UNDERGRADUATE THESIS

PERFORMANCE ANALYSIS OF FINE-TUNED EFFICIENTNET-B0 AND MOBILENETV2 FOR RICE LEAF DISEASE CLASSIFICATION WITH OPTIMIZER VARIATIONS ON MOBILE-BASED APPLICATION

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APPROVAL SHEET

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ABSTRACT

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Thesis Title:	Performance Analysis Of Fine-Tuned Efficientnet-B0 And Mobilenetv2 For Rice Leaf Disease Classification With Optimizer Variations On Mobile-Based Application
Advisor:	1. Dr. Faisal Muttaqin, S.Kom., M.T. 2. Afina Lina Nurlaili, S.Kom., M.Kom.

Rice leaf disease is one of the primary factors contributing to the decline of rice productivity in Indonesia. Accurate early detection is essential to enable farmers to take appropriate countermeasures before the disease spreads further. This study aims to analyze the performance of deep learning models based on Convolutional Neural Network (CNN) in classifying six classes of rice leaf diseases, namely Bacterial Leaf Blight, Brown Spot, Healthy Rice Leaf, Leaf Blast, Rice Hispa, and Sheath Blight, as well as implementing the best-performing model into a mobile application. Three model architectures were comparatively evaluated: MobileNetV2 with a frozen transfer learning approach, frozen EfficientNet-B0, and Fine-tuned EfficientNet-B0 which allows all base model parameters to be retrained. The search for optimal hyperparameter configurations was conducted through four sequential testing stages encompassing variations in batch size, epoch, learning rate, and optimizer (Adam, RMSprop, SGD) using a dataset of 4,770 images divided into training (3,333), validation (958), and testing (479) sets.

The results demonstrate that the Fine-tuned EfficientNet-B0 model with a configuration of batch size 16, epoch 50, learning rate 0.001, and Adam optimizer achieved the best performance with a testing accuracy of 99.79% and a macro average f1-score of 0.9981, with only 1 misclassification out of 479 images. In comparison, MobileNetV2 achieved an accuracy of 92.48%, while frozen EfficientNet-B0 experienced a complete failure in the form of class collapse with an accuracy of only 19.62%. The best model was subsequently converted to TensorFlow Lite Standard format with a size of 16.56 MB (a 67.4% reduction from the original model) and integrated into the SIPADI mobile application (Sistem Pendeteksi Awal Penyakit Daun Padi) developed using the Flutter framework. Testing on a mobile device showed that the application is capable of performing accurate classification with an inference time of 198 ms, accompanied by educational information including disease descriptions, symptoms, treatment steps, and prevention measures for each disease class.

Keywords: Rice Leaf Disease Classification, EfficientNet-B0, Fine-tuning, MobileNetV2, TensorFlow Lite, Mobile Application

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Surabaya, June 08th 2026

Author

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