Computer Vision Project

Covid Pneumonia Detection

Group 3

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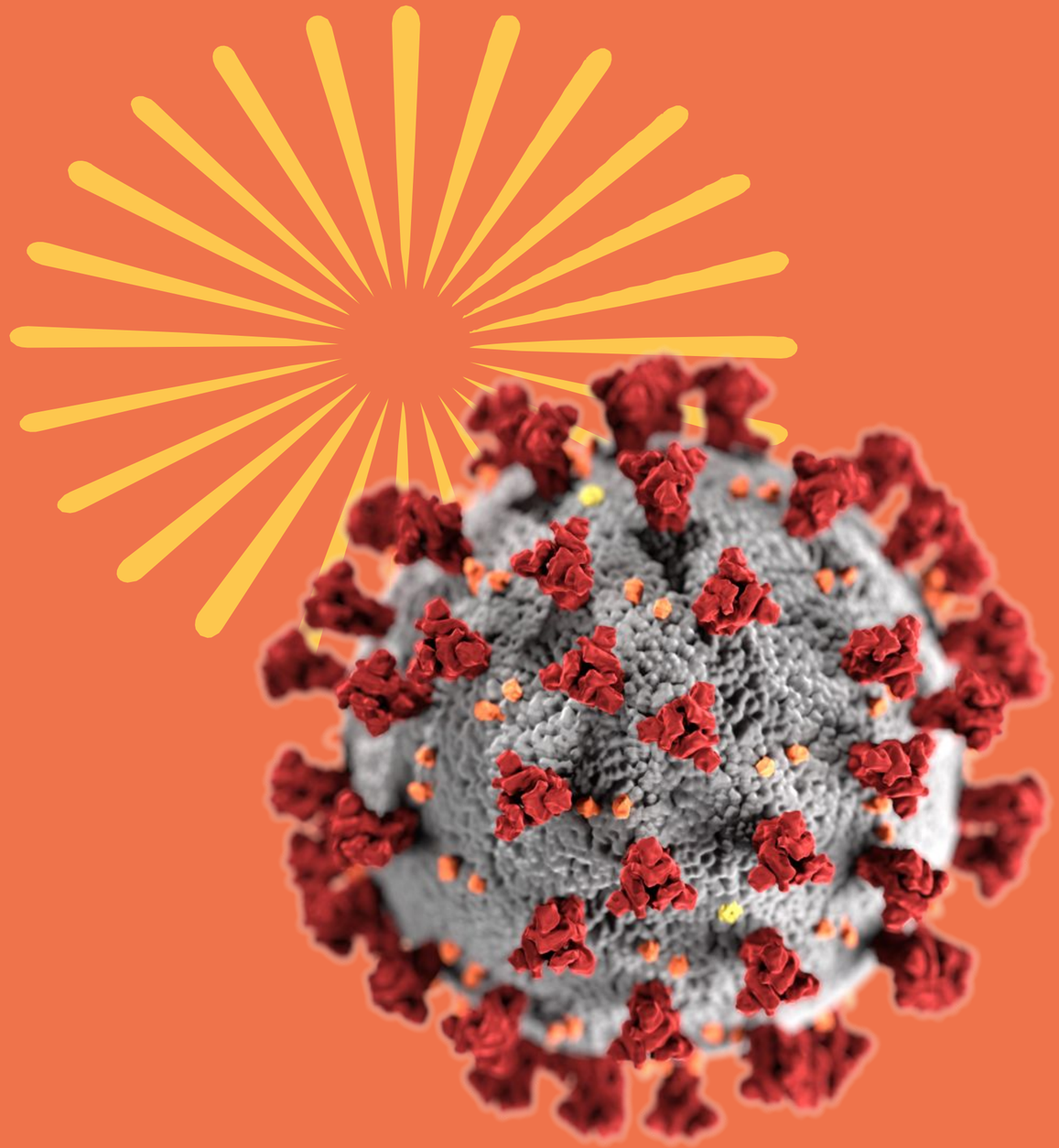
Introduction

Due to the spike of Covid cases across the world, healthcare systems have been overwhelmed.
We have devised a tool through which we can easily classify a given X-Ray as Covid positive or negative and Pneumonia positive or negative.
X-ray or CT-Scans are used as inputs.

This is done through a novel deep neural network based model largely inspired by the VGG16 architecture.



