Detection of Covid-19 using ResNet50 and VGG16 in Convolution Neural Network

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ABSTRACT

A novel coronavirus (CoV) generally known as 'SARS-CoV2' or '2019 novel coronavirus' or 'COVID-19' by the WHO which is the outbreak of pneumonia that started at the beginning of December 2019 in Wuhan City, China. COVID-19 is an infectious virus. As COVID-19 is a contiguous disease, early detection of the virus is very important but it can be incurable if the virus is detected later. The identification of COVID-19 disease is done by collecting samples from the throat and nose, which is susceptible to errors which are made by humans. This research proposed a system for identification of the virus utilizing X-Ray images. Dataset used consists of both Covid and Normal X-ray images. Among Convolutional Neural Network(CNN) models, the proposed models are ResNet50 and VGG16. RESNET50 consists of 48 convolutional layers, 1 MaxPool and Average Pool layers and VGG16 is a convolutional neural network that is 16 layers deep. By using these two models detection of COVID-19 is done. This research can be practically helpful to the physicians with the usage of datasets for the successful diagnosis of COVID-19 disease in the medical field.

INTRODUCTION TO PROBLEM

- The novel coronavirus, generally known as COVID-19, is a new type of Virus that is deadly to humans, as it is highly contagious.

- The typical COVID-19 diagnosis is based on swab extracts from nose and throat, this process is very time consuming and is prone to manual error. Human chest X-rays can be uncertain to detect virus as it can be misinterpreted.

- We can overcome these disadvantages using an efficient algorithm by detecting the virus from widely available chest X-ray images.

