Deep Learning Model Based Classification of Pomegranate Fruit (*Punica granatum*) Diseases

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Abstract:

Agricultural productivity heavily relies on the health of crops, making disease management crucial. Pomegranates, in particular, are vulnerable to leaf diseases that not only diminish their yield but also contribute to substantial global crop losses. Traditional methods for disease identification tend to be slow and often lack accuracy. However, advancements in deep learning and computer vision technologies present more effective solutions for the automatic detection of crop diseases. This study focuses on applying a highly accurate deep learning model to identify pomegranate diseases, thereby aiding farmers and agricultural experts in enhancing crop health, boosting yields, and managing diseases more efficiently. The research employed a deep learning approach to classify diseases in pomegranates. Various models were trained on images of pomegranate fruit to differentiate between diseased and healthy specimens. These models included DenseNet-201, DarkNet-53, EfficientNet-b0, GoogLeNet, and ResNet-101. All models were trained using the same parameters: an initial learning rate of 0.0001, a batch size of 11, a training frequency of 5, and a maximum of 8 epochs. From these, DenseNet-201 distinguished itself as the top achiever, achieving an accuracy value of 99.21%. DarkNet-53 followed near 98.82% accuracy, while EfficientNet-b0, GoogLeNet, and ResNet-101 achieved accuracy values of 97.74%, 97.45%, and 96.86% in that order. The results show the remarkable capability of deep learning in agriculture, which promises improved crop health, increased yields, and more sustainable farming tactics. Future research could include applying these models to other crops, and diseases, improving agricultural technology, and improving food security.