Defect Exposure in Citrus using Machine Learning

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Abstract-
Orange (Citrus) plants such as lemon are mainly affected by citrus canker (causing the leaves to drop and unripe fruit to fall to the ground) disease which affects the fruit production of the plants. Early canker disease distinguishing proof is one of the troublesome answers for expanding the plant generation. Previous methods intends to recognize and order the infection malady precisely from the influenced leaf pictures by embracing picture handling methods to distinguish plant leaf sicknesses from computerized pictures. In proposed project, an image recognition method of citrus diseases based on deep learning is proposed. They have developed a citrus image dataset comprising six prevalent citrus diseases. The deep learning network is used to train and learn these images, which can effectively identify and classify crop diseases. In the experiment, a Deep Learning model serves as the primary network and is compared with other network models in terms of speed, model size, and accuracy. The results indicate that their method reduces prediction time and model size while maintaining a high classification accuracy. Finally, The results suggest that the method employed by the researchers reduces prediction time and model size while maintaining a high classification accuracy.

Keywords: Machine Learning, Image Processing, Segmentation, Deep CNN.

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INTRODUCTION

Agrarian efficiency is something on which economy profoundly depends. This is the one of the reasons that disease recognition in plants assumes a significant job in agribusiness field, as having disease in plants are very characteristic. In the event that appropriate consideration isn't taken here, at that point it causes genuine impacts on plants and because of which individual item quality, amount or efficiency is influenced. Recognition of plant sickness through some auto-programmed strategy is useful as it diminishes a huge work of observing in huge ranches of crops, and at beginning period itself it identifies the side effects of sicknesses for example at the point when they show up on plant leaves. Innovation helps individuals in expanding the generation of food. Anyway the generation of food can be influenced by number of factor, for example, climatic change, infections, soil fruitfulness and so forth. Out of these, disease plays major job to influence the generation of food. Agriculture plays a significant job in Indian economy. Leaf spot infections debilitate trees and bushes by intruding on photosynthesis, the procedure by which plants make vitality that supports development and guard frameworks and impacts survival**.**

Fruit trees play an important role in any state's economic development. One of the most well- known fruit plant species is the citrus plant, which is high in vitamin C and widely used in the Indian sub-Continent, the Middle East and Africa. Citrus plants are associated with many health advantages, as well as being used as a raw material in the agricultural industry for the production of several types of other agri-products, including jams, sweets, ice cream, and confectionery, etc. Citrus, Pakistan's most important fruit crop, accounts for a significant portion of the country's horticultural exports

LITURATURE SURVEY

1. Noa Schor, Avital Bechar, Time Ignat (2016):

- Framework: Automated location framework for detecting powdery mildew (PM) and Tomato spotted wilt virus (TSWV) on greenhouse bell peppers.
- Approach: Utilized a controller to reach various detection postures, with detection algorithms developed based on Principal Component Analysis (PCA) and Coefficient of Variation (CV).
- Findings: Successful detection of PM, but encountered challenges in detecting TSWV.

2. Lucas G. Nachtigall, Ricardo M. Araujo (2016):
- Framework: Utilized Convolutional Neural Networks (CNNs) to automatically identify and classify diseases, nutritional deficiencies, and herbicide damage on apple trees from leaf images.
- Importance: Aims to ensure high-quality apple yields by automating a task usually performed by field experts.

3. Davoud Ashourloo, Ali Akbar Matkan (2016):
- Objective: Developed an unearthly disease index for identifying stages of wheat leaf rust disease at various Disease Severity (DS) levels.
- Methodology: Measured reflectance spectra of infected leaves at different DS levels using a spectroradiometer.

4. Aakansha Rastogi, Ritika Arora, Shanu Sharma (2015):
- Framework: Proposed a system for preprocessing, feature extraction, and disease classification of citrus fruits, along with pesticide recommendation.
- Approach: Used Convolutional Neural Networks (CNNs) with different layers and an Android application with Java Web Services for interaction.

