CROP DISEASE DETECTIONUSING MACHINE LEARNING

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Abstract

Crop diseases pose significant threats to global food security, affecting agricultural productivity and livelihoods. Traditional methods of disease detection often rely on manual inspection, which can be time-consuming and subjective.

In recent years, the advent of machine learning (ML) techniques has revolutionized crop disease detection by enabling automated and accurate identification of plant diseases. This paper presents a comprehensive review and analysis of the state-of-the-art ML approaches for crop disease detection.

We discuss various aspects including dataset acquisition, feature extraction, model selection, and evaluation metrics. Furthermore, we highlight challenges and opportunities in the field, such as dataset scarcity, model interpretability, and scalability. Through this review, we aim to provide insights into the current landscape of crop disease detection using ML, and offer guidance for future research directions to enhance agricultural sustainability and food security.

Crop diseases are caused by pests, insects, and pathogens, and if not promptly handled, they significantly reduce the yield. Farmers are losing money because of different crop diseases.

Introduction

This introduction sets the stage for discussing the significance of ML in crop disease detection, highlighting the limitations of traditional methods and the potential benefits of adopting ML techniques. Subsequent sections will delve into the methodology, challenges, and future prospects of utilizing ML for crop disease detection, aiming to provide insights into how this technology can contribute to sustainable agriculture and global food security.

The results show that the existing models are not sufficiently accurate for plant disease detection and classification of images collected directly from the field, although the classification task results for FieldPlant are better than those for PlantDoc.

Machine learning-based crop disease detection and classification techniques have gained significant attention in agriculture for early and accurate diagnosis of plant diseases. These techniques utilize various algorithms and data sources to help farmers and researchers identify, monitor, and manage crop diseases.

Literature survey

The paper " Crop disease detection " :FieldPlant Implementation: Crop disease images were collected from plantations and grouped by plant pathologists into folders according to the plant and the disease identified on the leaf. The annotation process was done using Roboflow, each image was annotated by specifying the disease class in its leaves. Two steps of annotations checking were set up before the publication of the datase

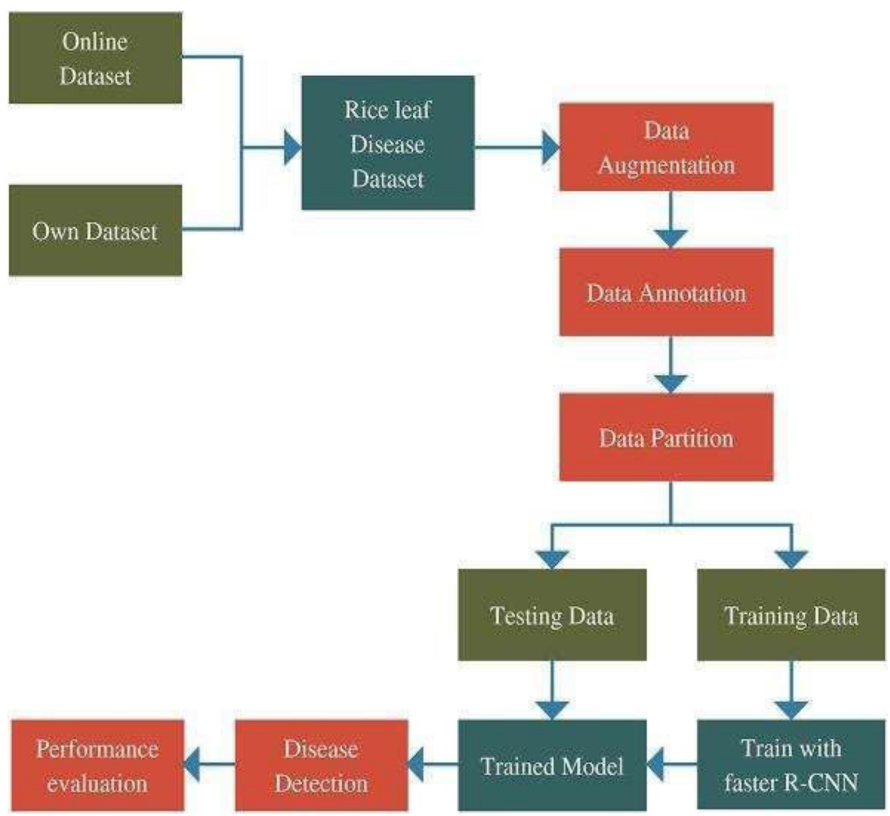
In contrast to conventional machine-learning techniques, deep learning can automatically learn the hierarchical features of pathologies. This eliminates the need to separately design the morphological operations of feature extraction for future classification. Therefore, we present the recent research on convolution neural networks for plant disease detection and classification.

Once images are collected in the field, they are made available to the plant pathologist, who then groups them into folders according to the plant and the disease identified on the leaf. Blurred images or images irrelevant to the study were ignored.

