

Figure 5: CNN distinguishing Images

4.4 Testing with RT images in GUI

Using PyQT5 for interface linkage to the CNN model, the usage of slots and signals helps the mentioned library to communicate with objects better.

The mentioned GUI uses 4 buttons modules alongside Data_image input and Bar graph output widgets.

Below mentioned images shows how the framework is returning the graph plotted alongside some preventive measures for the patient to follow.

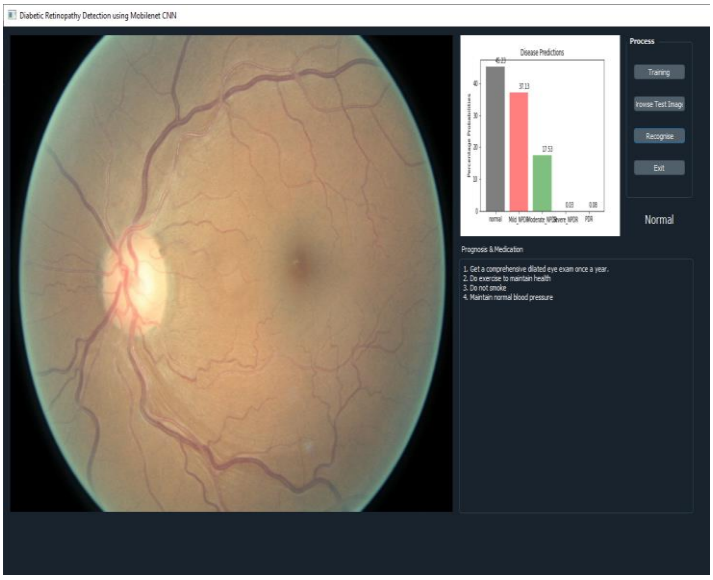

Figure 6: Testing with a new image-1

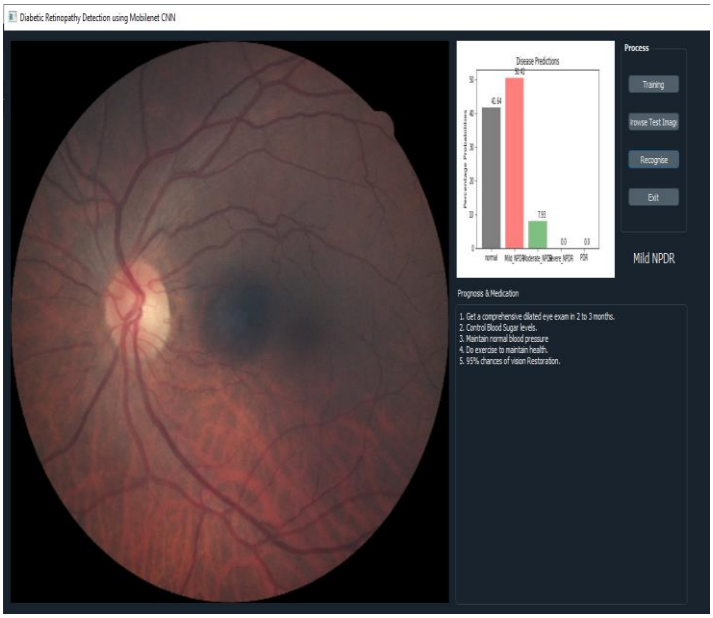

Figure 7: Testing with a new image -2

6. CONCLUSIONS

Several eye conditions such as Dibetic Retinopathy, Cataract, Macular Degeneration, Glaucoma, Amblyopia can be detected at an early stage. There would be an improvement in the accuracy of detection and that way it gets easier for ophthalmologists to give more accurate prescription to patients regarding their problem.

The measure of all stages of DR would provide a real time like result which not only states if the patient is normal but also the possibility if the DR is at an early stage.

Usage of Data segmentation using CNN provides a 96 percent Top 3 accuracy level spreaded over different fields of parameter.

REFERENCES

[1] Marco Alban, Tanner Gilligan, "Automated Detection of
Diabetic Retinopathy using Fluorescein Angiography Photographs"

[2] Akara Sopharak a* Matthew N. Dailey b ,Bunyarit Uyyanonvara a Sarah Barman c ,Tom Williamson d , KhineThet Nwe b and Yin Aye Moe b, "Machine learning approach to automatic exudate detection in retinal images from diabetic patients"

[3] Wong Li Yun and Muthu Rama Krishnan MookiahDepartment of Electronics and Computer Engineering,Ngee Ann Polytechnic, Singapore 599489 , "Detection of Diabetic Retinopathy Using K-Means Clustering and Self-Organizing Map "

[4] Enrique V. Carrera , Ricardo Carrera, Andres Gonzalez,"Automated detection of diabetic retinopathy using SVM "

[5] Salman Sayed, Dr. Vandana Inamdar , Sangram Kapre "Detection of Diabetic Retinopathy using Image Processing and Machine Learning"

[6] Kaggle.com Diabteic Retinopathy Database for Raw fundus Images.
https://www.kaggle.com/c/diabetic-retinopathy-detection

[7] Nikhil Tomar "UNET Segmentation with Pretrained MobileNetV2 as Encoder"
https://idiotdeveloper.com/unet-segmentation-with-pretrained-mobilenetv2-as-encoder/