

ABSTRACT

Lung disease is the most dangerous human disease worldwide. In 2021, Covid-19 is the disease with the most cases in the world which is classified as a lung disease. Lung disease identification techniques used today usually use RT-PCR or diagnosis via X-ray image which only relies on the ability of doctors or health workers. The length of time required to diagnose patients with lung disease results in a lack of time and energy efficiency for patient treatment. Deep learning is one of the methods that can be applied to the identification system of diseases of the lungs so that the diagnosis of diseases that can be seen on X-ray image is detected automatically.

In this study, the dataset consisted of five classes, namely normal, Covid-19, Bacterial Pneumonia, Viral Pneumonia, and Tuberculosis. The main proposal presented to the system is the combination of Convolutional Neural Network (CNN) and Vision Transformer to determine lung disease. Model architecture using EfficientNet-B1 as the first backbone and Vision Transformer as the second backbone with the application of image Relative Position Encoding (i-RPE) to improve the interrelationships between parts of the image. The obtained image is processed using Real ESR-GAN to remove noise in the image. Then, weighted cross entropy is applied to resolve the data imbalance.

The application of the proposed technique can improve the performance of the model. The addition of Vision Transformer can increase the accuracy by 4.793% to 92,348%. The application of Real ESR-GAN provides an increase in accuracy of 1.064%. i-RPE on Vision Transformer can provide an increase in accuracy of 0.314%. The best performance was obtained after adding weighted cross entropy with an increase in accuracy of 0.34%, so the accuracy obtained in this study was 93.942%.

Keywords: CNN, Covid-19, EfficientNet, Pneumonia, Real ESR-GAN, Tuberculosis, Vision Transformer