



PROJECT REPORT
PERFORMANCE COMPARISON OF
EFFICIENTNETV2, MOBILENETV3, AND THEIR
INTEGRATION WITH CAPSULE NETWORK FOR IMAGE-
BASED RICE PLANT DISEASE CLASSIFICATION

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ABSTRACT

Rice productivity in Indonesia is often disrupted by leaf and neck diseases such as bacterial leaf blight, brown spot, and leaf blast, while manual detection remains inefficient and error-prone. This study compares the performance of EfficientNetV2B0 and MobileNetV3, both individually and in hybrid combination with Capsule Neural Network (CapsNet), for image-based classification of ten rice plant disease classes. A public dataset of approximately 30,235 images was used, with all models trained through transfer learning under both augmented and non-augmented conditions, and evaluated using accuracy, precision, recall, F1-score, confusion matrix, inference time, and model size. Experimental results show that all six model configurations achieved excellent performance, with accuracy exceeding 99.5%. The hybrid EfficientNetV2B0+CapsNet model achieved the highest accuracy and F1-score of 99.784%, while MobileNetV3 reached its best accuracy of 99.736%. Data augmentation was found to provide a modest performance improvement compared to training without augmentation. However, integrating CapsNet increased training time and model complexity without producing a proportional gain in classification performance, making EfficientNetV2B0+CapsNet less efficient for real-world deployment despite its highest accuracy. In contrast, MobileNetV3 offered the smallest model size and fastest inference time, positioning it as the most suitable option for resource-constrained or edge-device implementation. These findings support the development of an accurate, efficient, and automated rice disease detection system for precision agriculture.

Keyword: *Rice Plant Disease, EfficientNetV2, MobileNetV3, Capsule Neural Network, Transfer Learning.*