

Computer Vision Project

# Covid and Pneumonia Detection

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**Group 3**

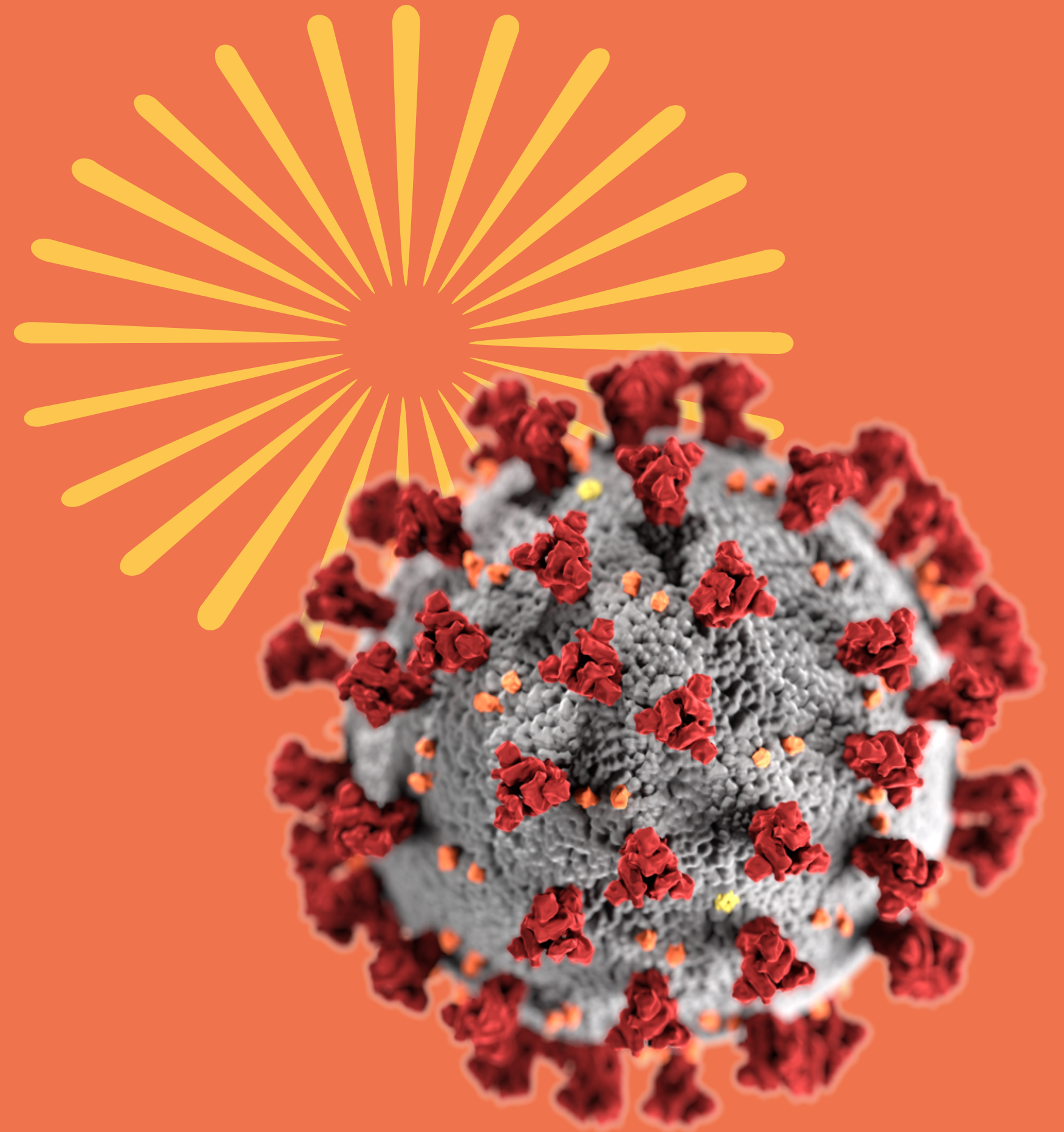
Under guidance of Dr. Shailendra Tiwari

# 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 Convolutions.
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 metrics