Method

1

Data Splitting

Divide data into three sets

1. Training
2. Validation
3. Testing

2

Building Model

Based upon VGG16 model

1. Depthwise Separable Convulations.
2. Batch normalisation
3. Dense Layers

3

Train Model

1. Get a train data generator
2. Fit model using *hist= model.fit_generator( )*
3. *Save the weights.*
4. *Load the saved weights for further use.*

4

Testing

1. Evaluation on test dataset
2. Getting predictions
3. Rendering Confusion Matrix
4. Calculating key metrices

Model

Convolution

- Connections sparsity reduces overfitting
- Conv + Pooling gives location invariant feature detection
- Parameter sharing

ReLU

- Introduces nonlinearity
- Speeds up training, faster to compute

Pooling

- Reduces dimensions and computations
- Reduces overfitting
- Makes the model tolerant towards small distortion and variations

Convolution Neural Network

- A convolutional neural network is generally used to analyze visual images by processing data.

- It’s also known as a ConvNet.
- A convolutional neural network is used to detect and classify objects in an image.

- The Layers in this model are as follows:-
  - Convolution Layers
  - Max Pooling Layers
  - Fully Connected Layers
  - Output Layer

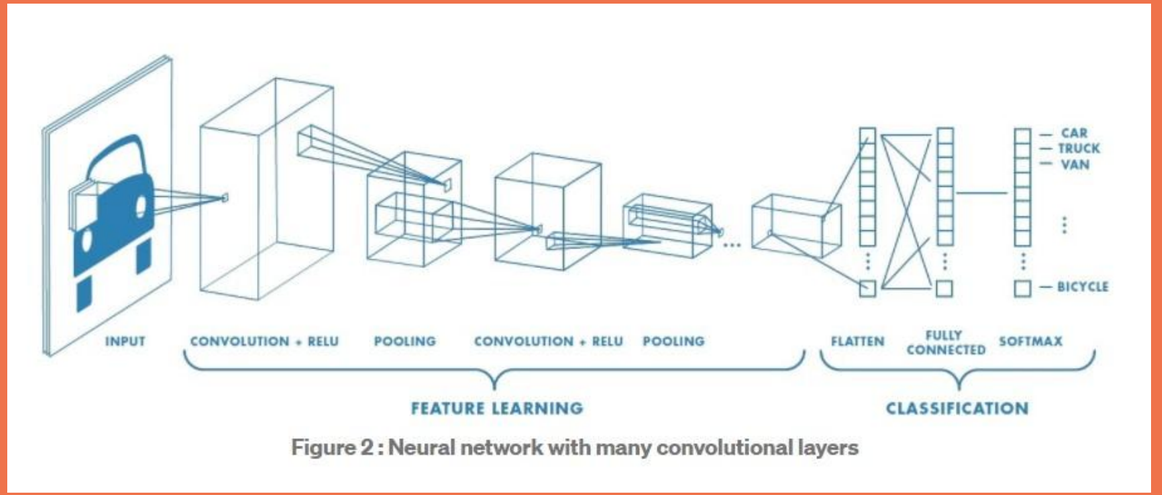


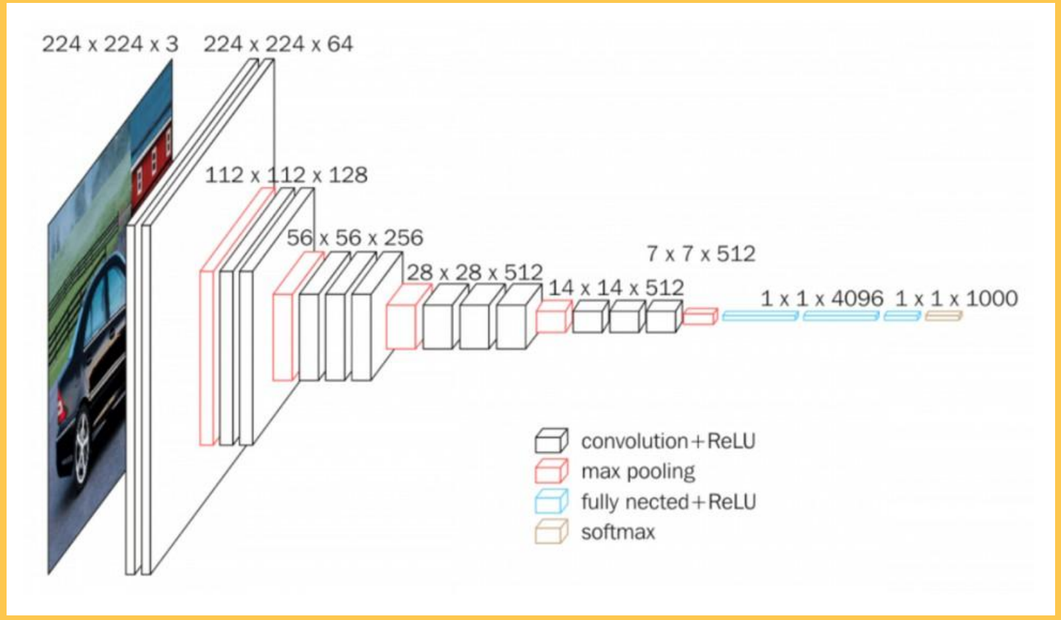
Figure 2 : Neural network with many convolutional layers

VGG-16 Architecture

- We have used VGG-16 architecture to train our model for binary classification of images

- VGG16 is a convolution neural net (CNN) engineering is viewed as one of the brilliant vision model design till date.

