

ABSTRAK

Penyakit daun padi merupakan permasalahan penting dalam sektor pertanian karena dapat menurunkan produktivitas secara signifikan. Deteksi dini sangat diperlukan untuk meminimalkan kerugian, namun identifikasi manual oleh ahli pertanian memerlukan waktu serta rentan kesalahan. Penelitian ini bertujuan mengembangkan sistem klasifikasi otomatis penyakit daun padi menggunakan *Convolutional Neural Network (CNN)* dengan pendekatan *transfer learning* pada arsitektur *MobileNetV2*. Model dikembangkan menggunakan lima skenario pelatihan, yaitu *Scratch*, *Fixed Feature*, *Fine-Tune First*, *Fine-Tune Middle*, dan *Fine-Tune Last*. Proses pelatihan dilakukan selama 50 *epoch* dengan *batch size* 32, menggunakan *optimizer Adam* dan *learning rate* 0,0001. Hasil penelitian menunjukkan bahwa *transfer learning* memberikan peningkatan performa yang signifikan dibandingkan pelatihan dari awal. Skenario *Fine-Tune First* menjadi model dengan performa terbaik dengan akurasi 80%, *macro average F1-score* sebesar 77%, *weighted average F1-score* sebesar 79%, serta rata-rata *AUC* sebesar 0,92. Evaluasi per kelas juga menunjukkan performa yang kuat, di mana kelas *Healthy* memiliki *recall* tertinggi (95%), sedangkan kelas *Hispa* yang sebelumnya sulit dikenali mengalami peningkatan *F1-score* menjadi 62%. Adapun skenario *Fine-Tune Middle* dan *Fine-Tune Last* menunjukkan performa menengah dengan akurasi masing-masing 76% dan 67%, sedangkan model *Scratch* memperoleh akurasi terendah yaitu 54%. Secara keseluruhan, penelitian ini membuktikan bahwa pendekatan *transfer learning* berbasis *MobileNetV2* efektif dalam meningkatkan kemampuan klasifikasi penyakit daun padi. Model yang dihasilkan berpotensi dikembangkan lebih lanjut sebagai bagian dari teknologi pertanian cerdas untuk membantu proses diagnosis penyakit secara cepat dan akurat.

Kata Kunci: Penyakit Daun Padi, *MobileNetV2*, *Convolutional Neural Network (CNN)*, *Transfer learning*.

ABSTRACT

Rice leaf diseases are a major issue in the agricultural sector as they can significantly reduce crop productivity. Early detection is essential to minimize losses; however, manual identification by agricultural experts is time-consuming and prone to errors. This research aims to develop an automatic rice leaf disease classification system using a Convolutional Neural Network (CNN) with a transfer learning approach based on the MobileNetV2 architecture. The model was trained under five scenarios: Scratch, Fixed Feature, Fine-Tune First, Fine-Tune Middle, and Fine-Tune Last. The training process was conducted for 50 epochs with a batch size of 32, using the Adam optimizer and a learning rate of 0.0001. The results show that transfer learning provides a significant performance improvement compared to training from scratch. The Fine-Tune First scenario achieved the best performance with an accuracy of 80%, a macro average F1-score of 77%, a weighted average F1-score of 79%, and an average AUC of 0.92. Class-level evaluation also demonstrated strong results, with the Healthy class achieving the highest recall (95%), while the previously challenging Hispa class showed improvement with an F1-score of 62%. The Fine-Tune Middle and Fine-Tune Last scenarios produced moderate performance with accuracies of 76% and 67%, respectively, while the Scratch model yielded the lowest accuracy at 54%. Overall, this study demonstrates that transfer learning using the MobileNetV2 architecture is effective in enhancing rice leaf disease classification performance. The resulting model shows strong potential for further development as part of smart agriculture technologies to support fast and accurate disease diagnosis.

Keywords: *Rice Leaf Disease, MobileNetV2, Convolutional Neural Network (CNN), Transfer learning.*