# Model

## Convolution

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

## ReLU

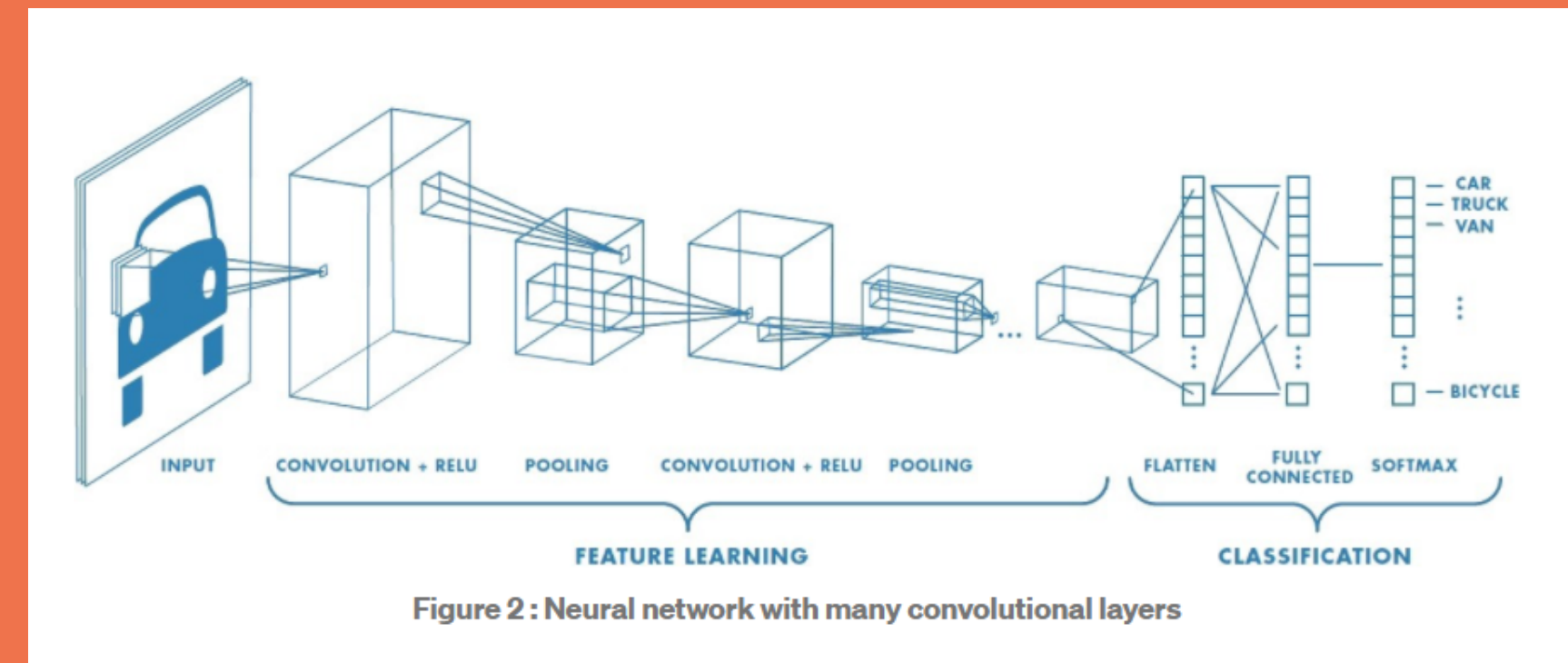
- Introduces nonlinearity
- Speeds up training, faster to compute

