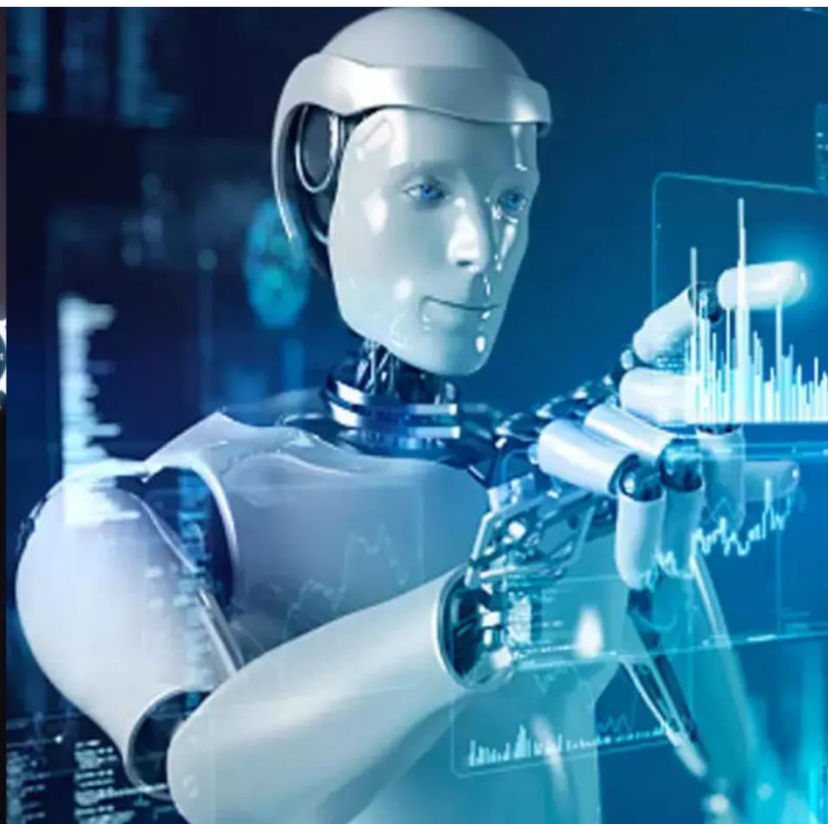




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Review Paper on Fruit Disease Detection

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ABSTRACT: Fruit crop health is critical to maintaining a consistent food supply, and the agricultural sector is essential to maintaining global food security. Fruit infections are a serious danger to crop quality and productivity, thus early detection and control are crucial. Artificial intelligence and technology have revolutionized fruit disease diagnosis in recent years, providing more precise and effective solutions. An overview of the methods and difficulties involved in fruit disease detection is given in this abstract. The several approaches used in fruit disease detection, such as computer vision, machine learning, and sensor-based techniques, are highlighted in this review. Deep learning techniques in computer vision have made it possible to automatically identify disease symptoms through image analysis. Neural networks and support vector machines are examples of machine learning models that have been used to categorize illness categories, forecast disease severity, and aid in disease management decision-making. Electronic nose devices and hyperspectral imaging are examples of sensor-based methods that provide non-invasive, real-time fruit health monitoring. Fruit disease detection methods have advanced, however there are still a number of issues. These include the necessity for reliable and transferable models, data collection and labeling, scalability, and technology integration. Additionally, infrastructure, resource limitations, and the digital divide in agricultural areas may need to be addressed before these technologies can be implemented in the field.

KEYWORDS: CNN, Convolutional neural network, Deep learning, analyzing visual imager

I. INTRODUCTION

Ensuring the health and quality of fruits is crucial for both farmers and consumers in modern agriculture. Fruits are vulnerable to a number of illnesses brought on by bacteria, fungus, viruses, parasites, and environmental elements. Crop output, shelf life, and economic sustainability can all be greatly impacted by these diseases. The implementation of suitable preventive or therapeutic interventions depends on the prompt discovery and diagnosis of these disorders. Conventional fruit disease detection techniques frequently entail expert manual inspection, which is labor-intensive, subjective, and error-prone. However, by examining digital photos of the fruit surfaces, automated systems that effectively and precisely identify fruit illnesses can be created thanks to developments in image processing and computer vision. In this study, we concentrate on using image processing methods to identify fruit illnesses.

We will use DSLR or smartphone cameras to take high-resolution pictures of fruit samples. To find patterns and characteristics linked to various illnesses, these photos will be examined using complex algorithms and machine learning models. A crucial component of contemporary horticulture and agriculture is the diagnosis of fruit diseases. Fruit crop diseases are identified, diagnosed, and controlled using a variety of technologies and methods. Crop yield, quality, and overall agricultural productivity can all be significantly impacted by these diseases. For sustainable food production, lowering financial losses, and guaranteeing that customers have access to high-quality fruit, it is essential to identify and control these illnesses. Fruit disease detection is a crucial aspect of agriculture that is developing along with technology, eventually improving crop health, production, and financial stability for farmers and the agricultural sector overall.

