

ABSTRAK

COVID-19 merupakan penyakit menular yang disebabkan oleh virus SARS-CoV-2, dengan lebih dari 780 juta kasus dan 6,9 juta kematian di seluruh dunia hingga tahun 2023. Gejalanya bervariasi, mulai dari kondisi ringan seperti demam dan batuk hingga kondisi berat seperti pneumonia dan *Acute Respiratory Distress Syndrome* (ARDS). Deteksi dini sangat penting untuk menurunkan angka kematian, tetapi metode seperti RT-PCR dan *Rapid Diagnostic Test* (RDT) memiliki keterbatasan dalam hal kecepatan dan akurasi. Sebagai alternatif, *Chest X-Ray* (CXR) dapat digunakan, meskipun memerlukan keahlian radiologi. Penelitian ini bertujuan untuk menganalisis performa berbagai model *Convolutional Neural Network* (CNN) dalam mendeteksi COVID-19 melalui citra CXR. Model yang diuji meliputi baseline CNN, VGG16, ResNet50, DenseNet201, MobileNetV1, dan NASNetMobile. Model yang telah dilatih kemudian dievaluasi berdasarkan metrik akurasi, sensitivitas, spesifisitas, dan *Intersection over Union* (IoU). Hasil evaluasi menunjukkan bahwa NASNetMobile memiliki performa terbaik dengan akurasi 90,57% dan spesifisitas 95,05%, diikuti oleh VGG16 dengan akurasi 89,93% dan spesifisitas 94,70%. Sementara itu, DenseNet201 memiliki performa terendah, dengan akurasi 83,06% dan IoU 71,03%. Model dengan arsitektur lebih kompleks, seperti NASNetMobile dan VGG16, cenderung memiliki performa lebih baik dibandingkan model yang lebih sederhana seperti baseline CNN dan DenseNet201. Dengan demikian, pemilihan model CNN yang tepat dapat meningkatkan akurasi deteksi COVID-19 melalui citra CXR, dengan tetap mempertimbangkan keseimbangan antara akurasi dan efisiensi komputasi sesuai dengan kebutuhan implementasi.

Kata Kunci: COVID-19, CXR, CNN, *transfer learning*.

ABSTRACT

COVID-19 is an infectious disease caused by the SARS-CoV-2 virus, with more than 780 million cases and 6.9 million deaths worldwide by 2023. Symptoms vary from mild symptoms such as fever and cough to severe conditions such as pneumonia and Acute Respiratory Distress Syndrome (ARDS). Early detection is crucial to reduce mortality, but methods such as RT-PCR and Rapid Diagnostic Test (RDT) have limitations in terms of speed and accuracy. As an alternative, Chest X-Ray (CXR) can be used, although it requires radiology expertise. This study aims to analyze the performance of various Convolutional Neural Network (CNN) models in detecting COVID-19 from CXR images. The models tested include baseline CNN, VGG16, ResNet50, DenseNet201, MobileNetV1, and NASNetMobile. The trained models are then evaluated based on accuracy, sensitivity, specificity, and Intersection over Union (IoU) metrics. The evaluation results show that NASNetMobile has the best performance with an accuracy of 90.57% and a specificity of 95.05%, followed by VGG16 with an accuracy of 89.93% and a specificity of 94.70%. Meanwhile, DenseNet201 has the lowest performance, with an accuracy of 83.06% and an IoU of 71.03%. Models with more complex architectures, such as NASNetMobile and VGG16, tend to perform better than simpler models such as baseline CNN and DenseNet201. Thus, selecting the right CNN model can improve the accuracy of COVID-19 detection through CXR images, while still considering the balance between accuracy and computational efficiency according to implementation needs.

Keywords: COVID-19, CXR, CNN, transfer learning