5. Ms. Kiran R. Gavhale, Prof. Ujwalla Gawande, Mr. Kamal O. Hajari (2014):
- Objective: Early detection of plant diseases through leaf feature analysis using image processing techniques.
- Methodology: Implemented image analysis and classification methods for extracting and characterizing leaf diseases.

6. Peng Hui, Zhai Ruifang (2011):
- Approach: Developed a self-adaptive intelligent agent for detecting edges of growing citrus images, focusing on RGB color images transformed into R-B chromatic aberration space for edge detection.

7. Sivasubramaniam Janarthan (2020):
- Framework: Proposed a lightweight, fast, and accurate deep metric learning-based architecture for citrus disease detection from sparse data.
- Methodology: Patch-based classification network including an embedding module, a cluster prototype module, and a simple neural network classifier.

8. Chau Chung Song (2020):
- Method: Implemented automatic detection and image recognition of citrus diseases using the YOLO (You Only Look Once) algorithm for object detection in citrus leaf images.

9. Hui Zhang (2020):
- Framework: Introduced the Mask R-CNN network framework for multi-task detection of citrus in complex environments.
- Methodology: Added multi-task branches, modified model parameters, and designed a multi-task loss function for effective and accurate detection.

10. Hu Xiaomei (2019):
- Objective: Proposed a method for citrus picking point location based on structured light camera, considering the specific characteristics of citrus fruit and fruit stem growth.

11. Jun Lu, Pengfei Wu (2015):
- Method: Developed an automatic segmentation method to detect defects on citrus surfaces eroded by diseases and pests based on circularity threshold segmentation, utilizing a visible imaging system.

METHODOLOGY

Human experts play a crucial role in these complex multi-step architectures. Crop illnesses are a significant danger to plants growth; however their fast recognizable proof stays troublesome in numerous pieces of the world due to the absence of the fundamental foundation. This problem is overcome by blend of expanding worldwide computer infiltration and ongoing advances in neural science made conceivable by profound learning has made ready for system helped disease finding and suggesting required

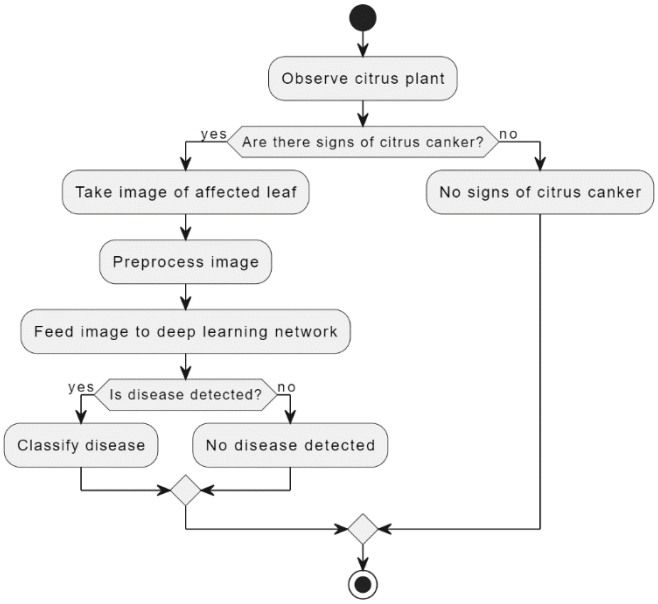

Fig.1. Activity Diagram

PROPOSED METHODOLOGY

- The proposed method uses CNN model for classifying citrus fruit and leaf diseases into different classes, namely black spot, canker, early blight and late blight.
- The proposed deep learning model integrates a sufficient number of layers and parameters.
- The main purpose of proposed system is to detect the disease of citrus by using feature extract.
- User will register in the system and proceed for authentication stuff.
- Datasets Creation step is been done for analysis the fruit diseases.
- After that Dataset creation Process is done to trained the system to detect the fruit diseases.
- Then we are providing the a feature for user where he will upload the image of fruit in system , Then system will process the image and predict the output for the user.

