

# Optimasi Pendeteksian COVID-19 Tiga Kelas Menggunakan Principal Component Analysis Berbasis Arsitektur Ensemble model = Optimization of Three Class COVID-19 Detection Using Principal Component Analysis Method with Ensemble model Based

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## Abstrak

Corona Virus Disease 2019 (COVID-19) adalah penyakit yang menyerang tubuh manusia melalui virus Severe Acute Respiratory atau SARS-CoV-2. Munculnya wabah COVID-19 menimbulkan setidaknya 16,6 juta penduduk di dunia meninggal dunia serta tidak sedikit dari penderitanya mengidap Community Acquired Pneumonia (CAP). CAP adalah infeksi akut parenkim paru pada orang yang telah mendapatkan infeksi di masyarakat. Menurut World Health Organization (WHO), pneumonia menjadi penyebab utama kematian nomor tiga di negara miskin dan berkembang. Dengan adanya pendeteksian serta diagnosis lebih dini, pengidap CAP akibat terpapar oleh virus COVID-19 ini dapat ditangani lebih cepat sebelum menyebar luas. Oleh karena itu, analisis gambar medis sangat penting dalam upaya pengobatan CAP sedini mungkin. Adanya pengembangan teknologi deep learning dan computer vision dapat membantu dokter dalam melakukan pendeteksian lebih cepat serta akurat. Maka dari itu, penelitian ini mengusulkan model Convolutional Neural Network (CNN) dengan arsitektur ensemble model Xception, InceptionV3, NASNet Large, dan Inception Resnet-V2 dengan menggunakan metode pre-processing Principal Component Analysis (PCA) dalam melakukan pendeteksian COVID-19 tiga kelas pada gambar chest xray. Penggunaan metode PCA pada data pre-processing dapat membantu mengembangkan model yang lebih efisien serta akurat. Para peneliti telah mencoba pemrosesan gambar baik menggunakan gambar rontgen dada dan juga Computerized Tomography (CT scan) khususnya CNN. Penelitian sebelumnya telah membuat model CNN dengan arsitektur ensemble model yang terdiri dari Xception, Inception-V3, NASNet Large, dan Inception Resnet-V2 berbasis ensemble model. Namun, hasil akurasi dalam pendeteksian masih belum optimal. Oleh karena itu, penelitian ini mengusulkan penggunaan metode PCA untuk meningkatkan akurasi pendeteksian menjadi 88,95%. Akurasi pendeteksian meningkat sebesar 3,14% dari penelitian sebelumnya.

.....Corona Virus Disease 2019 (COVID-19) is a disease that attacks the human body through the SARS-CoV-2 virus. The emergence of the COVID-19 outbreak has caused at least 16.6 million people worldwide to die, and many of them suffer from Community Acquired Pneumonia (CAP). CAP is an acute lung parenchyma infection in people who have been infected in the community. According to World Health Organization (WHO), pneumonia is the third leading cause of death in poor and developing countries. With earlier detection and diagnosis, CAP sufferers due to exposure to the COVID-19 virus can be treated more quickly before it spreads widely. Therefore, medical image analysis is crucial in the effort to treat CAP as early as possible. The development of deep learning and computer vision technology can help doctors to perform faster and more accurate detection. Hence, this research proposes a Convolutional Neural Network (CNN) model with ensemble architectures of Xception, InceptionV3, NASNet Large, and Inception Resnet-V2, using Principal Component Analysis (PCA) pre-processing method to perform three-class COVID-19 detection in chest x-ray images. The use of the PCA method in pre-processing data can help develop a more efficient and accurate model. Researchers have tried image processing using both chest X-ray images and

also Computerized Tomography (CT scan), especially CNN. Previous research has created a CNN model with an ensemble model architecture consisting of Xception, Inception-V3, NASNet Large, and Inception Resnet-V2 based on the ensemble model. However, the results of the accuracy in the detection are still not optimal. Therefore, this study proposes the use of the PCA method to increase the detection accuracy to 88.95%. Detection accuracy increased by 3.14% from previous studies.