

Title: Advancing Agricultural Diagnostics with a Hybrid Deep Learning Model for Sugarcane Leaf Disease Classification

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Abstract: Sugarcane, an essential crop for sugar production and biofuel, is susceptible to diseases that greatly affect its yield and quality. To address this, we propose a hybrid deep learning model combining ResNet152 and MobileNetV3Large to accurately classify sugarcane leaf diseases. Our method involves careful dataset preparation and data augmentation to enhance model robustness. The hybrid model leverages the strengths of fine-tuned pre-trained networks with custom layers, achieving an impressive accuracy of 98.19%, outperforming other models such as DenseNet121 (76.09%) and NASNetLarge (82.65%). The dataset includes images from ten sugarcane leaf disease classes, including healthy leaves. Thorough metrics, such as recall, precision, and F1-score, along with visualizations of training and validation results, emphasize the model's effectiveness. This hybrid model shows significant potential for agricultural diagnostics. Future work will focus on fine-tuning and exploring ensemble methods to improve accuracy and generalization across various agricultural environments.

Keywords: • Sugarcane leaf disease classification • Hybrid deep learning model • ResNet152–MobileNetV3Large • Transfer learning • Precision agriculture

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