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A robust and light-weight transfer learning-based architecture for accurate detection of leaf diseases across multiple plants using less amount of images

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Leaf diseases are a global threat to crop production and food preservation. Detecting these diseases is crucial for effective management. We introduce LeafDoc-Net, a robust, lightweight transfer-learning architecture for accurately detecting leaf diseases across multiple plant species, even with limited image data. Our approach concatenates two pre-trained image classification deep learning-based models, DenseNet121 and MobileNetV2. We enhance DenseNet121 with an attention-based transition mechanism and global average pooling layers, while MobileNetV2 benefits from adding an attention module and global average pooling layers. We deepen the architecture with extra-dense layers featuring swish activation and batch normalization layers, resulting in a more robust and accurate model for diagnosing leaf-related plant diseases. LeafDoc-Net is evaluated on two distinct datasets, focused on cassava and wheat leaf diseases, demonstrating superior performance compared to existing models in accuracy, precision, recall, and AUC metrics. To gain deeper insights into the model's performance, we utilize Grad-CAM++.

KEYWORDS

multi-leaf disease, plant leaf disease, multi-plant leaf disease, attentive-transition, attention module, lightweight architecture, robust architecture, swish activation