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Diabetic retinopathy detection using Machine Learning

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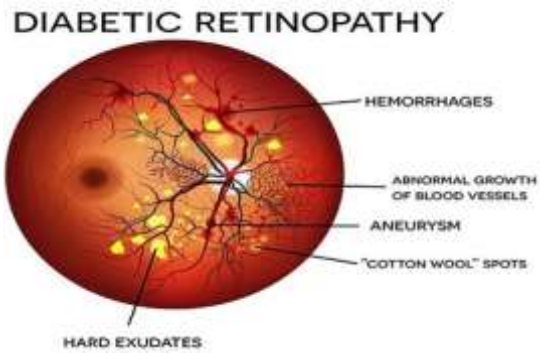
ABSTRACT

This project is a machine learning model about "Diabetic Retinopathy detection using AI" Detection of Diabetic Retinopathy: Diabetic retinopathy is a diabetes complication that affects eyes. It's caused by damage to the blood vessels of the light-sensitive tissue at the back of the eye (retina). At first, diabetic retinopathy might cause no symptoms or only mild vision problems.Risk Factors: Diabetes; Tobacco smoking Diseases or conditions caused Blindness.

Keywords—*CNN, Diabetic Retinopathy, Image Classification*

1. INTRODUCTION

Imaging techniques are used to capture anomalies of the human body. The captured images must be understood for diagnosis, prognosis and treatment planning of the anomalies. Convolutional neural networks (CNNs) are effective tools for image understanding. They have outperformed human experts in many image understanding tasks. The underlying objective is to motivate medical image understanding researchers to extensively apply CNNs in their research and diagnosis. People with diabetes are at a higher risk of peripheral neuropathy and various eye complications. High blood sugar is a leading cause of glaucoma, cataract and diabetes retinopathy. According to the National Health Portal of India (NHP India), one of the leading causes of chronic blindness includes diabetic retinopathy.



2. LITERATUREIREVIEW

- Diabetic Retinopathy detection using CNN based feature extraction-2019 by IEEE.(1)
- Transfer learning with deep convolutional neural network for diabetic retinopathy detection-2020, applied sciences.
- Classification of images of childhood diabetic retinopathy using CNN-2019, scitepress.
- classification to detect diabetic retinopathy using CNN-2020, academia.edu .
- diabetic retinopathy detection from radiography images using CNN-2019, IEEE.
- A graph knowledge embedded CNN for detecting diabetic retinopathy-2021, information processing
- In the Existing systems even after the mode accuracy is so good few models had overfitting issues sensed as the model starts .

For example, Imagine we have an image and we want to determine whether it's a picture of a person or not, there are some features that can be relevant to the model such as two eyes, nose, mouth, ears etc.

And here are some features that are not relevant to determine whether the image shows a person or not, such a color of eyes, open or closed mouth, color of skin, length of hair etc A model that generalizes well will learn to recognise relevant features and discard irrelevant, such model will be good at predicting data that it has never seen before, For example, Imagine we have an image and we want to determine whether it's a picture of a person or not, there are some features that can be relevant to the model such as two eyes, nose, mouth, ears etc.

And here are some features that are not relevant to determine whether the image shows a person or not, such a color of eyes, open or closed mouth, color of skin, length of hair etc A model that generalizes well will learn to recognise relevant features and discard irrelevant, such model will be good at predicting data that it has never seen before,

3. PROPOSED SYSTEM

The Proposed System is to make the user handle his/her personal data related to Diabetic Retinopathy in an ease.For now our proposed work doesn't share the data with any external agents that we even deal with within our Model.

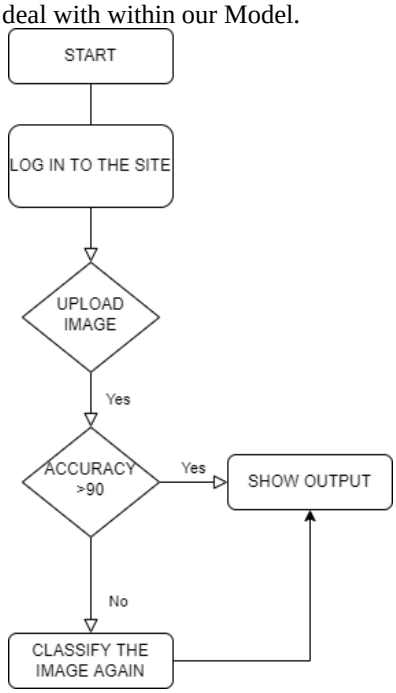


Fig.1. Flow diagram of Proposed System

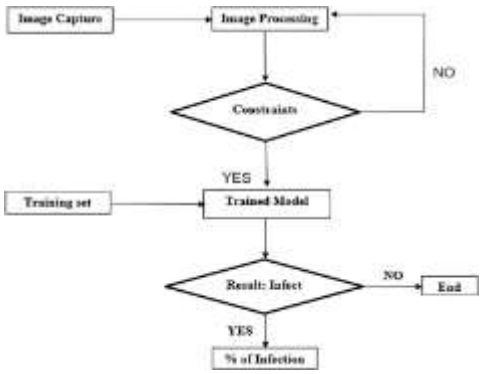
5. PROPOSED WORKING

The Data set for diabetic retinopathy detection is collected from kaggle, It is classified data of x-ray images regarding DR. We use this data set to train our ML model using CNN to detect DR images, so that it can detect and extract info from We have trained around 35k images belonging to two classes i.e, Normal x-ray images and Positive x-ray images.

The architecture of the project describes its major components, their relationships (structures), and how they interact with each other.

WEBSITE LOGIN- Helps you to login to the website and then allow you to access the machine learning model

DIABETIC RETINOPATHY DETECTION- The machine learning model trained using convolutional neural networks helps to classify the positive and negative diabetic retinopathy images



6. CONVOLUTIONAL NEURAL NETWORK

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

The architecture of a ConvNet is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlap to cover the entire visual area.

