Title: Rice Leaf Disease Classification—A Comparative Approach Using Convolutional Neural Network (CNN), Cascading Autoencoder with Attention Residual U-Net (CAAR-U-Net), and MobileNet-V2 Architectures.

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Abstract: Classifying rice leaf diseases in agricultural technology helps to maintain crop health and to ensure a good yield. In this work, deep learning algorithms were, therefore, employed for the identification and classification of rice leaf diseases from images of crops in the field. The initial algorithmic phase involved image pre-processing of the crop images, using a bilateral filter to improve image quality. The effectiveness of this step was measured by using metrics like the Structural Similarity Index (SSIM) and the Peak Signal-to-Noise Ratio (PSNR). Following this, this work employed advanced neural network architectures for classification, including Cascading Autoencoder with Attention Residual U-Net (CAAR-U-Net), MobileNetV2, and Convolutional Neural Network (CNN). The proposed CNN model stood out, since it demonstrated exceptional performance in identifying rice leaf diseases, with test Accuracy of 98% and high Precision, Recall, and F1 scores. This result highlights that the proposed model is particularly well suited for rice leaf disease classification. The robustness of the proposed model was validated through k-fold cross-validation, confirming its generalizability and minimizing the risk of overfitting. This study not only focused on classifying rice leaf diseases but also has the potential to benefit farmers and the agricultural community greatly. This work highlights the advantages of custom CNN models for efficient and accurate rice leaf disease classification, paving the way for technology-driven advancements in farming practices.

Keywords: Neural Network Architectures, Rice Leaf Disease, Cascading Autoencoder with Attention Residual U-Net (CAAR-U-Net), Mobilenetv2, Convolutional Neural Network (CNN).

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