Optimizing Plant Health Monitoring with Machine Learning and Deep Learning

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This paper highlights how Artificial Intelligence (AI) can revolutionize the detection of plant diseases in agriculture to address the urgent need for effective solutions. As the population is rapidly growing and food demand rising, protecting the crops and boosting the yield is crucial. Traditional detection methods are slow and laborious and require specialized knowledge limited to a few, resulting in substantial economic and environmental harm. AI-driven plant disease detection provides numerous advantages to overcome agricultural challenges by making use of machine learning and deep learning. As these models have continuous learning capabilities, they improve over time, enhancing their effectiveness and adaptability. Real-world examples show how using AI to detect plant diseases helps farmers grow more food while using fewer pesticides. The proposed idea involves using the machine learning algorithm Random Forest along with feature extraction techniques like Hu Moments, Haralick Texture and Color Histogram to detect plant diseases. This approach offers several benefits over traditional methods such as enhanced accuracy, efficiency and scalability. The project is divided into five major phases: dataset acquisition, image preprocessing, segmentation, feature extraction and classification. The dataset used in this model is the New Plant Diseases Dataset, recreated from the original PlantVillage Dataset using offline augmentation. The proposed system produces output with an accuracy of 96.12%. The model is then incorporated into a website to allow easy access to users. Moreover, the website provides solutions to various classes of diseases present in the New Plant Diseases Dataset. The project is designed for the binary classification of plant images which identifies them as either healthy or diseased. To enhance the system to detect which class the disease belongs to, deep learning techniques like Convolutional Neural Network will be implemented. Deep learning algorithms such as CNN can handle larger datasets and produce results with greater accuracy and precision.

Keywords: Artificial Intelligence, Agriculture, Machine Learning, Deep Learning, Random Forest