

DEEP LEARNING-BASED DETECTION OF LEAF DISEASES IN SOLANACEAE AND ROSACEAE PLANTS

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ABSTRACT

Plant diseases pose a significant challenge in agriculture, leading to substantial yield losses and jeopardizing food security, particularly in developing countries. Traditional methods for disease identification primarily depend on manual observation and expert consultation, which can be time-consuming, inaccurate, and often inaccessible to many growers. Although there have been advancements in deep learning-based solutions for plant disease detection, most existing systems concentrate on a single crop or disease, creating a gap in practical tools for multi-crop and multi-disease detection in real-world applications. This study proposes a deep learning-based system utilizing the InceptionV3 model to identify leaf diseases in the Solanaceae and Rosaceae families, both of which are economically significant, using the PlantVillage dataset. An Android application has been developed that integrates the trained model, allowing growers to detect diseases simply by capturing images of leaves with their smartphones. The model achieved an overall accuracy of 92% on the test data, with high F1 scores for most disease classes; however, challenges remain in accurately classifying certain healthy and infected leaves. For instance, the model demonstrated a precision of 91%, a recall of 90%, and an F1 score of 90.5% across various disease categories. The system reflects the capacity to enhance the early detection of plant diseases, minimize crop losses, and promote sustainable agricultural practices, particularly in environments with limited resources. Future improvements could include enhancements in handling misclassification of specific classes and dependence on image quality. Integration of Internet of Things (IoT) devices for more comprehensive environmental monitoring and expansion of the dataset to include more plant species and diseases could further enhance the robustness and applicability of the system.

Keywords: Android, convolutional neural networks, plant disease detection, inceptionv3, multi-crop disease identification