## Pooling

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

# Convolution Neural Network

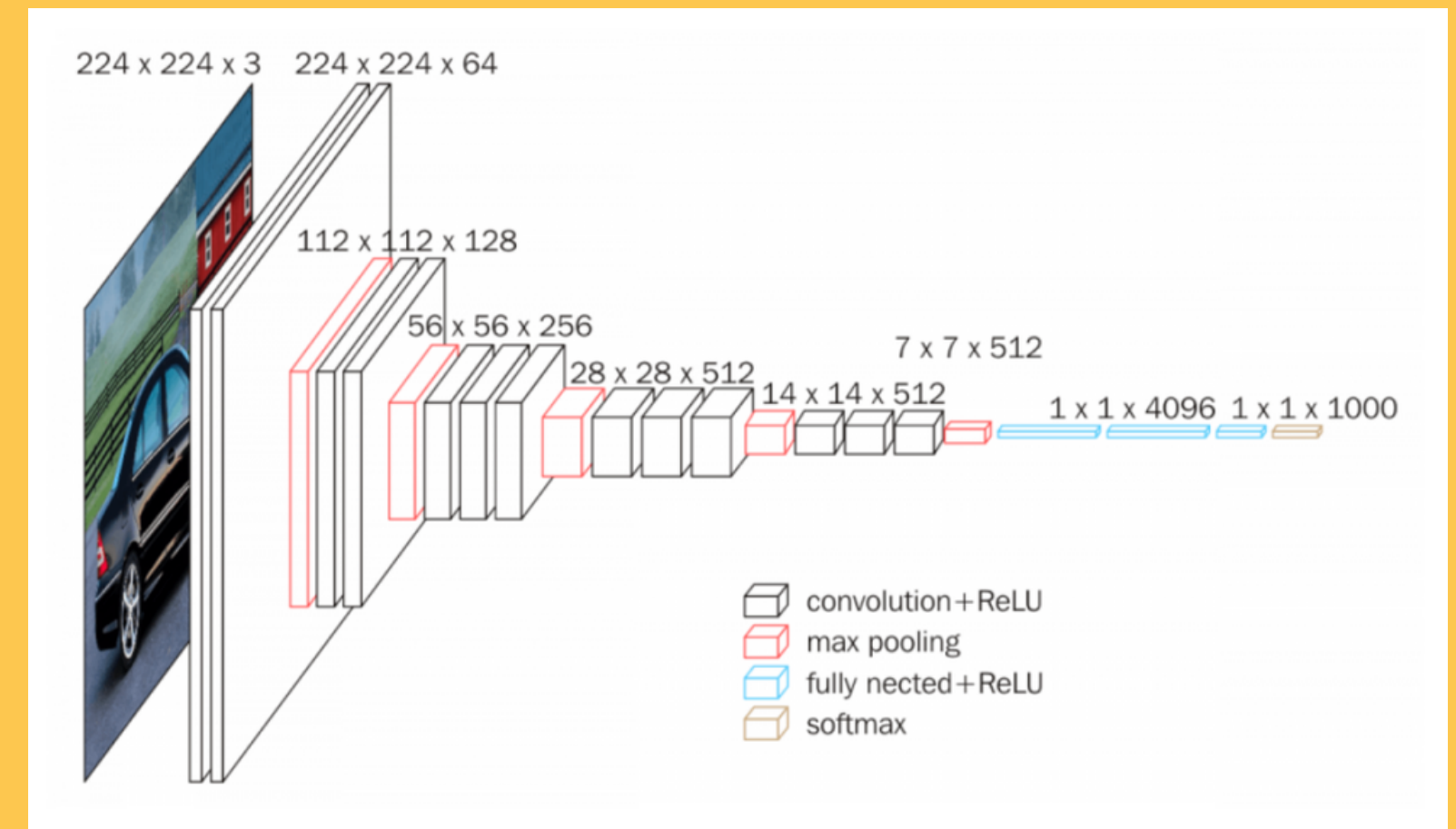
- A convolutional neural network is generally used to analyze visual images by processing data.
- It's also known as a ConvNet.
- A convolutional neural network is used to detect and classify objects in an image.
- The Layers in this model are as follows:-
  - Convolution Layers
  - Max Pooling Layers
  - Fully Connected Layers
  - Output Layer





