

Rice Seedling Quality Classification System Using the Convolutional Neural Network Method

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ABSTRACT

Rice is a key strategic food commodity in Indonesia, where crop productivity heavily depends on the quality of high-germination-rate seeds. Conventional germination testing still has limitations because it is subjective and time-consuming. This study aims to implement the MobileNetV2 Convolutional Neural Network (CNN) architecture to classify rice sprout quality into three classes: Normal Sprouts, Abnormal Sprouts, and Dead Seeds. A total of 545 images in the initial dataset, which suffered from class imbalance, were addressed using spatial augmentation techniques and an image preprocessing pipeline. The preprocessing stage plays a crucial role through the extraction of Regions of Interest (ROI) using mean-value-based adaptive binary segmentation (Mean $\times$ 2.2) and morphological operations to completely isolate the sprout objects from the background. Evaluation of the model using a confusion matrix showed that an 80:20 data split with a training cycle of 25 epochs yielded the best performance, with a test accuracy of 93.58%. Successful feature isolation during the preprocessing stage proved capable of naturally reducing bias toward the minority class without requiring an additional class weighting algorithm. The best model was then integrated into a mobile app prototype called Sprouts Scan. Accuracy testing of the system using new images by two experts yielded an average classification accuracy of 98.27%, while UAT testing showed an acceptance rate of 100%. Overall, this intelligent system has been empirically proven to improve the objectivity, accuracy, and efficiency of documentation in germination testing, thereby supporting the smooth implementation of the national seed quality certification process.

Keywords: *Rice Sprouts, Image Classification, Convolutional Neural Network, MobileNetV2, Image Preprocessing, Mobile Application.*