


# Chapter 10

## GUI-Based End-to-End Deep Learning Model for Corn Leaf Disease Classification


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### ABSTRACT

*Food security is a major problem worldwide. Ensuring that the crops produced are both safe and wholesome is crucial not only for people as the ultimate consumers of the crops, but also for farmers. Plant diseases are responsible for a significant percentage of crop losses. This alleviates the need for a fast and accurate model to discriminate and identify plants with diseases. The base chapter chosen aims to achieve the same through deep learning. The data set used in the work was obtained from Plant Village Dataset. The work customizes deuce pre-trained models, EfficientNetB0 and DenseNet121, to citation the traits of the plants. The extracted traits are then fused together through concatenation to allow the model to read the more meaningful crop trait data. This also ensures that the different sets of feature data read by the two models compensate for any feature loss during extraction. It turns out that the above method gives better results associated to other models.*

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## 1. INTRODUCTION

Food Security indicates the availability of food at all times and the accessibility of individuals to it. According to an article published in 'Agronomy' - factors that influence crop yield and hence food security can be grouped into three categories namely technological, biological and environmental. The amount of influence of each of these factors on crop production again varies based on region to region and crop to crop. In these factors plant diseases make up a major part of the biological group with pests, weeds and insects. It is estimated by FAO that annually the loss due to pests is up to 40% of global crop production. Every year, the global economy is affected by over \$220 billion due to plant diseases and a minimum of \$70 billion due to invasive insects. Especially in a highly populated country like India, which is one of the largest producers of most food crops around the world, the threat to food security is even more imminent. Hence it is imperative that new and better methods to identify plant diseases are explored.

Deep Learning, a subset of machine learning, is in use across the various industries ranging from driving to medical devices. Deep learning at its root is a neural network with layers. These layers attempt to replicate the neural functioning of the human brain to enable it to process and learn from large amounts of data. One of the key recomences of using deep learning algorithms apart from the large amounts of data it can work with is the kind of data it can work with. Deep Learning algorithms cannister progress unstructured data, for example text and images. It mechanizes feature extraction reducing the involvement of humans and also performs pattern analysis and data classification.

The traditional methods of detecting plant diseases involve visual inspection and later detailed detection in the laboratory. This process is both time-consuming and accessible to farmers from different economic backgrounds, such as B. small farmers, not accessible. This involves the development of automated and intelligent illness detection systems that deliver faster findings and are more accessible through the use of diverse technologies such as artificial intelligence, machine learning, and deep learning. Deep learning techniques gather features from pictures and then utilise these functions to conduct classification or regression as needed.

The proposed work is a unique classification model to correctly categorize corn leaves from digital images of gray spot, leaf rust, northern leaf blight and healthy leaves. This study uses two pre-trained deep convolutional neural networks (DCNNs), EfficientNetB0 and DenseNet121. Appropriate parameter selections and feature fusion techniques are used to combine the predictive capabilities of the two models and create an end-to-end classification model Our primary contributions are as follows:

- Characteristics are retrieved from two separate models and merged.
- A appropriate amount of parameters increases classification accuracy.

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