ABSTRAK

Deteksi pneumonia melalui citra X-ray merupakan langkah penting dalam dunia medis untuk mendukung proses diagnosis dan penanganan yang lebih cepat serta akurat. Pneumonia merupakan salah satu penyakit infeksi paru-paru yang dapat berdampak serius pada kesehatan, terutama pada anak-anak, lansia, dan individu dengan sistem imun lemah. Seiring dengan perkembangan teknologi kecerdasan buatan, metode *deep learning* menunjukkan potensi besar dalam meningkatkan akurasi diagnosis berbasis citra medis, termasuk dalam klasifikasi kondisi paru-paru.

Penelitian ini bertujuan untuk membandingkan kinerja tiga arsitektur *deep learning*, yaitu VGG19, ResNet50 dan DenseNet121, dalam mendeteksi pneumonia menggunakan citra X-ray. Dataset yang digunakan berasal dari website *Kaggle* dan berisi citra dada pasien yang dikategorikan ke dalam dua label, yaitu Normal dan Pneumonia. Proses metodologi mencakup tahap *pre-processing* data seperti augmentasi, *resize*, normalisasi, *to tensor* dan normalisasi untuk memperbaiki kualitas serta variasi data pelatihan. *Hyperparameter* model dioptimalkan menggunakan metode grid search, dan sistem diimplementasikan menggunakan *framework Streamlite* untuk visualisasi interaktif.

VGG19 memperoleh precision sebesar 0,88, recall 0,80, dan f1-score 0,78. DenseNet121 mencatat precision 0,89, recall 0,79, dan f1-score 0,81. Sementara itu, ResNet50 menghasilkan precision 0,89, recall 0,77, dan f1-score 0,79. Ketiga arsitektur menunjukkan performa yang cukup baik dalam mendeteksi pneumonia melalui citra X-ray, dengan perbedaan nilai yang relatif kecil. Namun, berdasarkan keseimbangan antara precision, recall, dan f1-score, DenseNet121 dapat dikatakan sebagai arsitektur yang paling optimal dalam penelitian ini. Hal ini menunjukkan bahwa DenseNet121 mampu memberikan hasil klasifikasi yang lebih konsisten, baik dalam mengenali kasus pneumonia maupun membedakannya dari citra normal, sehingga lebih andal untuk digunakan dalam sistem deteksi otomatis.

Kata kunci : Pneumonia, Citra X-ray, *Deep Learning*, VGG19, ResNet50, DenseNet121

ABSTRACT

Detection of pneumonia through chest X-ray images is a crucial step in the medical field to support faster and more accurate diagnosis and treatment processes. Pneumonia is a type of lung infection that can have serious health impacts, particularly on children, the elderly, and individuals with weakened immune systems. With the advancement of artificial intelligence technology, deep learning methods have shown great potential in improving the accuracy of medical image-based diagnoses, including in the classification of lung conditions.

This study aims to compare the performance of three deep learning architectures—VGG19, ResNet50, and DenseNet121—in detecting pneumonia using chest X-ray images. The dataset used was obtained from the Kaggle website and contains chest X-ray images categorized into two labels: Normal and Pneumonia. The methodology includes data preprocessing steps such as augmentation, resizing, to tensor and normalization to improve the quality and diversity of the training data. Model hyperparameters were optimized using the grid search method, and the system was implemented using the Streamlit framework for interactive visualization.

VGG19 achieved a precision of 0.88, recall of 0.80, and an F1-score of 0.78. DenseNet121 recorded a precision of 0.89, recall of 0.79, and an F1-score of 0.81. Meanwhile, ResNet50 produced a precision of 0.89, recall of 0.77, and an F1-score of 0.79. All three architectures demonstrated fairly good performance in detecting pneumonia from chest X-ray images, with relatively small differences in their evaluation metrics. However, based on the balance between precision, recall, and F1-score, DenseNet121 can be considered the most optimal architecture in this study. This suggests that DenseNet121 provides more consistent classification results, both in identifying pneumonia cases and distinguishing them from normal images, making it more reliable for automated detection systems.

Keywords: Pneumonia, X-ray Image, Deep Learning, VGG19, DenseNet121