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**CropDoc: A Deep Ensemble Learning Approach for
Plant Pathology Detection**

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Abstract

Sri Lanka is a country with a rich background in agriculture that was called the ‘Granary of the east’, which resembles the rich agricultural status of the country. Agriculture plays a vital role in the economic growth and balance of the country however, the agriculture domain faces many challenges like diseases, pest attacks, nutrition deficiencies, climate changes, etc. Due to these challenges, about 30% of the crop cultivation gets destroyed annually. Most of these challenges can be identified and controlled at an initial stage by correct identification and management, however, due to the lack of knowledge among the agricultural community and communication between agricultural officers and farmers, these challenges still pertain in the current society.

Different research projects have been carried out on identifying plant pathologies in the past few years. However, there are still some research gaps that need to be fulfilled which will be tried to achieve through this research. A deep ensemble neural network approach is proposed for the pathology classification in this paper using a customized dataset from a few sources. As the base models of the ensemble approach, Keras pre-trained models were imported and modified for a better performance using transfer learning. Few base models were tested for the performance and ResNet50, DenseNet121, and EfficientNetB0 were selected as the base models considering their relatively high performance. Stacking was used as the ensemble approach and average output from each base model was utilized in the ensemble model.

All base models and ensemble model were trained and tested using training and testing datasets and the ensemble model was able to outperform all the pre-trained base models by achieving 99.5%, and 99.1% training and testing accuracies respectively. The implemented approach had a high success rate however, this approach could be further improved so that it can be applied in more image classification problems in different domains.

Keywords: Deep Learning, Ensemble Learning, Transfer Learning, Convolutional Neural networks, Image Classification, Plant pathologies

Subject Descriptors:

- Computing methodologies ~ Artificial Intelligence ~ Computer vision
- Computing methodologies ~ Machine learning ~ Neural networks
- Computing methodologies ~ Machine learning ~ Transfer learning
- Applied computing ~ Computers in other domains ~ Agriculture