

Simultaneously in Fig 4(b), Number of Epochs is taken on X-axis and Loss is represented on Y axis. When the training data is considered there is a sudden fall in the loss and it further decreases when it reaches the final epoch. As per the testing data there is no constant loss instead there is a continuous rise and fall in the loss for each and every epoch. Therefore for 20 epochs the loss is about 0.55. Similarly, when tested with 30 epochs the model accuracy is around 0.94 and model loss is identified as 0.53. Therefore, when testing with 20 and 30 epochs the accuracy has been constant i.e., 0.94 achieving good model performance when implemented using a limited dataset. Hence, this model has achieved better prediction rate as it is trained using both CXR and RT-PCR diagnostic tests.

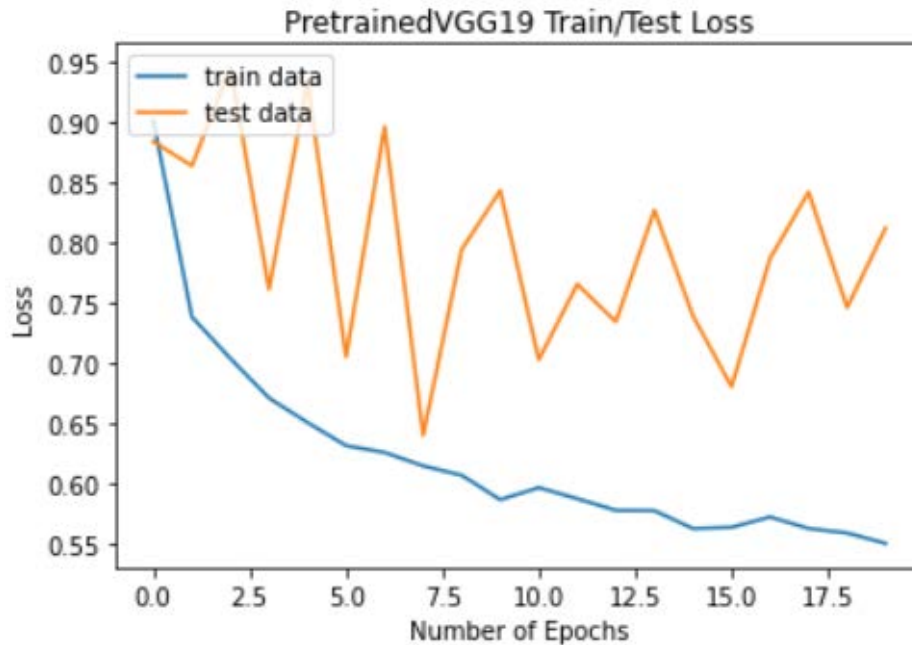


Fig.4(b).VGG19 Train and Test Loss

Classification of images is done applying some visualization techniques. Image filtration is done using Saliency Maps and Gradient-Weighted Class Activation Mapping (Grad-CAM). Saliency maps will visually process the image highlighting the abnormal pixels used for classifying the image. Concurrently, Grad-CAM technique is implemented displaying the abnormal regions within the image generating a heat map which is further used in detailed decision making for image classification. Thus, both Saliency maps and heat maps are used in classifying the given image into its respective category as displayed in Fig 5.

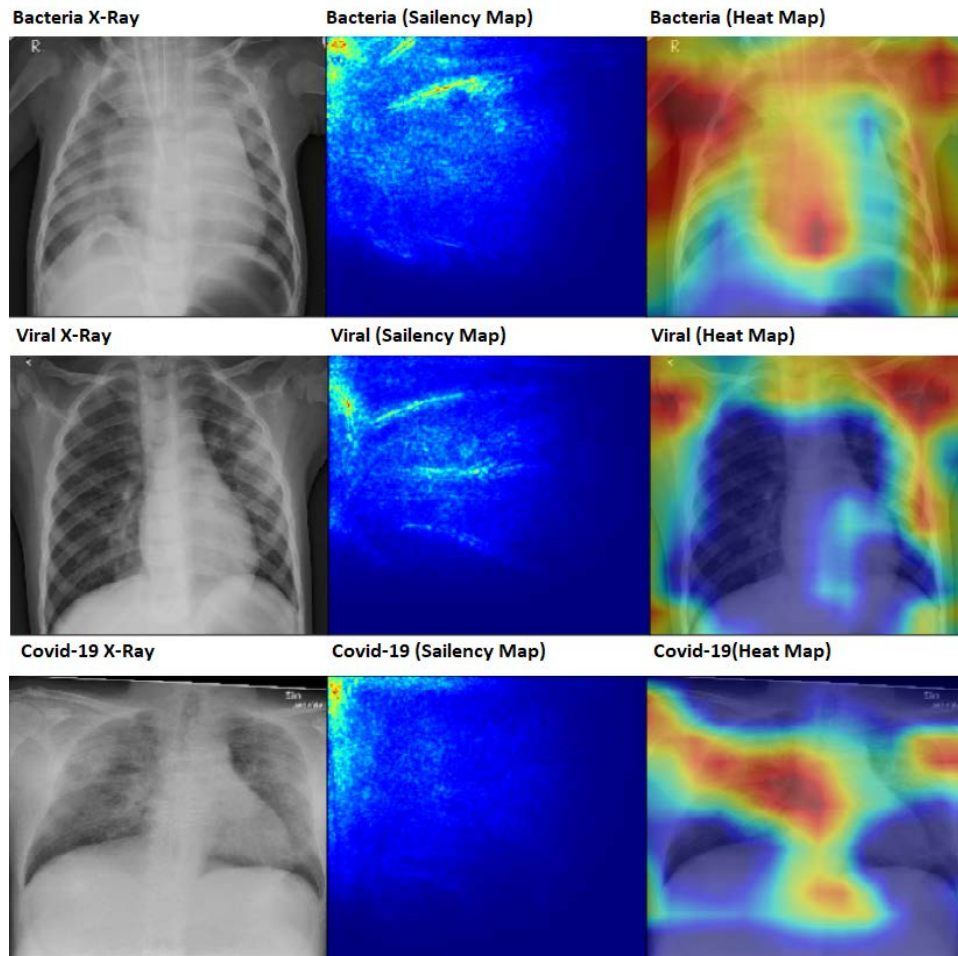


Fig 5. Abnormalities highlighted in Saliency map/Heat map

5. Conclusion

In this model, prediction of multiple classification is done i.e., Normal, Bacterial Pneumonia, Viral Pneumonia and Covid-19. All the images are used to train and test the model. The considered Covid-19 image dataset is very important as it is fetched based on the Corona positive report obtained by both RT-PCR test and CXR. Therefore, the abnormal features identified within the images are extracted using VGG-19 and is later forwarded through Fully Connected Layers achieving good prediction rate. The accuracy of about 0.94 is determined based on the performance metrics. Better accuracy may be achieved when tested on more data. Along with CXR there are some more tests like Antibody test and CT Scans. Therefore, if this model is implemented with some other diagnostic test like CT scan or Antibody report we can get better result.

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