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# Crop Disease Detection Using Deep Learning

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**ABSTRACT:** The project utilizes a deep convolutional network model to rapidly and accurately detect crop diseases by analyzing various photos of diseased crops. Crop diseases can manifest in different symptoms, making it challenging for inexperienced farmers to identify infections compared to trained crop pathologists. To address this issue, an autonomous system has been developed that can recognize agricultural illnesses based on visual symptoms and the appearance of the crops. This system serves as a verification tool to aid farmers in disease identification. Significant effort has been dedicated to developing efficient and precise methods for identifying leaf diseases. Neural networks and digital image processing techniques can be employed to identify crop diseases. In recent years, there has been significant progress in deep learning, enabling the extraction of practical feature representations. The proposed solution consists of four main phases: a color conversion structure, an image segmentation technique, calculation of texture features, and the utilization of a pretrained neural network to extract relevant features.

**KEYWORDS:** Disease Detection, Convolutional Neural Network, Deep Learning

## I. INTRODUCTION

Agriculture is a vital sector for any country as it provides food and essential resources to its people. It acts as the main source of income for numerous individuals. However, those involved in agriculture face numerous challenges, such as declining productivity caused by unfavorable climate changes, floods, scarcity, and other natural factors. These difficulties often make it difficult for farmers to engage in agricultural activities, resulting in significant losses due to a lack of knowledge. Unfortunately, some farmers resort to extreme measures like suicide or migration as a result.

The objective of this project is to develop a system that can provide farmers with relevant information to identify crop diseases. Additionally, we address some of the current challenges and problems that need to be resolved. Accurately identifying crop diseases is crucial in preventing their spread to neighboring farms, implementing appropriate disease control measures, and maximizing crop productivity. It is also important to monitor and assess the quality and quantity of crops in order to make informed decisions.

Farmers frequently incur substantial financial losses due to various conditions that can affect crops. If farmers can identify these conditions in advance and apply suitable treatments, it can significantly reduce waste and mitigate financial losses. Different crop diseases require specific treatments, so it is essential to identify the exact type of disease affecting the plants. The proposed system offers a fast, automated, and accurate image-based solution for identifying crop conditions.

## II. RELATED WORK

The detection of the disease is an important step in reducing its spread to neighbouring plants, application of appropriate disease control treatments, and improving crop Productivity[1]. "Banana Sigatoka, Banana Cordial Leaf Spot, Banana Diamond Leaf Spot, and Deightoniella Leaf and Fruit Spot" disease detection & classification are carried out in[2] An end-to-end deep learning model is developed to identify healthy and unhealthy corn Plant leaves while taking into consideration the number of parameters of the model. [3], This study concentrated on two diseases of cardamom plants, Colletotrichum Blight and Phyllostactic Leaf Spot of cardamom. A multi-layer CNN to detect Cardamom leaf diseases and achieved 97.13% detection accuracy [4]. Alternaria leaf spot, Brown spot, Mosaic, Grey spot, and Rust are five common types of Apple leaf diseases that severely affect apple yield. The Proposed System provided a fast, automatic and accurate image-based solution for the identification of leaf diseases.[5].

### III. METHODOLOGY

Crop disease detection involves identifying and addressing plant diseases in agricultural settings. There are several methodologies and approaches that can be employed in problem-solving for crop disease detection. Here are some commonly used methodologies:

**Visual Inspection:** This method involves physically examining plants for symptoms of diseases. Trained experts or farmers can visually identify characteristic symptoms such as leaf discoloration, wilting, lesions, abnormal growth, or pest infestations. Visual inspection provides an initial assessment and can help narrow down potential diseases.

**Diagnostic Tools:** Various diagnostic tools are available to aid in crop disease detection. These include handheld devices such as magnifying lenses, UV lights, moisture meters, and pH meters, which can provide additional information about plant health. More advanced diagnostic tools include spectrometers, infrared cameras, and molecular techniques like polymerase chain reaction (PCR) or enzyme-linked immunosorbent assays (ELISA) to detect specific pathogens.

**Remote Sensing:** Remote sensing involves using aerial or satellite imagery to detect changes in plant health. Hyperspectral or multispectral sensors can capture reflectance patterns from crops, which can be analyzed to identify stress indicators or disease patterns. Remote sensing provides a broad-scale view of crop health and can help detect diseases early and over large areas.

**Data Analysis and Machine Learning:** Crop disease detection can benefit from data analysis and machine learning techniques. By collecting data on crop characteristics, environmental conditions, and disease history, algorithms can be trained to identify patterns and predict disease outbreaks. Machine learning models can analyze large datasets, identify disease symptoms, and suggest appropriate management strategies.

