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## Plant Leaf Disease Detection and Classification

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### Abstract

**Background:** Agriculture is a major contributor to economic growth in a developing country like India and provides employment to about 60% of the population. Technological applications will help farmers detect leaf diseases in a timely fashion because the traditional methods require manual investigation on a daily basis. The problem of plant leaf disease detection needs attention in order to help farmers prevent crop damage and thereby minimize economic and revenue losses. Some of earlier proposed algorithms have been studied such as an automated system developed by (Rokeya Mumtahana Mou et al., 2018) using SVM with features for detecting three types of tea leaves diseases, groundnut color leaf disease extraction, and classification using color imagery by (Ramakrishnan.M et al., 2015), etc.

**Objectives:** This paper proposes a new approach to detect plant leaf diseases using Neural Networks and Image Pre-processing. Though there are different algorithms established, but high accuracy, precision, and recall over a variety of datasets is an important factor under consideration.

**Methodology:** The proposed approach is an extension of the single-phase model discussed and uses two-phase training. The first part of the model which is CNN based is built using the hybrid inbuilt InceptionResNetV2 model trained on ImageNet and a spatial global average pooling layer is added. The second part of the model which is RNN based is developed using Long Short Term Memory Networks (LSTM) including a Reshape step in between.

**Results and discussion:** The accuracy results of the proposed approach on potato and cotton leaf datasets are approximately 0.97, which is higher than the algorithms like CNN, SVM, KNN, and LR, that have been studied and presented. The comparison is done on the basis of accuracy, precision, recall, and F1-score on potato and cotton leaf datasets. An illustration of the confusion matrix for the cotton leaf dataset has been presented.

**Conclusions and future work:** Thus, we proposed a novel approach to detect diseased leaves in plants across different datasets. The proposed algorithm can be applied to a variety of other datasets as part of future scope work.

