ABSTRACT

Plant disease identification is crucial for maintaining agricultural productivity, as early detection can mitigate crop losses and improve overall yield quality. This study explores using EfficientNet, both in its original and modified forms, for classifying apple plant diseases based on leaf images. EfficientNet was chosen due to its scalability and efficiency, making it well-suited for agricultural applications requiring accurate yet feasible solutions. The architecture was modified by removing specific blocks to improve computational efficiency while maintaining accuracy. Experiments using datasets with complex and simple backgrounds evaluated model robustness under varied conditions, such as different lighting, background noise, and natural clutter. The modified EfficientNetB0 variant demonstrated an optimal balance of training time, accuracy, and efficiency, achieving a training accuracy of 99.10%, validation accuracy of 97.40% and a test accuracy of 84.50%, with up to 50% fewer parameters. These findings suggest that the modified EfficientNet is promising for real-world agricultural applications, especially in resource-constrained settings where computational power is limited. It offers an accessible solution for early disease detection, benefiting small-scale farmers without advanced computing infrastructure. Future work involves expanding the dataset to other crops, testing additional disease types, optimizing the model further for edge devices, and integrating it into decision-support systems for real-time monitoring and analysis.

Keywords: *EfficientNet, apple plant diseases, computational efficiency, modified EfficientNetB0*