

# A Study of Infection Segmentation in X-ray images of Covid-19 patients

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## 1 Introduction

In this research, we implement a neural network with integrated Residual Blocks for segmenting areas in medical X-ray images. The focus is on evaluating the network's performance with different loss functions in segmenting COVID-19 infections.

## 2 Data Analysis

The dataset used in this study is the COVID-QU-Ex Dataset, comprising 2913 X-ray images of COVID-19 patients. For data processing, i resized images to 256x256 pixels to maintain uniformity and rescale pixel values to the  $[0, 1]$  range for effective model training.

## 3 Model

At the heart of this investigation is the Xception model, which utilizes depthwise separable convolutions within its convolutional neural network architecture. This allows for reduced computational demand while preserving the model's ability to discern and classify features in image data effectively.

### 3.1 Xception Architecture

The Xception model employs a structured flow comprising entry, middle, and exit stages, each contributing to a systematic and efficient image analysis. Its depth-wise separable convolutions enable the model to perform with enhanced efficiency, fostering both speed and accuracy in the learning process.

## 4 Results

The model's performance was assessed using key classification metrics, resulting in a strong predictive accuracy. The precision for COVID-19 cases was notably high, illustrating the model's capability in identifying true positives. Below is a confusion matrix and the precision-recall curves that visually depict the model's performance:

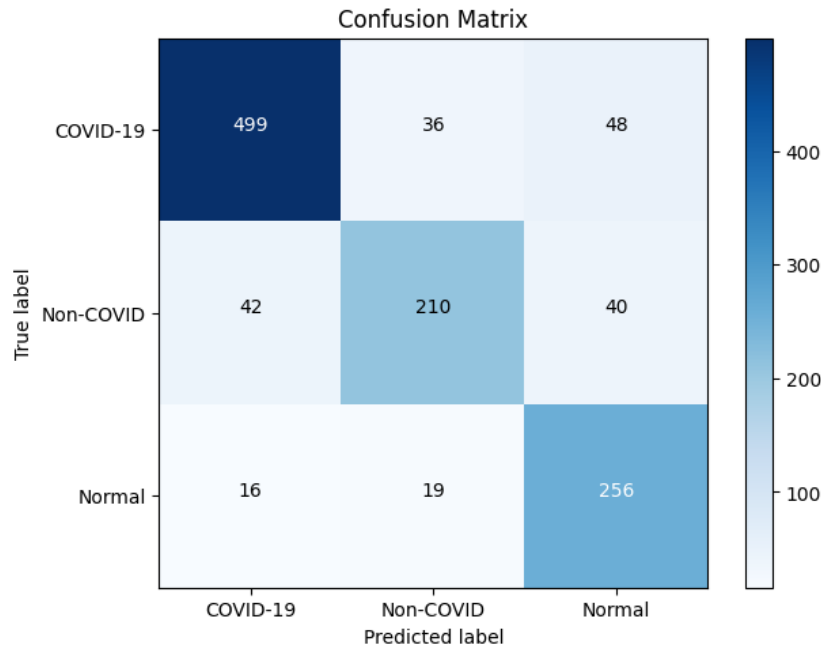


Figure 1: Confusion matrix showing the model's classification accuracy for each class.

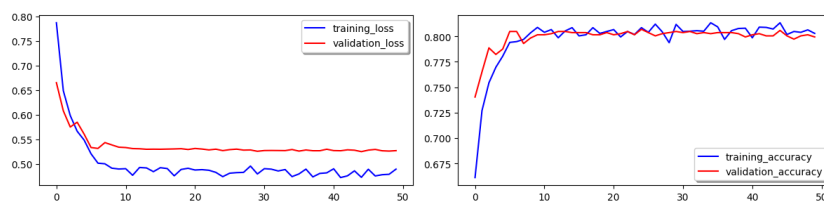


Figure 2: Loss Learning Curve and Accuracy Learning Curve for the model during validation.

The accuracy across all classes reached 0.83, demonstrating the model's robustness. The detailed performance metrics are tabulated below:

Class	Precision	Recall	F1-score	Support
COVID-19	0.90	0.86	0.88	583
Non-COVID	0.79	0.72	0.75	292
Normal	0.74	0.88	0.81	291

Table 1: Classification metrics for the Xception model.

## 5 Conclusion

This study underscores the potential of the Xception model in the realm of image classification, highlighting its efficiency and the strategic advantage of depthwise separable convolutions. Looking forward, we anticipate further exploration into the model’s application across broader domains and its adaptability to various classification challenges.