7. RESULTS

The Result majorly is been discussed about the ML model we have in our project about Diabetic Retinopathy Detection , A Various methods have been tested for optimal results and listed below

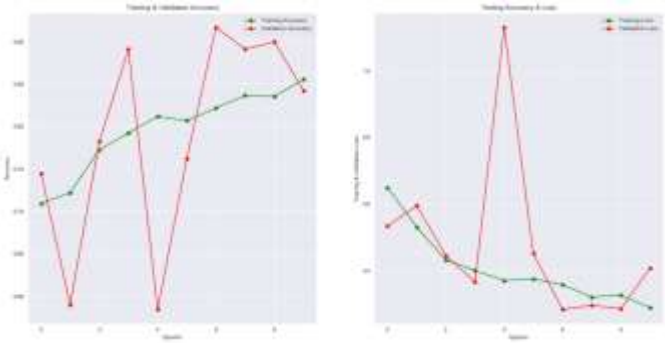


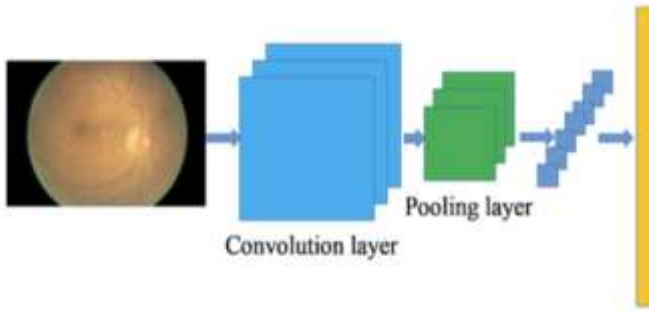
Fig.3. Accuracy in Matplotlib

Accuracy (Train)	MSE	Accuracy (Validation)
82	0.145	84.24

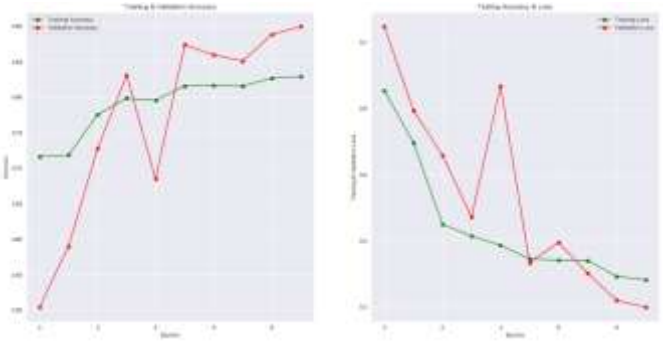
Confusion Matrix: array([[387, 3],
[100, 125]], dtype=int64)

Fig.4. Normal Path

Model Description: 5 CNN layers followed Max Pooling layer activation function used Relu and for final dense layer sigmoid activation function is used.



Accuracy (Train)	MSE	Accuracy (Validation)
85.5(approx)	0.1095	91.6



As we can see the Performance Accuracy of the model is 91.6% Which is a Good Considerable Model.

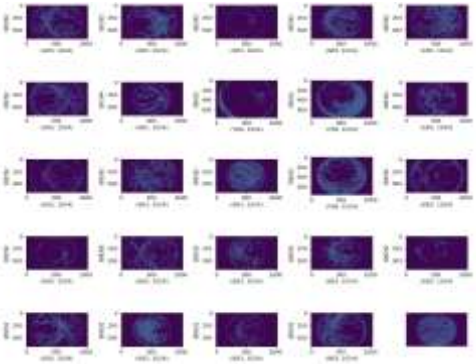


Fig.7.

8. CONCLUSIONS AND FUTURE SCOPE

From the above mentioned ML model trails of Diabetic retinopathy Detection we can see the confusion matrix , Accuracy and the MSE measured for both the trails and the Trail 2 where the optimizer we used is ADAM gave us optimal result than the one with RMSPROP which in intent calculated as 87.9% accuracy and it detects 302 DR results and 207 Normal Results correctly and just 68+7 inaccurate results which makes the trail 2 worth it considering and can be termed as a decent model accuracy achieved .

```
Model: "model_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
input_2 (InputLayer)         [(None, 180, 180, 3)]     0
_________________________________________________________________
conv2d_5 (Conv2D)            (None, 178, 178, 128)     3584
_________________________________________________________________
leaky_re_lu_6 (LeakyReLU)    (None, 178, 178, 128)     0
_________________________________________________________________
conv2d_6 (Conv2D)            (None, 88, 88, 128)       262272
_________________________________________________________________
leaky_re_lu_7 (LeakyReLU)    (None, 88, 88, 128)       0
_________________________________________________________________
conv2d_7 (Conv2D)            (None, 43, 43, 128)       262272
_________________________________________________________________
leaky_re_lu_8 (LeakyReLU)    (None, 43, 43, 128)       0
_________________________________________________________________
conv2d_8 (Conv2D)            (None, 20, 20, 128)       262272
_________________________________________________________________
leaky_re_lu_9 (LeakyReLU)    (None, 20, 20, 128)       0
_________________________________________________________________
conv2d_9 (Conv2D)            (None, 9, 9, 128)         147584
_________________________________________________________________
leaky_re_lu_10 (LeakyReLU)   (None, 9, 9, 128)         0
_________________________________________________________________
flatten (Flatten)            (None, 10368)             0
_________________________________________________________________
dense_1 (Dense)              (None, 1)                 10369
=================================================================
Total params: 948,353
Trainable params: 948,353
Non-trainable params: 0
_________________________________________________________________
None
```

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