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DenseNet201Plus: Cost-Effective Transfer-Learning Architecture for Rapid Leaf Disease Identification with Attention Mechanisms

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Abstract

Plant leaf diseases are a significant concern in agriculture due to their detrimental impact on crop productivity and food security. Effective disease

detecting leaf diseases by introducing a new architecture called DenseNet201Plus. DenseNet201 was modified by including superior data augmentation and pre-processing techniques, an attention-based transition mechanism, multiple attention modules, and dense blocks. These modifications enhance the robustness and accuracy of the proposed DenseNet201Plus model in diagnosing diseases related to plant leaves. The proposed architecture was trained using two distinct datasets: Banana Leaf Disease and Black Gram Leaf Disease. Through extensive experimentation, we evaluated the performance of DenseNet201Plus in terms of various classification metrics and achieved values of 0.9012, 0.9012, 0.9012, and 0.9716 for accuracy, precision, recall, and AUC for the banana leaf disease dataset, respectively. Similarly, the black gram leaf disease dataset model provides values of 0.9950, 0.9950, 0.9950, and 1.0 for accuracy, precision, recall, and AUC. Compared to other well-known pre-trained convolutional neural network (CNN) architectures, our proposed model demonstrates superior performance in both utilized datasets. Last but not least, we combined the strength of Grad-CAM++ with our proposed model to enhance the interpretability and localization of disease areas, providing valuable insights for agricultural practitioners and researchers to make informed decisions and optimize disease management strategies.

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