**Disease Forecasting Models:** Disease forecasting models use historical and real-time data on weather conditions, disease occurrence, and crop growth stages to predict disease outbreaks. These models utilize mathematical algorithms and statistical techniques to assess the risk of disease occurrence, allowing farmers to implement preventive measures in advance.

**Expert Consultation:** In complex or uncertain situations, consulting with agricultural experts, plant pathologists, or extension services can provide valuable insights. These professionals possess specialized knowledge and experience in crop diseases and can offer guidance on diagnosis, treatment, and prevention strategies.

**Integrated Pest Management (IPM):** IPM is a holistic approach to managing crop diseases that involves combining multiple strategies. It includes cultural practices (crop rotation, sanitation), biological control (using beneficial organisms), chemical control (judicious use of pesticides), and monitoring systems (traps, pheromone-based techniques). IPM emphasizes a proactive approach and sustainable practices.

By employing a combination of these methodologies, farmers and researchers can enhance their ability to detect, diagnose, and manage crop diseases effectively, leading to improved crop health and increased agricultural productivity.





IV. EXPERIMENTAL RESULTS



Figure.(A)

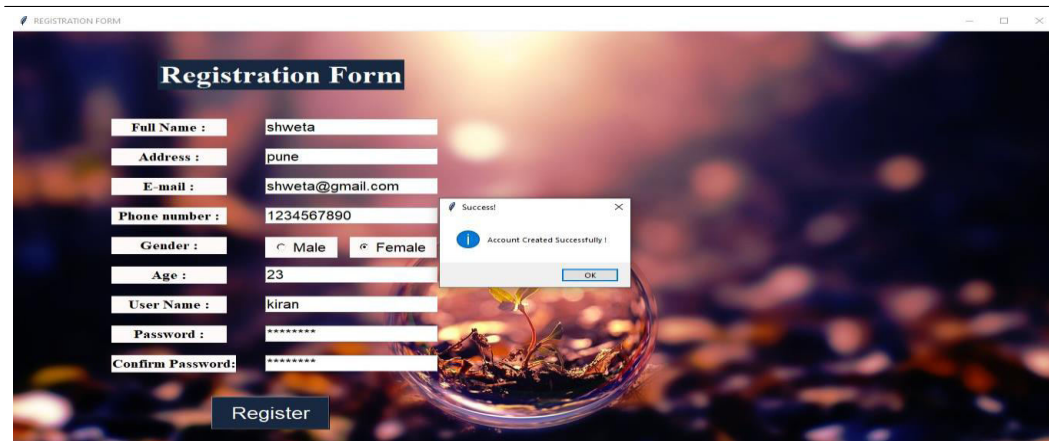


Figure.(B)



Figure.(C)



Figure.(D)



Figure.(E)

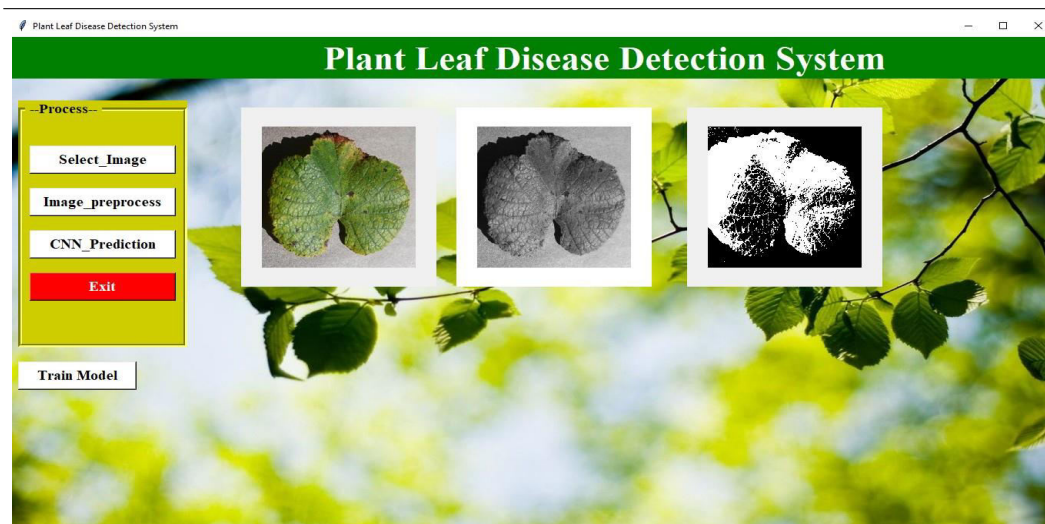


Figure.(F)