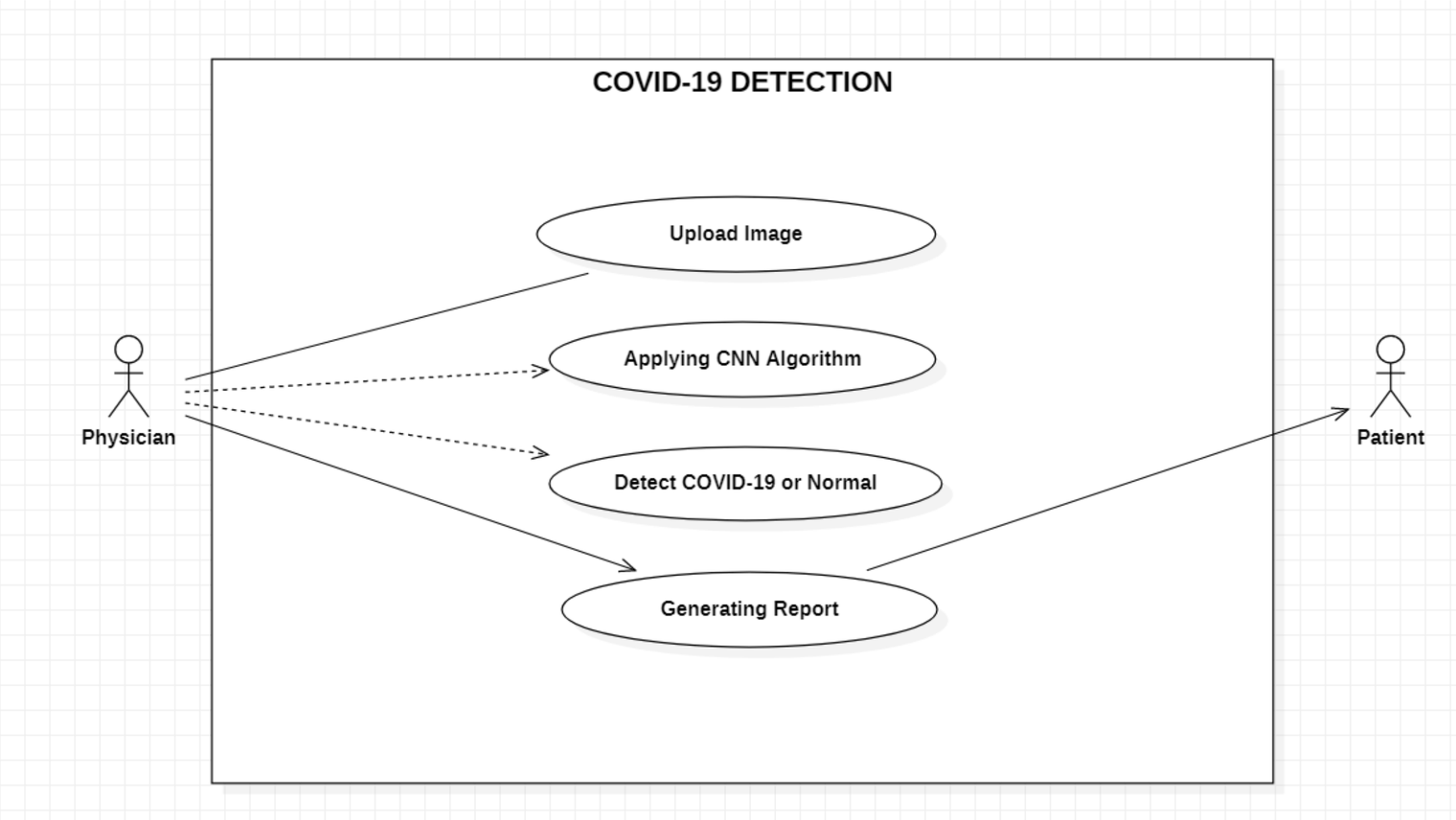
LITERATURE SURVEY

- In [1] this paper, the authors have worked on the Convolutional Neural Network (CNN) model and proposed for the detection of COVID-19 disease using COVID-19 Radiography dataset from Kaggle. They used ReLU as the activation function and Softmax Classifier which makes final predictions of the disease. This CNN model is used to conclude whether a given chest X-ray image of a patient has COVID-19 or not.

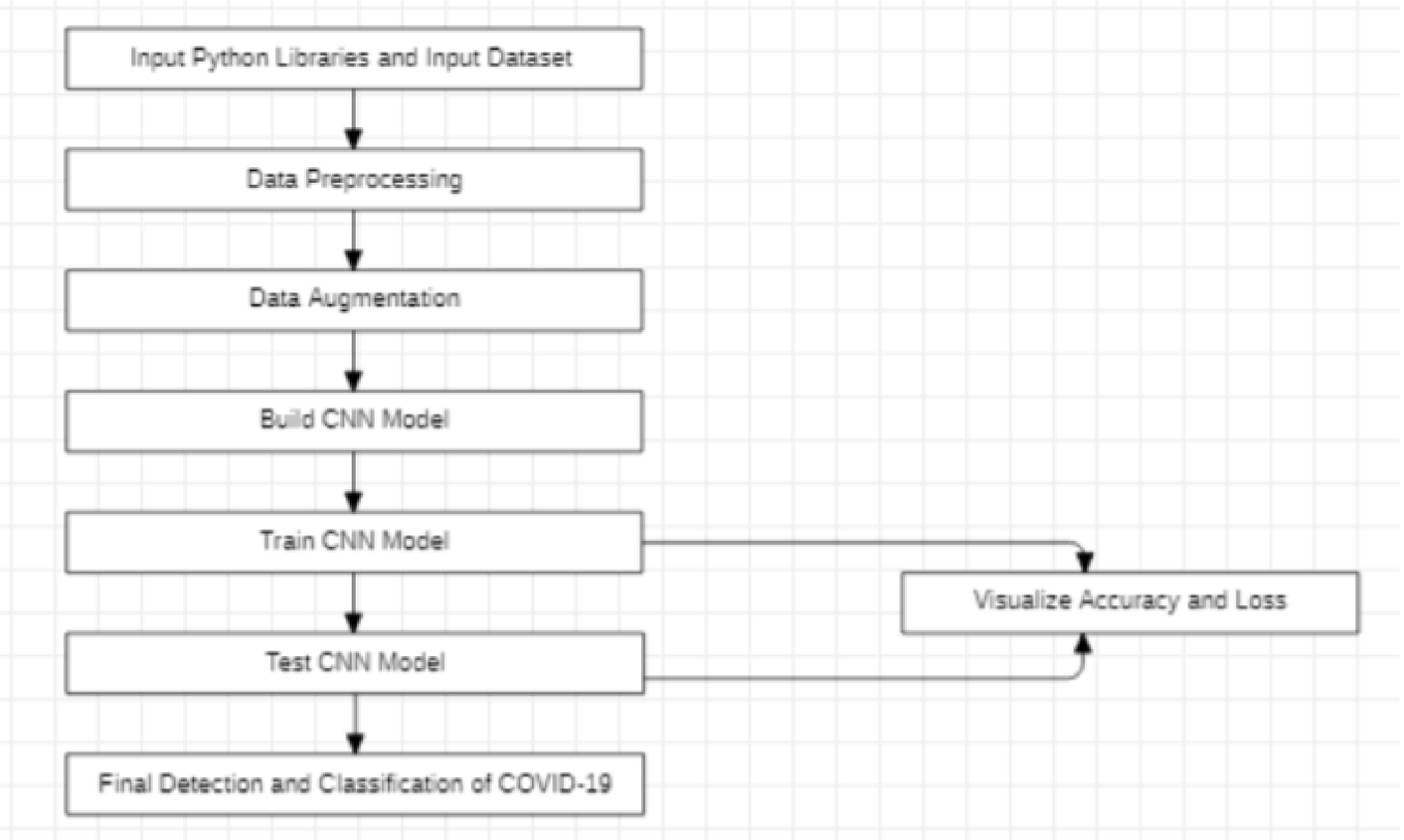
- The authors in [2] have attempted on an automated system for identification of the Covid19 virus infected images of chest X-Ray using CNN model. Local binary patterns are used for feature extraction and the classifiers used are “K-Nearest Neighbours(KNN), Naive Bayes(NB), Support Vector Machine(SVM), Random Trees and Random Forests.” Here, the proposed method uses a dataset which has human chest X-Rays of non infected people as well as patients suffering from pneumonia and Covid19 virus infection.

