

# SMART AGRICULTURAL MONITORING SOLUTION FOR CHILLI LEAF DISEASES USING A LOW-COST KINECT CAMERA AND AN IMPROVED CNN ALGORITHM

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## Graphical abstract



## Abstract

Chilli is extensively grown all over the globe and is particularly important as a food. One of the most difficult issues confronting chilli cultivation is the requirement for accurate identification of leaf diseases. Leaf diseases have a negative impact on chilli production quality, resulting in significant losses for farmers. Numerous Machine Learning (ML) and Convolutional Neural Network (CNN) models have been developed for classifying chilli leaf diseases under uniform background and uncomplicated leaf conditions, with an average classification accuracy achieved. However, a diseased leaf usually grows alongside a cluster of other leaves, making it difficult to classify the disease. It will be easier for farmers if there is a reliable model that can classify a chilli leaf disease in a cluster of leaves. The aim of this study was to propose a model for classifying chilli leaf disease from both a uniform background and a complex cluster of leaves. Images of diseased chilli leaves are acquired using a low-cost Kinect camera, which include discoloration, grey spots, and leaf curling. The different types of chilli leaf disease are then classified using an improved ShuffleNet CNN model. With a classification accuracy of 99.82%, the proposed model outperformed the other existing models.

**Keywords:** Chilli, leaf disease, Machine Learning, Convolutional Neural Network, ShuffleNet

## Abstrak

Cili ditanam secara meluas di seluruh dunia dan amat penting sebagai makanan. Salah satu isu paling sukar yang dihadapi dalam penanaman cili adalah keperluan untuk mengenal pasti penyakit daun dengan tepat. Penyakit daun memberi kesan negatif terhadap kualiti pengeluaran cili sehingga mengakibatkan kerugian yang