

Chapter 4

Plant Disease Classification in Segmented Images Using Computer Vision

Rajashri Roy Choudhury
Brainware University, India

Piyal Roy
Brainware University, India

Shivnath Ghosh
Brainware University, India

ABSTRACT

Agriculture productivity has a significant impact on the lives of people and economies because of the growing human population. In agriculture, plant diseases are a big problem since they result in severe crop losses and financial hardship for farmers. Traditional disease detection and categorization methods take a long time and are subjective, so automated and effective methods are required. Computer vision techniques have recently shown promise as tools for classifying plant diseases. To provide a precise and dependable system for disease detection and management, this article gives a thorough study on computer vision approaches for plant disease categorization. The research uses a variety of approaches, such as feature extraction, image pre-processing, and machine learning algorithms. Benchmark datasets are used for comparative study and performance evaluation of various methods. The outcomes show how effective computer vision techniques are at precisely diagnosing and categorising plant diseases.

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1. INTRODUCTION

The goal of this research article is to establish a trustworthy system for the precise diagnosis and classification of diseases. It does this by investigating computer vision approaches for plant disease classification. Automating disease diagnosis enables prompt responses, which improves resource allocation and reduces environmental impact. In order to assess their effectiveness and applicability in agriculture, the article examines image preprocessing, feature extraction, and machine learning techniques. To overcome the drawbacks of conventional techniques, computer vision provides non-destructive, quick, and accurate illness identification. It can help with early warning systems, disease surveillance, and effective monitoring of expansive crop fields. Discussions of the methodologies used, benchmark datasets, and comparative analysis are made, assessing strengths and weaknesses. The study concludes an impact on crop management as well as potential improvements in the classification of plant diseases based on computer vision. This study advances our understanding of the subject by demonstrating how computer vision has the power to transform the way that diseases are managed, increase agricultural productivity, and guarantee food security around the world.

1.1 Background and Significance

Plant diseases are a danger to global food security and agricultural output. Traditional disease diagnosis techniques take a lot of time and are subjective. The method of identifying and categorising plant diseases has, however, been substantially enhanced by recent developments in deep learning and machine learning. The performance of convolutional neural networks (CNNs) in image recognition tasks, such as plant pathology, has been exemplary [1]. The accurate classification of plant diseases using annotated plant images is made possible by deep learning models' ability to automatically learn complicated properties from vast datasets [2]. Deep learning algorithms have several significant advantages when used to classify plant diseases. The ability to recognise infections early enables timely control actions before they spread and cause significant harm. Second, by incorporating deep learning models into intelligent agricultural systems, it is possible to monitor plant health in real-time, giving vital information for focused interventions and efficient resource use [4]. Thirdly, by enabling farmers to select suitable treatments and disease-resistant crop varieties, precise disease categorization promotes efficient disease management and yield optimisation. This lowers the need for chemicals, lessens the impact on the environment, and increases agricultural yields [3]. Fourthly, the incorporation of deep learning-based disease classification models into decision support systems might help plant pathologists and farmers make well-informed choices regarding

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