- In [3], the authors have proposed a deep transfer learning-based model that improves the current accuracy. They worked on COVID-19 Radiography dataset from Kaggle. The multiple CNN models are used like ”AlexNet, VGG, SqueezeNet, GoogleNet”. The DenseNet121 and ResNet50 are the two networks which are fine-tuned with the deep classifiers such as “Support vector machine (SVM), random forest, K-Nearest neighbor (KNN), and CNN with softmax classifier” with data augmentation to detect three classes of COVID-19 ,Viral Pneumonia and normal radiographs.

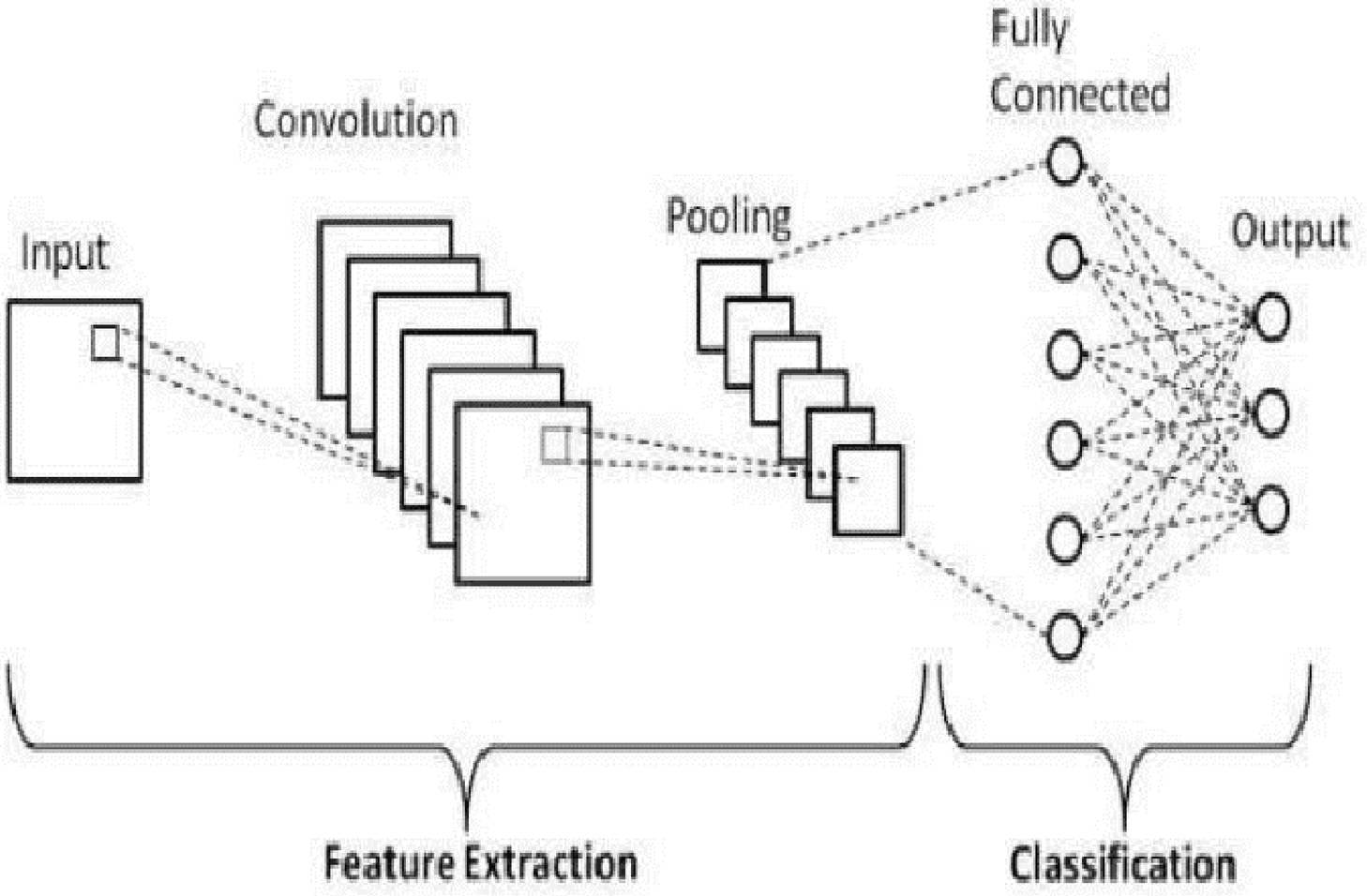
USE CASE DIAGRAM



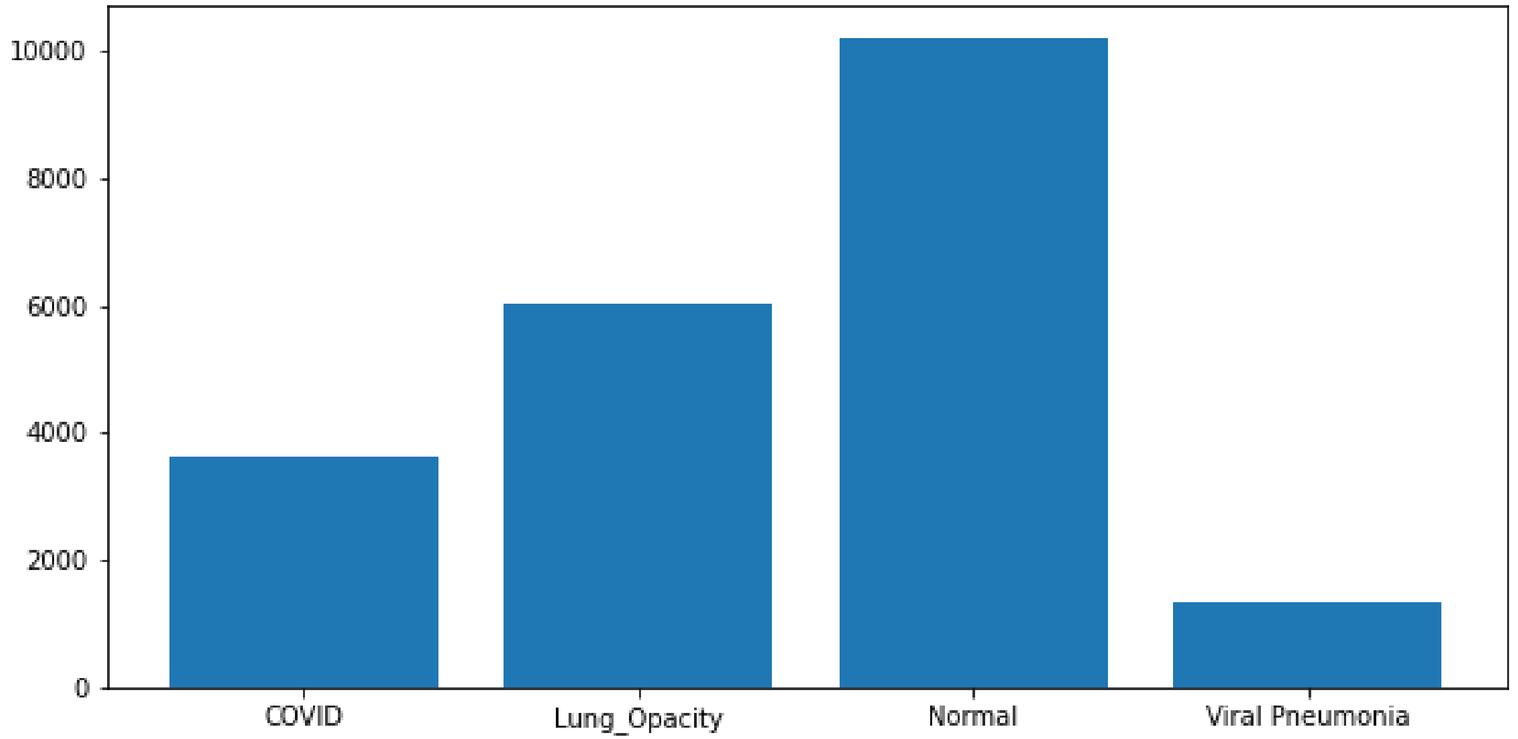
FLOWCHART


Input Python Libraries and Input Dataset
Data Preprocessing
Data Augmentation
Build CNN Model
Train CNN Model
Visualize Accuracy and Loss
Test CNN Model
Final Detection and Classification of COVID-19