II. LITERATURE SURVEY

Mukesh Kumar Tripathi et al.: In this paper, we examine the paper broadly related to fruits and vegetables among various horticulture products of agriculture fields, specific model, data pre-processing, data analysis method and overall value of performance accuracy by using a particular performance metric. Moreover, we study the different type of disease present in various fruit and vegetable. We have also focused on the comparison of different machine learning approach with respect to different performance metrics on the same dataset.

R. Thanusri et al.: This RESNET 152 deep CNN-based model has been created to assess the mellowness of the dragon fruit. Training and testing processes were carried out using the live photos captured on the varying stages of the dragon fruit. Contrary to the VGGNET, where accuracy decreases because the network becomes complicated and the number of epochs gets higher, the results obtained showed greater precision in testing and training even in the expanded number of epochs.

Guobin Shi et al.: The following are the conclusions from this study: 1. The proposed on-board image processing algorithm demonstrated the best apple segmentation performance among tested algorithms (i.e., algorithm-1 and algorithm-2) with the highest segmentation accuracy of 57.78% for three clusters ($k=3$) using k-means++ classifier. The customized algorithm had missing and segmentation errors of 12.09% and 0.13%, respectively.

Tharindu Dharmasena et al.: This paper proposes a automated system to optimally control the climate and irrigation in a greenhouse by monitoring temperature, soil moisture, humidity and pH through a cloud connected mobile robot which can detect the unhealthy plants using image processing. A fuzzy controller will control the heating and cooling system, irrigation system and humidifiers installed in the greenhouse based on the sensor readings.

J. Rex Fiona et al.: In this paper, we have analyzed the various applications of image processing in field of agriculture pertaining to areas such as crop analysis, detection and identification of plant diseases.

Santhosh Kumar S et al.: Farmers are unaware of what kind of crops that grows well on their land. When plants are affected by heterogeneous diseases through their leaves that will effects on production of agriculture and profitable loss. Also reduction in both quality and amount of agricultural production. Leaves are important for fast growing of plant and to increase production of crops. Identifying diseases in plants leave is challenging for farmers also for researchers.

Mehmet Metin Ozguven et al.: Recently, potential use of image processing and machine learning for disease detection in plants and leaves has been extensively explored by several researchers. Despite several methods and computer algorithms developed in this area of research, there is still room for improved achievements. Majority of previous models address only a couple of morphological attributes of the diseased areas. In present study, Updated Faster R-CNN model, developed by changing the parameters of CNN architecture, was used in order to automatically detect diseased areas in sugar beet leaves

Vippon Preet Kour et al.: In this study the authors have proposed Fuzzy Rule-Based Approach for Disease Detection (FRADD) for detection and classification of the most prevalent apple diseases in Kashmir valley (particularly apple scab). The basic steps of FRADD. In this approach, different stages are involved from image collection to the classification and these steps are depicted below. The framework of the proposed approach.

V S Magomadov et al.: Deep learning is a data analysis and image-processing method, which has recently gained a lot of attention as a tool, which has great potential and promising results. There are many different fields that deep learning has been applied to and it is also being applied to the field of agriculture. The purpose of this paper is to explore deep learning in terms of agriculture and food production. The performance of deep learning in agriculture is the focus of this paper comparing it to other existing artificial intelligence models, which have been used in agriculture.

Prabira Kumar Sethy et al.: In this paper it suggests a method of dissimilar disease cataloguing for the green foliage identification of the infected plants. It also recommends and assesses an instinctive image dissection and cataloguing techniques by framing a layered set of rules for the infected plants. From the execution point of view, the proposed methodology was tried and verified on various kind of rice leaf diseases like bacterial blight, brown spot, leaf scald and leaf blast successfully.

Gap Analysis:

- A gap analysis in the context of disease detection in fruits using image processing involves identifying the existing challenges, limitations, and areas that require improvement or further research.
- Insufficient and imbalanced datasets can hinder the development of robust disease detection models.
- Preprocessing techniques may not adequately address noise, variations in lighting, or quality issues in images.

- Traditional feature extraction techniques may not capture all relevant features necessary for accurate disease detection.
- The performance of disease detection models may not be optimal due to limited training data and suboptimal model architectures.

III. CONCLUSION

Plants must be free of disease and pests in order for humans to contribute significantly to the global economy and for farmers and agriculturalists to lead contented, prosperous, and healthy lives. These things are indeed achievable with the help of image processing and the proposed technique. CNN algorithms provide a straightforward way to identify fruit diseases and help distinguish between healthy and unhealthy fruit. Based on these methods and algorithms, this strategy may use image processing techniques to swiftly identify and categorize the fruits. Increasing the value of fruit disease detection is the primary objective of our initiative.

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