

Deep Learning Based Automated Crop Pest Detection Using Image Processing

P. S. M. Veena

Department of ECE, Anil Neerukonda Institute of Technology and Sciences. Visakhapatnam, India

K. Sai Ganesh

Department of ECE, Anil Neerukonda Institute of Technology and Sciences. Visakhapatnam, India

M. Mehar Manas

Department of ECE, Anil Neerukonda Institute of Technology and Sciences. Visakhapatnam, India

K. Devi Prasad

Department of ECE, Anil Neerukonda Institute of Technology and Sciences. Visakhapatnam, India

Abstract

To get the crop yield and maintain quality standards in farming it is crucial to detect plant diseases and pests early and accurately. Traditional methods that rely on checks or old image analysis techniques are often not good enough because they are costly, subjective and cannot handle changes in the environment. In years deep learning, especially convolutional neural networks has greatly improved the automation and reliability of crop plant disease and pest identification. This review looks at how research has moved from digital image processing to modern deep learning techniques highlighting the benefits of new architectures. It shows how disease and pest symptoms can now be classified detected and segmented with accuracy. There are convolutional neural network approaches, such as ResNet, DenseNet, Mobile Net V2, AlexNet, VGG and Inception-art networks that are suitable for use in real-time on-device or edge-computing scenarios, which are common in farming. These methods can achieve classification accuracy when trained on large datasets rivaling the performance of more complex models while using fewer resources. The review also looks at open-access datasets and evaluates the performance of various deep learning frameworks noting the pros and cons of different methodologies. Key challenges in this area include dataset imbalance, environmental variation and the visual complexity of field conditions. Potential solutions, such as data augmentation and attention mechanisms are discussed. Overall, the survey highlights the deep learning models that are revolutionizing plant health monitoring by offering scalable and accessible solutions for automated crop protection and management.

Index Terms

Deep learning, Object detection, Plant Diseases and Pests, Classification, Convolutional Neural Network