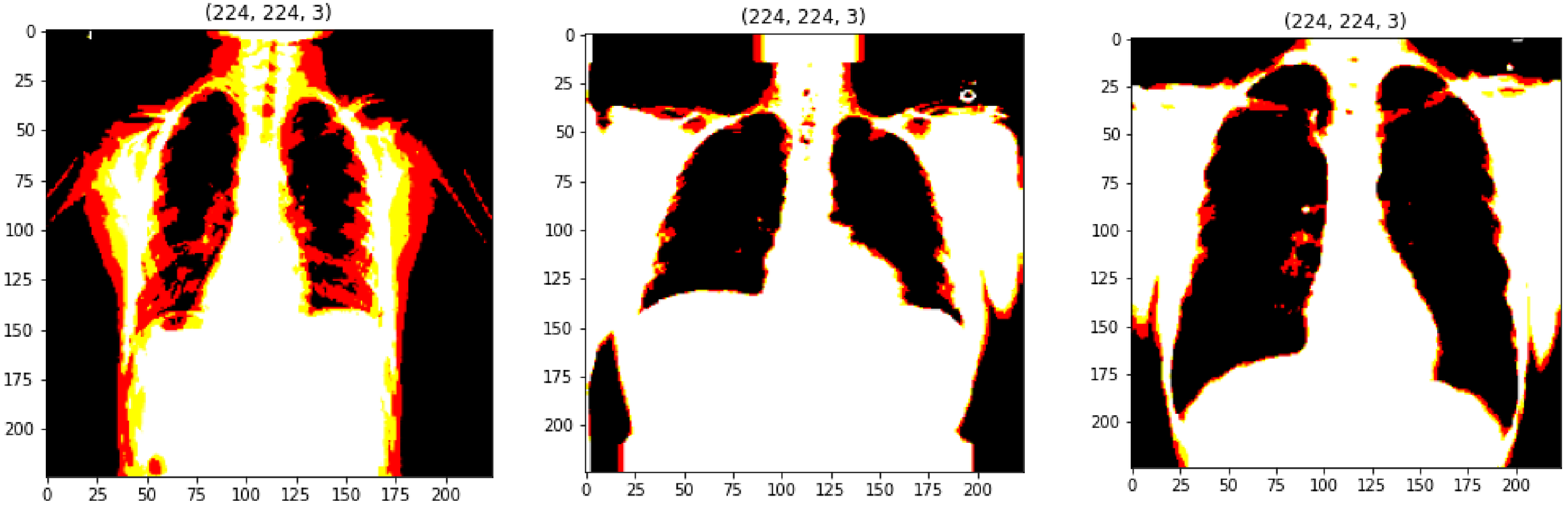
ARCHITECTURE



PARTIAL IMPLEMENTATION RESULTS

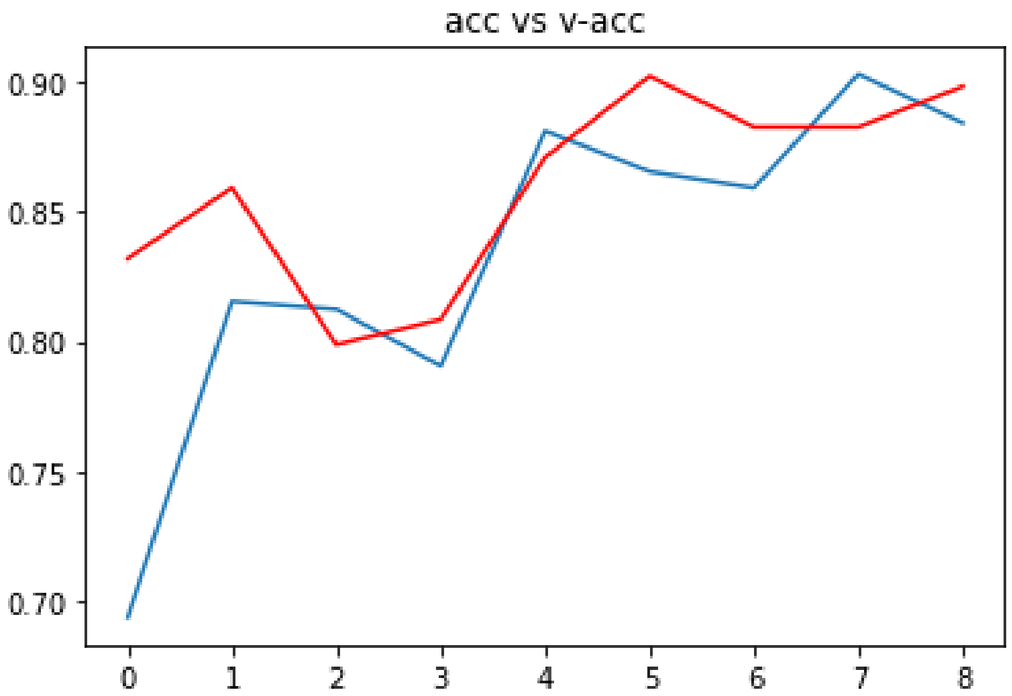


Graph representing count of each class



Clipping input data to the valid range for imshow with RGB data (For ResNet50)

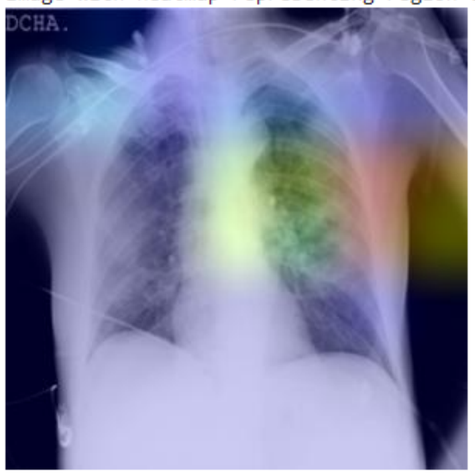
EXTENDED DESIGN FOR PHASE 2



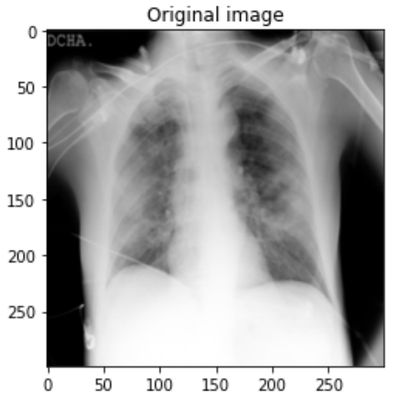
Graph representing
accuracy vs validation accuracy

Graph representing
loss vs validation loss

```
The given X-Ray image is of type = Covid

The chances of image being Covid is : 99.96157884597778 %
The chances of image being Normal is : 0.21855097729712725 %

image with heatmap representing region on interest
```