System Design

Gather a diverse dataset of images showing healthy crops and crops affected by various diseases. Clean and preprocess the images to remove noise and standardize them for better model performance. Extract relevant features from the images using techniques like convolutional neural networks (CNNs) to capture patterns indicative of different diseases.

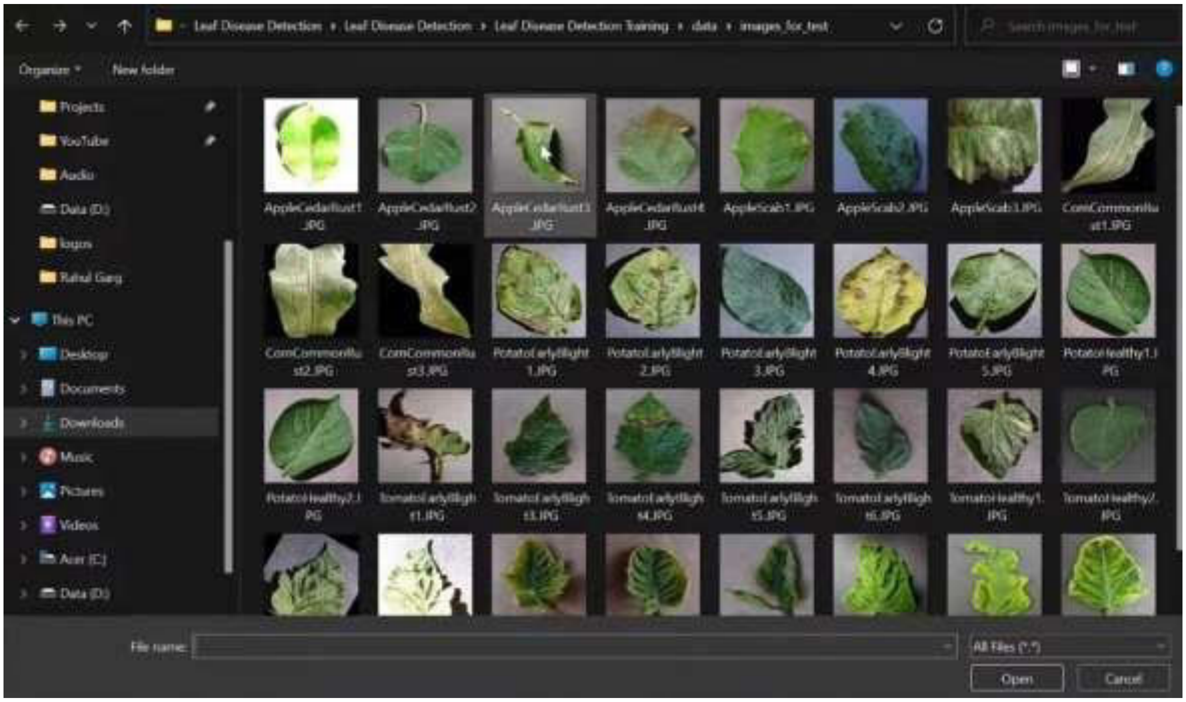
Train a machine learning model, such as a CNN, on the labeled dataset to learn the patterns associated with different crop diseases. Evaluate the trained model using metrics like accuracy, precision, recall, and F1-score to assess its performance. Deploy the trained model to a production environment, which could be a web application, mobile app, or embedded system, depending on the target platform. Integrate the deployed model with the user interface for seamless interaction with end-users. Continuously update the model with new data to improve its accuracy and robustness over time.



Implement a feedback loop mechanism where users can report misclassifications, helping to improve the model further.

Ensure that the system is scalable to handle increasing loads and maintainable for long-term usage by monitoring performance and updating dependencies as needed.

Snapshots


Leaf Disease Detection › Leaf Disease Detection › Leaf Disease Detection Training › data › images_for_test
Organize
New folder
Projects
YouTube
Audio
Data (D:)
logos
Rahul Garg
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Acer (C:)
Data (D:)
File name:
All Files (*.*)
Open
Cancel


Leaf Disease Detection
Choose File
No file chosen
Predict Leaf Disease
Original Image
Predicted Disease: Tomato__Septoria_leaf_spot

Conclusion

In conclusion, employing machine learning for crop disease detection offers promising avenues for enhancing agricultural productivity and sustainability. By leveraging advanced algorithms and data-driven approaches, such systems can accurately identify and diagnose plant diseases in real-time, enabling timely interventions and targeted treatments. Additionally, the integration of such technologies into existing agricultural practices has the potential to revolutionize crop management, minimizing yield losses, reducing reliance on chemical inputs, and ultimately contributing to global food security.

Future enhancements

In future enhancement, Enhancing the robustness and generalization capabilities of machine learning models to accurately detect a wide range of crop diseases across different regions, crop types, and environmental conditions.

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