ABSTRACT

Manual identification of rice leaf diseases requires specialized expertise and tends to be inefficient when applied broadly. Moreover, the visual similarity among various disease types can complicate the diagnostic process. This study aims to develop an automatic classification system for rice leaf diseases using a Convolutional Neural Network (CNN) integrated into a Flutter-based Android application. The dataset consists of 15,030 rice leaf images categorized into nine classes: eight disease classes and one healthy class. The data was divided in a ratio of 80:10:10 for training, validation, and testing. The CNN model was developed using TensorFlow and Keras on the Google Colab platform, featuring three convolutional blocks and two dense layers. The training process involved image normalization and data augmentation to enhance model generalization. The model was compiled using the Adam optimizer and the sparse categorical cross-entropy loss function, and evaluated using accuracy, precision, recall, and F1-score metrics. Testing results showed an accuracy of 84.52% on the test set and the highest F1-score of 0.988 was achieved in the Tungro class. However, the variation in F1-scores across classes indicates that the model performs best for diseases with distinct visual symptoms. At the same time, performance declines for diseases with high visual similarity, such as Brown Spot, Narrow Brown Spot, and Leaf Blast. The trained model was then converted into TensorFlow Lite format and embedded into an Android application capable of offline operation. The application was tested in a limited field trial to evaluate its functionality, including user interface, responsiveness, and image input capability via camera, gallery, and live video. This testing was not intended to assess diagnostic accuracy but to ensure that the system functions effectively as an early-stage support tool for detecting rice leaf disease symptoms.

Keywords: *Rice Leaf Disease, Convolutional Neural Network (CNN), Image Classification, Android Application, Early Detection*