Plant Disease Detection using Deep Learning

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Abstract:

Plant diseases pose a significant threat to agricultural productivity in Tamil Nadu, particularly for staple crops such as rice, cotton, banana, tomato, and groundnut. Traditional methods of disease identification often rely on expert knowledge, which is not always accessible to rural farmers. This project proposes a deep learning–based approach to automate plant disease detection using leaf images, enabling early diagnosis and timely intervention. A Convolutional Neural Network (CNN) model is trained on a dataset of healthy and diseased plant leaves and integrated into a user-friendly Flask-based web application. Farmers can upload leaf images via mobile or desktop devices to receive instant predictions on plant health, reducing dependency on chemical overuse and improving crop management practices.

The system emphasizes accessibility, scalability, and cost-effectiveness, empowering farmers with limited technical expertise to adopt sustainable agricultural practices. Ethical considerations, including data privacy for user-submitted images and model accuracy validation, are addressed to ensure reliability and trust. Experimental results demonstrate high diagnostic accuracy, highlighting the potential of AI to transform agricultural outcomes in both rural and urban regions of Tamil Nadu.

Future enhancements may involve expanding the dataset to include regional pest-specific diseases, integrating real-time mobile app features, and leveraging IoT sensors for continuous field monitoring.

This research underscores the role of AI in bridging technological gaps in agriculture, fostering food security, and supporting economic resilience for farming communities.