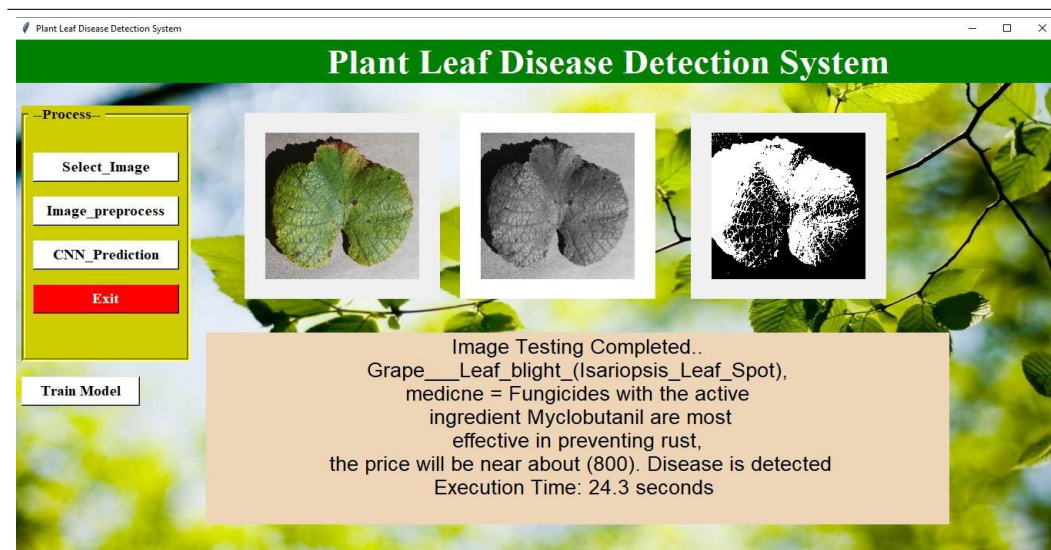


Figure.(G)

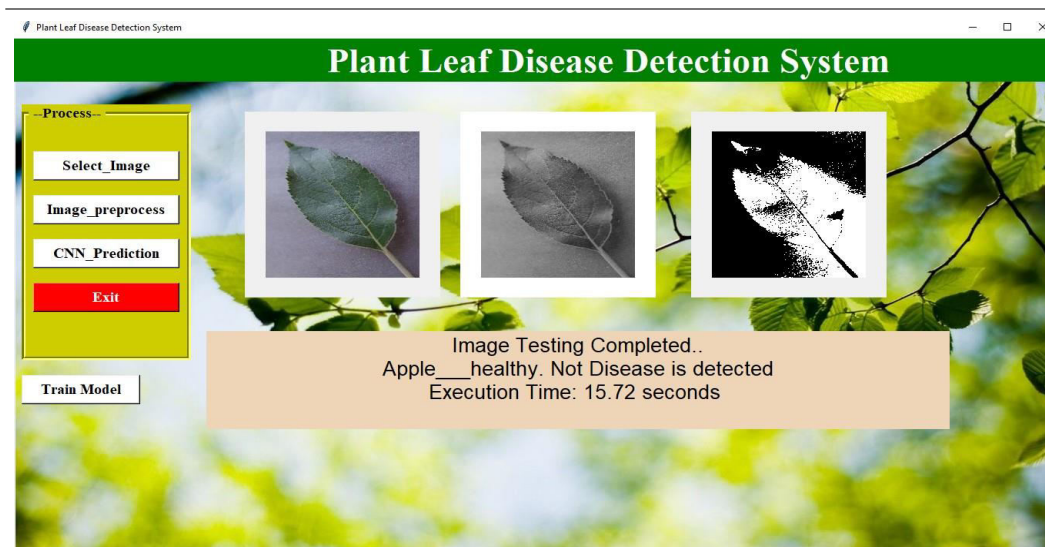


Figure.(H)

## V. CONCLUSION

The agricultural sector is of utmost importance worldwide, as it provides the essential crops needed for food production. Early detection and identification of crop conditions play a vital role in the agricultural industry. This research paper successfully addresses the objective of identifying and categorizing 32 different crop types and their respective conditions using a convolutional neural network. The trained model can be utilized to analyze real-time images and accurately identify crop conditions.

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