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# Plant Disease Detection Using Deep Learning

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**Abstract:** *Agriculture contributes enormously to global food security, but crop diseases result in huge yield losses every year, compromising food production globally. Conventional disease identification practices depend mostly on visual inspection by agricultural specialists, which is time-consuming, subjective, and not accessible to small farmers. Deep Learning (DL) has come forward as a revolutionary technology to implement automated plant disease detection with the promise of quick, precise, and scalable applications. This work introduces an end-to-end deep learning-based plant disease detection and classification system using Convolutional Neural Networks (CNNs). The system applies transfer learning using pre-trained networks like VGG16, ResNet50, and MobileNetV2 with a high accuracy and efficiency in computations. The system takes leaf images using smartphones or Internet of Things (IoT)-based cameras, performs processing using a trained CNN model, and makes real-time diagnosis along with treatment suggestions. Experimental outcomes show classification accuracy of over 95% for various crop species like tomato, potato, apple, and corn. Combining this technology with IoT devices and mobile applications facilitates farmers to make prompt decisions based on accurate information, saving losses on crops and ensuring eco-friendly farming. This work contributes to precision agriculture by narrowing the gap between cutting-edge AI technologies and effective farming requirements.*

**Keywords**: Deep Learning, Convolutional Neural Networks, Plant Disease Detection, Precision Agriculture, Transfer Learning, Computer Vision, IoT, Smart Farming.


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