



Chapter 1

Deep Learning Techniques for Smart Agriculture Applications


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ABSTRACT

With an emphasis on the rapid and accurate diagnosis of plant and fruit diseases, researchers have been looking into sustainable agriculture utilizing cutting-edge deep learning techniques. The objective is to show how effective deep learning algorithms can revolutionize the agricultural industry. Automated illness detection is the main area of focus, where advances in image processing and computer vision techniques enable precise and quick identification while lowering labor requirements and associated costs. In order to identify plant and fruit diseases in a sustainable manner, this project intends to explore the possibilities of deep learning algorithms in detecting diseases from the leaves of agricultural plants using pre-trained deep convolutional neural network. This book chapter provides informative information on the use of deep learning in smart agriculture and a significant resource for researchers, professionals, and students interested in sustainable farming and intelligent agricultural systems.

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1. INTRODUCTION

In order to overcome the difficulties associated with the identification of plant and fruit diseases within the context of sustainable agriculture, researchers have recently shown an increased interest in applying cutting-edge deep learning approaches. By increasing the efficiency and precision of disease detection, the agriculture business will undergo a transformation. Growing emphasis on utilizing cutting-edge technologies plays an important role in development of smart agriculture. The Internet of Things (IoT), big data, and deep learning frameworks are just a few of the cutting-edge technologies that academics are integrating to improve agricultural practices. We'll focus on how modern world technologies, like big data, machine learning, and deep learning frameworks, may boost agricultural systems' effectiveness and efficiency. As automation of disease detection is a crucial component of managing plant and fruit diseases, this will be our key area of concentration.

In order to identify plant and fruit diseases in a sustainable manner, this project intends to explore the possibilities of deep learning algorithms in detecting diseases from the leaves of agricultural plants since leaves are important in detecting plant diseases because they often show visible signs of sickness. Changes in leaf color, shape, and texture can indicate that a plant is infected. By closely examining the leaves, we can look for spots, discoloration, wilting, or unusual patterns that suggest the presence of a disease. Leaves also help us identify the specific disease and make decisions on how to manage it. Monitoring the progression of symptoms on the leaves helps us understand the effectiveness of treatments and interventions. Our study will concentrate on automating disease detection from the leaves using the Pre-Trained Deep Convolutional Neural Networks. We will also study these pre-trained models which are already trained with lots of images. We will emphasize the benefits and drawbacks of these technologies in the context of sustainable agriculture through the outcomes analysis.

Figure-1 depicts a deep learning framework for plant disease detection and control. By improving the effectiveness and precision of diagnosis of these leaves, the deployment of these cutting-edge technologies has the potential to transform agricultural practices. The approach used to examine the performance of deep learning algorithms in disease diagnosis through leaves will be covered in the following sections of this study. In order to emphasize the possible advantages and disadvantages of these technologies in the context of sustainable agriculture, we will present and analyze the results achieved.

The overall goal of this research project is to highlight how machine learning and deep learning algorithms can revolutionize the agricultural industry. By utilizing cutting-edge technologies, we can open the door for a more effective and long-

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