RESULT DISCUSSION

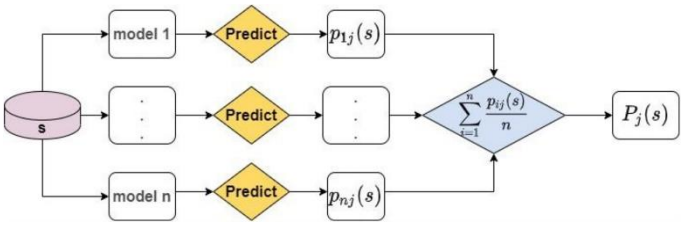

Fig.2. Result Model

Fig.3.Dashboard

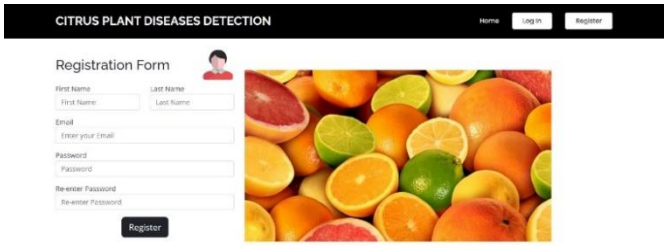

Fig.4. Registration Page

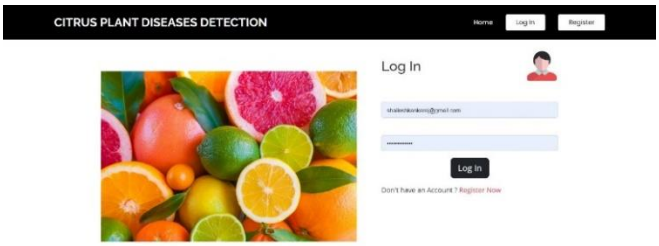

Fig.5. Login Page

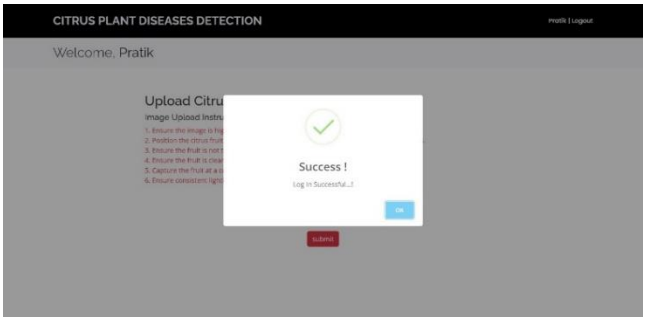

Fig.6. Login Successful

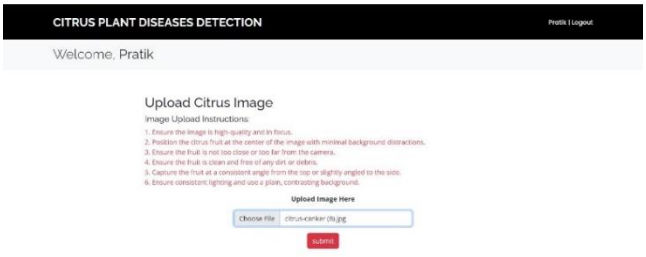

Fig.7. Input Page

CONCLUSION

In this Work, the basic Convolutional Neural Network (CNN) architecture model will classify Citrus fruit and leaf diseases. Convolution Neural Network (CNN) architecture model is used to avoid the expensive training from scratch and to get higher efficiency with limited number of datasets. The proposed work will be able to give a good accuracy where training accuracy and validation accuracy on the test data with small misclassifications on normal and very mild demented Multiple plant disease datasets of varying sizes may be used to improve the model's performance. In future the accuracy and the speed can be increased by use of Googles GPU for processing.

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