# Chapter 2
# A Smart Agronomy:
## Deep Learning Process for Recognition and Classification Plant Leaf Diseases

**Chandra Prabha Ramakrishnappa**

http://orcid.org/0000-0003-4236-2782

*BMS Institute of Technology and Management, India*

**Seema Singh**

*BMS Institute of Technology and Management, India*

## ABSTRACT

*The main part of the agriculture process is the timely detection of leaf diseases to have a healthy growth. In routine implementation, the identification of diseases is realized either by manual or laboratory testing. Physical testing involves few expertise and results could vary from individuals which can result in false interpretation while the latter requires extra time and might not be able to deliver the production, due to which the spread of disease gradually increases. Hence an automated system is required for the identification and classification of the disease. This chapter intends leaf sickness detection and recognition by applying deep learning for two data split ratios. The classification task is performed using Alex-net, a pre-trained architecture. The data set has three categories of leaf disease, namely, bacterial leaf blight, brown spot, and leaf blast, each consisting of 40 infected images. The proposed architecture classifies the diseases into three categories. The comparison study for various performance metrics—such as recall, precision, and specificity—is measured.*

## INTRODUCTION

Agriculture is a major source of national wealth in many countries. Crop diseases are important causes of decreased quantity and quality of production; thus, recognising plant diseases is critical. Disease signs can appear in several areas of the plant; nevertheless, plant leaves are frequently utilised to identify diseases. Early and correct diagnosis is an important first step in reducing losses caused by plant diseases. An inaccurate diagnosis might lead to poor management decisions, such as using the wrong chemical application, potentially resulting in additional health loss and production decline. The unaided

eye method is a classic way of illness identification that involves a lot of labour, is prone to human error, takes a long time, and is not suitable for big fields.

An underdeveloped growth in plants due to various plant diseases causes a dreadful effect on the profit and yield in society. Due to this underdeveloped growth, financial damage valued all over the world is up to $20 billion per year. (Ahmed, K., Shahidi, T. R., Alam, S. M. I., & Momen, S. (2019)). Accurate identification is very challenging due to various geographical conditions and other reasons. Also, the conventional methods that are used in most farming areas largely depend on specialists in the domain, experience, skill set, and manual testing. Many of the methods are costly, consume more time, and are labor-intensive with the pain of identifying precisely (Ahmed, K., Shahidi, T. R., Alam, S. M. I., & Momen, S. (2019)). Hence, a quick, accurate plant disease classifier is greatly essential to support the agriculturalists which consecutively leads to the growth of occupational and ecosystem agriculture. There are many issues such as animate or abiotic causes, Nutrient deficiency, leaf disease, Microorganisms, and environmental changes that constrain plant growth.

*Figure 1. Rice leaf diseases*



Figure 1 illustrates a few rice leaf categories Here the plant leaf disease is one of the factors to hinder the plant growth c identification model using the pre-trained - deep learning algorithms designed to answer the listed issues Sladojevic, S., Arsenovic, M., Anderla, A., Culibrk, D., & Stefanovic, D. (2016).A few rice leaf infections such as rice blast, rice brown spot, rice sheath blight, rice bacterial leaf blight, rice bacterial sheath rot, rice bakanae disease, rice sheath rot, and rice bacterial wilt (Rahman, C. R., Arko, P. S., Ali, M. E., Khan, M. A. I., Apon, S. H., Nowrin, F., & Wasif, A. (2020)).

In the proposed design the three-leaf disease namely Leaf smut, Bacterial blight, and Leaf Blast is considered for the classification. Brown Spot and Leaf Blast are prominent leaf infections. Bacterial Leaf Blight and brown are taken as the most projecting and unsafe rice leaf infection. Leaf smut is triggered by fungal Pyricularia grisea. The leaf blades have small black linear lesions and leaf tips may turn grey and dry. Bacterial blight is caused by the bacteria Xanthomonas oryzae. It is elongated lesions near the leaf tips and margins and gradually turns white to grey due to fungal attack. Brown spot is caused by the fungus Helminthosporiose. The structure has round to oval designed lesions and a dusky auburn colored on rice leaves (Ahmed, K., Shahidi, T. R., Alam, S. M. I., & Momen, S. (2019)).

The rice quality and profit decrease due to these leaf diseases. An effective and accurate diagnosis will increase the profit and quality. Effective diagnosis includes monitoring of the diseases, their occurrences, and frequencies through manual observation.

16 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/a-smart-agronomy/350030

## Related Content

Adaptive Neuro-Fuzzy Inference System in Agriculture
K. Aditya Shastryand Sanjay H. A. (2020). *Fuzzy Expert Systems and Applications in Agricultural Diagnosis (pp. 130-153).*
www.irma-international.org/chapter/adaptive-neuro-fuzzy-inference-system-in-agriculture/233219

The Influence of Common Agricultural Policy (CAP) on Development of the Agricultural Production Structures in Romania and EU-28
Andrei Jean-Vasile, Mihai Mieilaand Alexandra Smoleanu (2015). *Agricultural Management Strategies in a Changing Economy (pp. 52-79).*
www.irma-international.org/chapter/the-influence-of-common-agricultural-policy-cap-on-development-of-the-agricultural-production-structures-in-romania-and-eu-28/125985

Exploring the Potentials of Antioxidants in Retarding Ageing
Minu Kesheri, Swarna Kanchanand Rajeshwar P. Sinha (2017). *Examining the Development, Regulation, and Consumption of Functional Foods (pp. 166-195).*
www.irma-international.org/chapter/exploring-the-potentials-of-antioxidants-in-retarding-ageing/165949

Advances in Innovative and Emerging Technologies in Food Processing
Mahesh Pattabhiramaiahand Shanthala Mallikarjunaiah (2023). *Impactful Technologies Transforming the Food Industry (pp. 1-32).*
www.irma-international.org/chapter/advances-in-innovative-and-emerging-technologies-in-food-processing/329474

Green Economy and Sustainable Development
Elvira Nica (2015). *Agricultural Management Strategies in a Changing Economy (pp. 337-356).*
www.irma-international.org/chapter/green-economy-and-sustainable-development/125997