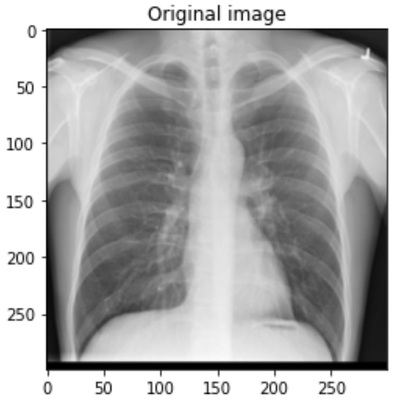



```
the original input image
```

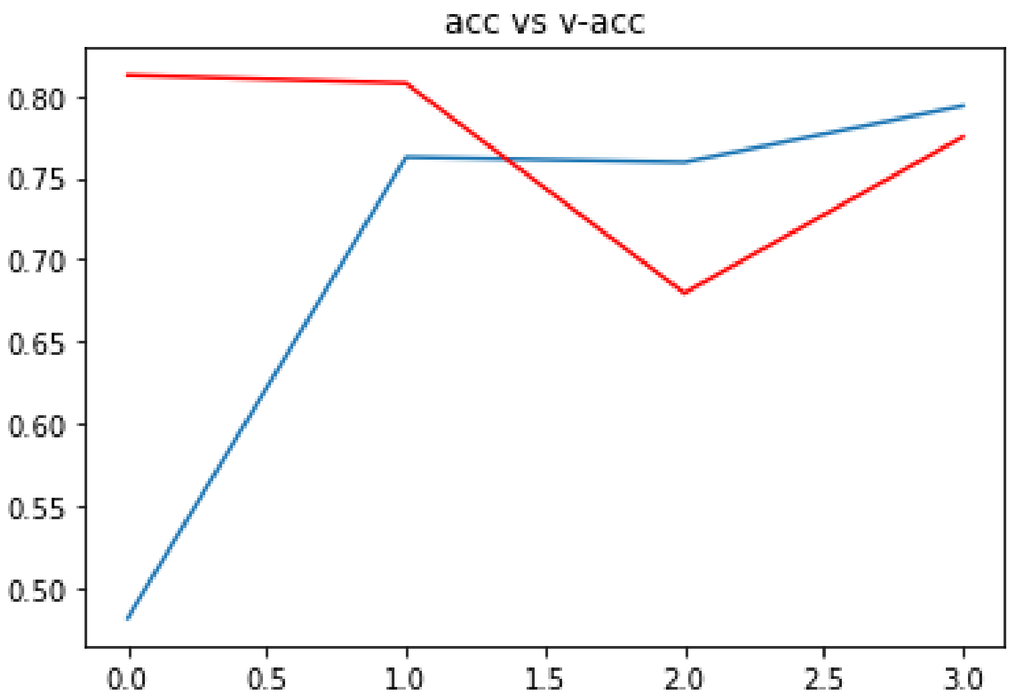



```
The given X-Ray image is of type = Normal

The chances of image being Covid is : 0.0009507289178145584 %
The chances of image being Normal is : 99.99955892562866 %

image with heatmap representing region on interest
```

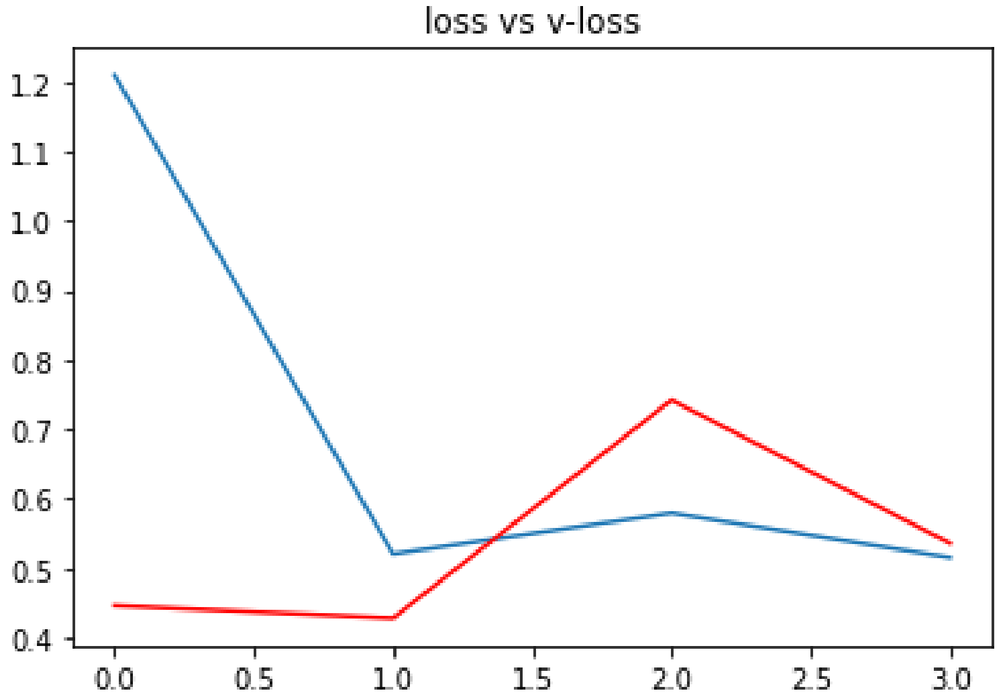
```
the original input image
```



Clipping input data to the valid range for imshow with RGB data (For VGG16)