- It follows this course of action of convolution and max pool layers reliably all through the entire engineering. In the end, it has 2 of the FC(fully associated layers) trailed by a softmax for yield. The 16 in VGG16 alludes to it has 16 layers that have loads.



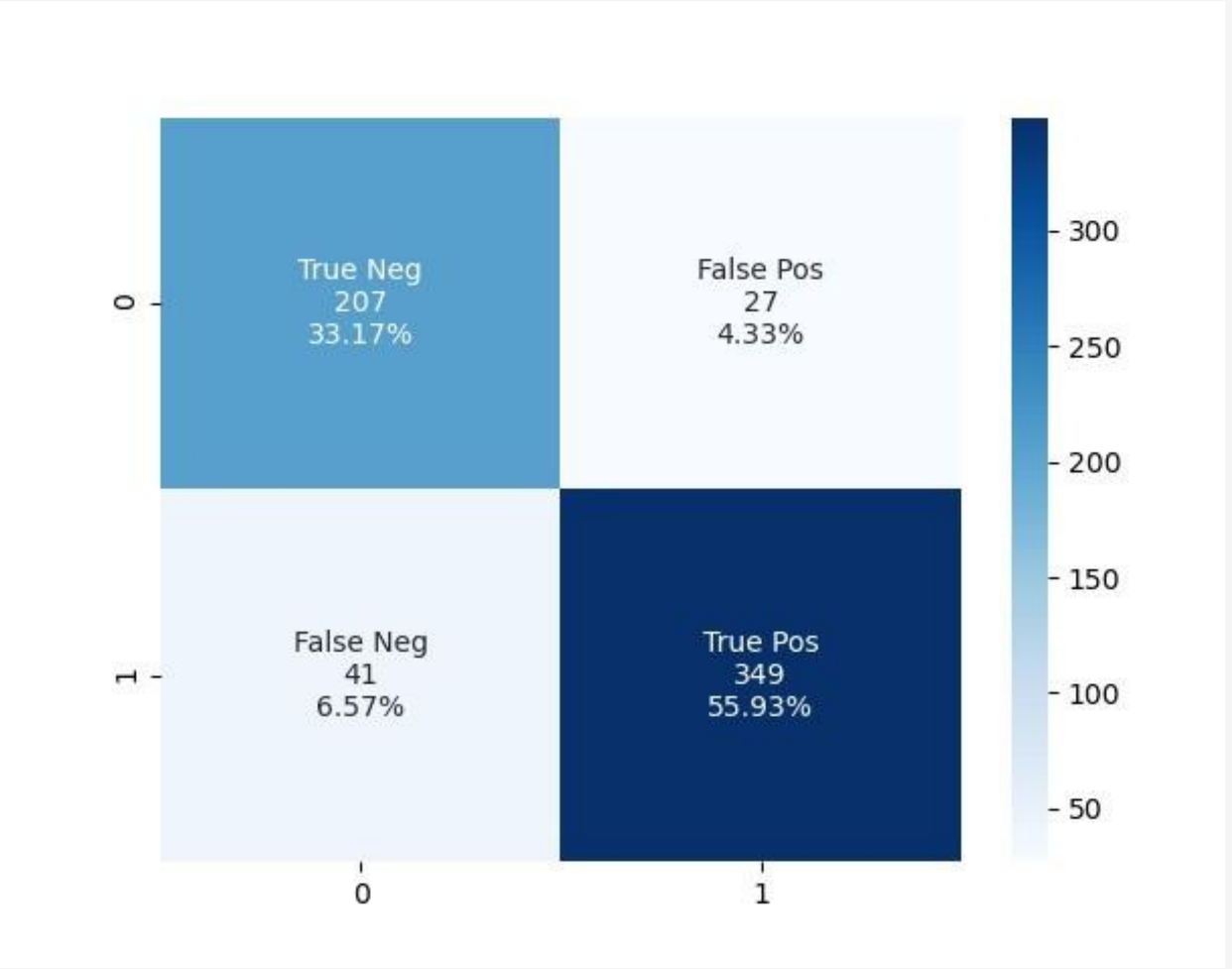
Results

Evaluation metrices

The confusion matrices on the test data for the two configurations of our model:

! Pneumonia positive vs Normal

2. Covid Positive vs Normal



Comfusion Matrix for Pneumonia positive vs Normal

Results

Evaluation metrices

The confusion matrices on the test data for the two configurations of our model:

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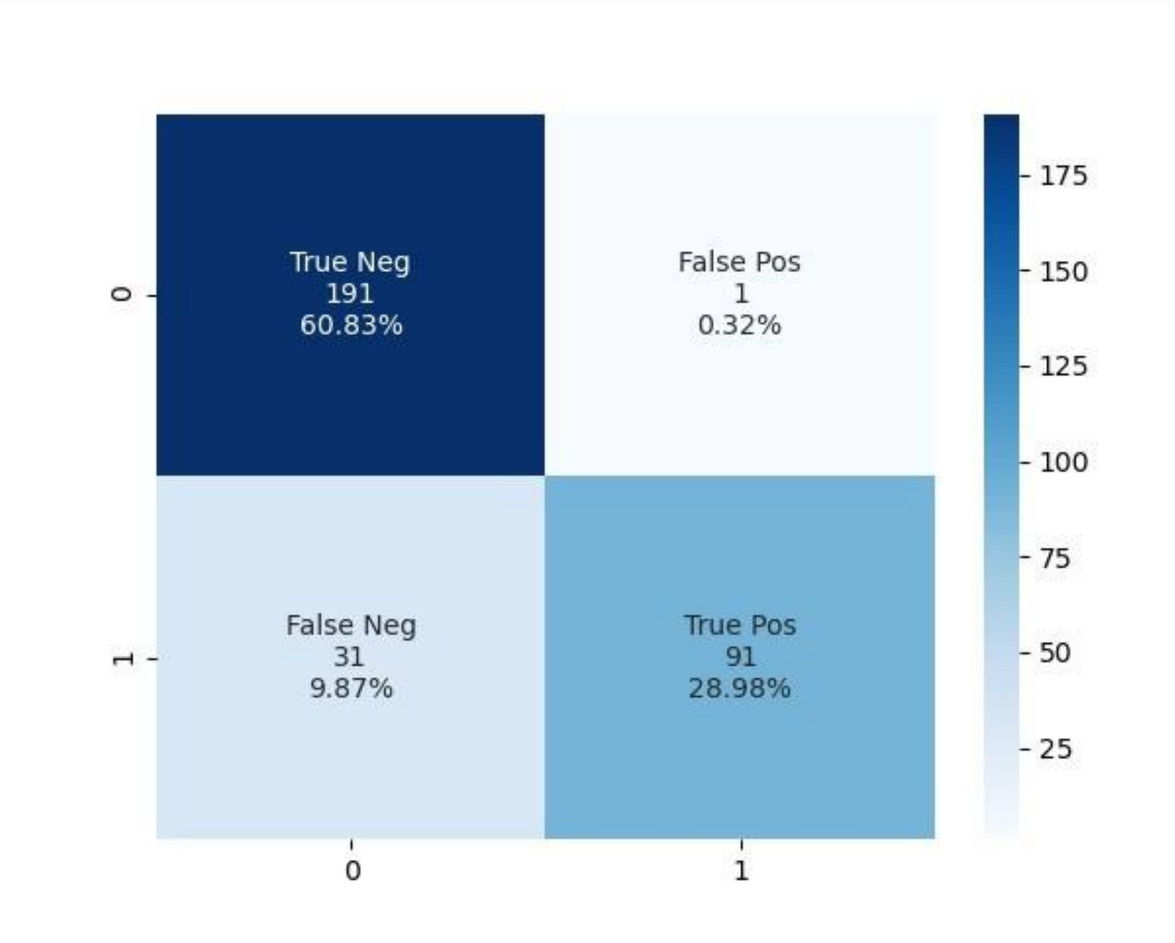

Comfusion Matrix for Covid Positive vs Normal

Results

Evaluation metrices

An accuracy of 89% is obtained in our binary classification. Detailed results for Sensitivity, Positive Predictive Value (PPV or Precision) and F1-score are given in the tables below.

	Pneumonia vs Normal	Covid vs Normal
Accuracy	89.102564%	89.808917%
Precision	92.819148%	98.913043%
Recall	89.487179%	74.590163%
Specificity	88.461538%	99.479166%
F1-score	91.122715	85.046728

Thank You!