

ML Models

Several techniques can be employed to train the models to classify DR. Below mentioned are certain possible ones with reference to existing literature and implementations that have proven to be effective with high accuracy.

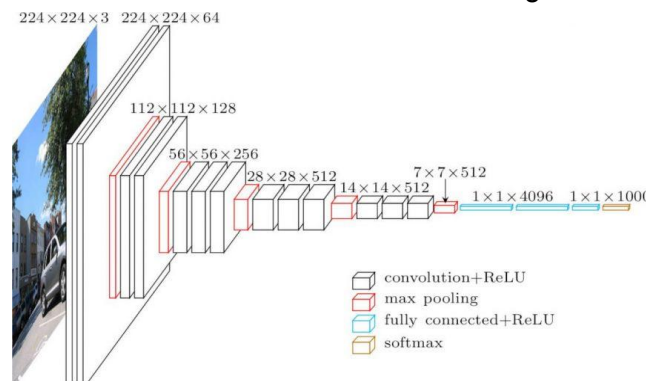
Pre-Trained Models with Fine Tuning:

Several renown model architectures exist that can be suited to be used in the project. These models have been tested and proven to be effective in the field of computer vision and to add to their convenience, they come packaged with tensorflow. Certain changes such as adding or removing layers, changing weights etc can be performed to suit our purpose.

Inception_V3: Inception_v3 is a convolutional neural network for assisting in image analysis and object detection, and got its start as a module for Googlenet. It is the third edition of Google's Inception Convolutional Neural Network, originally introduced during the ImageNet Recognition Challenge. The design of Inception_v3 was intended to allow deeper networks while also keeping the number of parameters from growing too large.

type	patch size/stride or remarks	input size
conv	$3 \times 3 / 2$	$299 \times 299 \times 3$
conv	$3 \times 3 / 1$	$149 \times 149 \times 32$
conv padded	$3 \times 3 / 1$	$147 \times 147 \times 32$
pool	$3 \times 3 / 2$	$147 \times 147 \times 64$
conv	$3 \times 3 / 1$	$73 \times 73 \times 64$
conv	$3 \times 3 / 2$	$71 \times 71 \times 80$
conv	$3 \times 3 / 1$	$35 \times 35 \times 192$
$3 \times$ Inception	As in figure 5	$35 \times 35 \times 288$
$5 \times$ Inception	As in figure 6	$17 \times 17 \times 768$
$2 \times$ Inception	As in figure 7	$8 \times 8 \times 1280$
pool	8×8	$8 \times 8 \times 2048$
linear	logits	$1 \times 1 \times 2048$
softmax	classifier	$1 \times 1 \times 1000$

VGG-16: VGG16 is a convolutional neural network model which achieves 92.7% top-5 test accuracy in ImageNet, which is a dataset of over 14 million images belonging to 1000 classes.



Several other implementations such as ResNet50 etc can be used too.

Advantages:

- Efficient Implementation.
- Model well suited for a wide variety of purposes.
- Proven and tested methods.

Drawbacks:

- Resource Intensive.
- Models require more storage.
- Long time to train.

New Model Implementation:

An entirely new implementation of a CNN can be done using techniques such as **Hyperparameter Tuning** with the help of tools such as **Talos**. The model may turn out to be better suited for the exclusive purpose of classifying DR from Fundus Images. The scale of the task, however, may be monumental leading to more time being spent on it than viable.

Advantages:

- The model will be built exclusively for DR prediction.
- Optimizations and reductions can be made as and when needed.

Drawbacks:

- Requires a certain level of expertise.
- May take a long time to implement.