Graph representing
accuracy vs validation accuracy

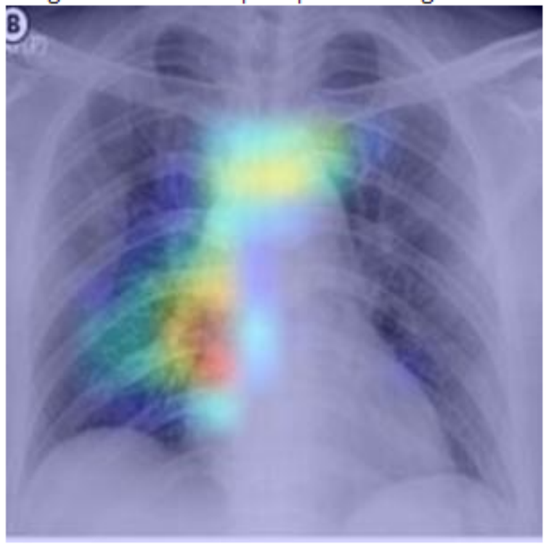


Graph representing
loss vs validation loss

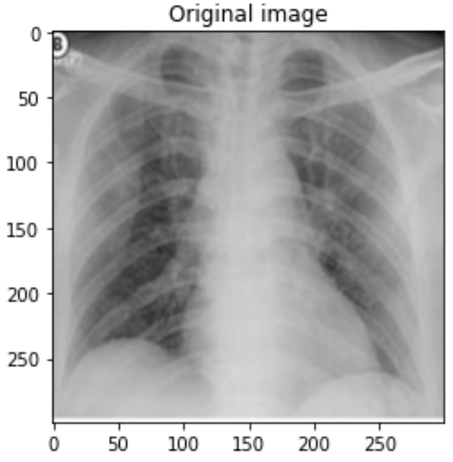
The given X-Ray image is of type = Covid

The chances of image being Covid is : 47.966137528419495 %
The chances of image being Normal is : 11.099046468734741 %

image with heatmap representing the covid spot



the original input image

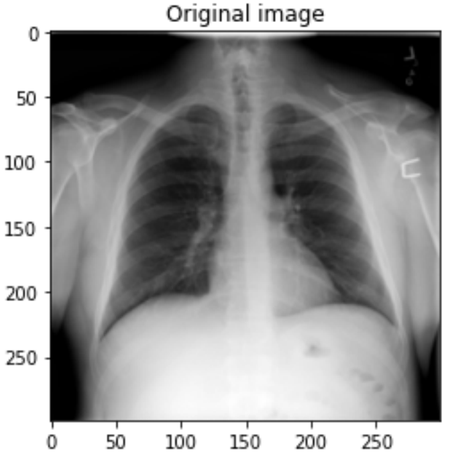


The given X-Ray image is of type = Normal

The chances of image being Covid is : 5.65820150077343 %
The chances of image being Normal is : 62.85563111305237 %

image with heatmap representing the covid spot

the original input image



REFERENCES

1. E. Irmak, "A Novel Deep Convolutional Neural Network Model for COVID-19 Disease Detection," 2020 Medical Technologies Congress (TIPTEKNO), 2020, pp. 1-4, doi: 10.1109/TIPTEKNO50054.2020.9299286.

2. S. D. Thepade and K. Jadhav, "Covid19 Identification from Chest X-Ray Images using Local Binary Patterns with assorted Machine Learning Classifiers," 2020 IEEE Bombay Section Signature Conference (IBSSC), 2020, pp. 46-51, doi: 10.1109/IBSSC51096.2020.9332158.

3. COVID-19 Radiography Database(Dataset) :
https://www.kaggle.com/tawsifurrahman/covid19-radiography-database

THANK YOU