# 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.



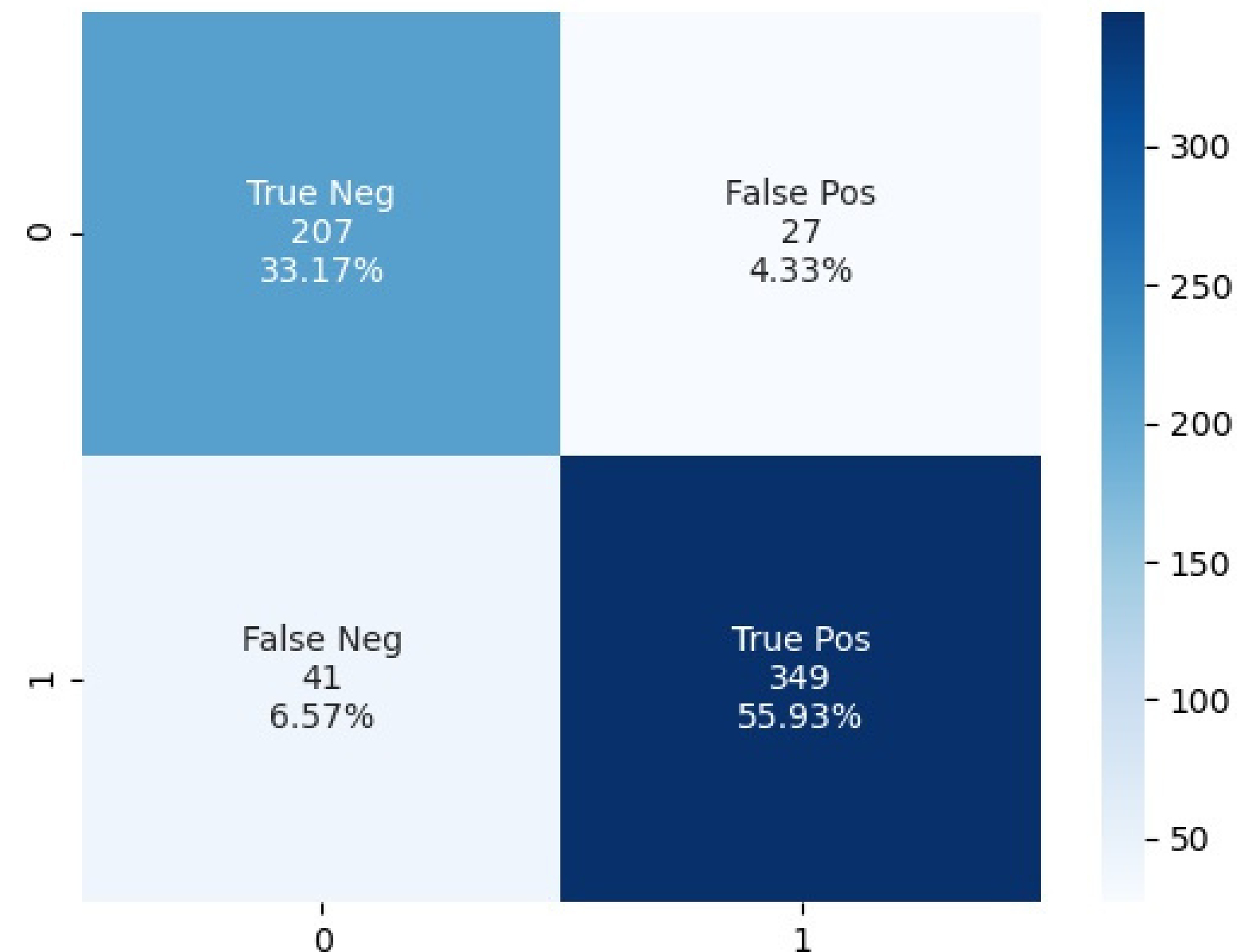
# Results

## Evaluation metrics

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

1. Pneumonia positive vs Normal

2. Covid Positive vs Normal

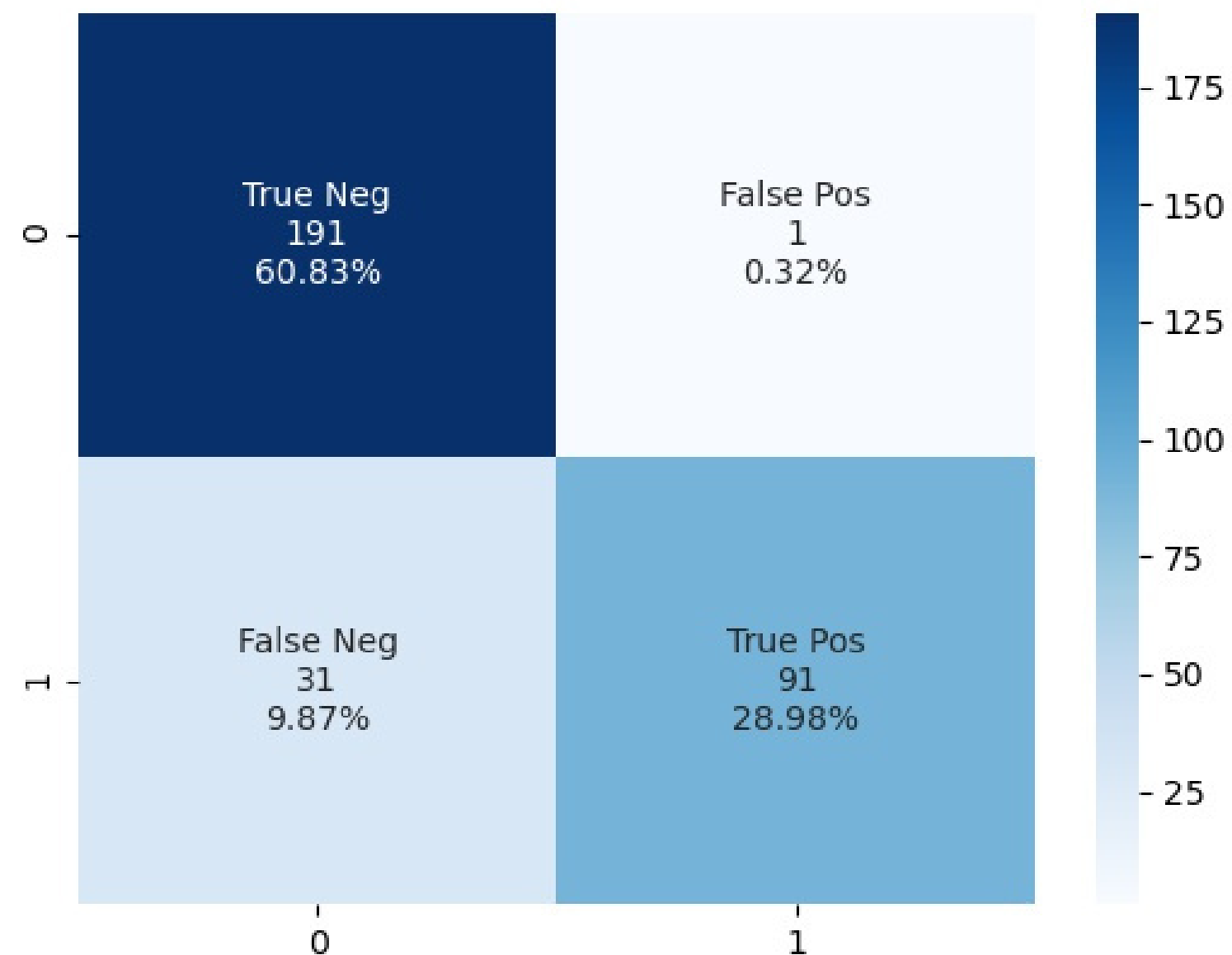


Confusion Matrix for Pneumonia positive vs Normal

# Results

## Evaluation metrics

The confusion matrices on the test data for the two configurations of our model:  
1. Pneumonia positive vs Normal  
2. Covid Positive vs Normal



Confusion Matrix for Covid Positive vs Normal



# Results

## Evaluation metrics

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!

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