IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

PLANT DISEASE DETECTION USING DEEP LEARNING TECHNIQUE

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Abstract : Crop diseases are a major threat to food security, but their rapid identification remains difficult in many parts of the world due to the lack of the necessary infrastructure. The combination of increasing global smartphone penetration and recent advances in computer vision made possible by deep learning has paved the way for smartphone assisted disease diagnosis. Using a public dataset of 2000 images of diseased and healthy plant leaves collected under controlled conditions, we train a deep convolutional neural network to identify Cotton crop species and 3 diseases (or absence thereof). The trained model achieves an accuracy of 82.35% on a heldout test set, demonstrating the feasibility of this approach. Overall, the approach of training deep learning models on increasingly large and publicly available image datasets presents a clear path toward Web based crop disease diagnosis on a massive global scale. The advance and novelty of the developed model lie in its simplicity; healthy leaves and background images are in line with other classes, enabling the mode l to distinguish between diseased leaves and healthy ones or from the environment by using deep CNN. Novel way of training and the methodology used facilitate a quick and easy system implementation in practice. All essential steps required for implementing this disease recognition model are fully described throughout the paper, starting from gathering images in order to create a database, assessed by agricultural experts, a deep learning framework to perform the deep CNN training. This method paper is a new approach in detecting plant diseases using the deep convolutional neural network trained and fine-tuned to fit accurately to the database of a plant's leaves that was gathered independently for diverse plant diseases. The advance and novelty of the developed model lie in its simplicity; healthy leaves and background images are in line with other classes, enabling the model to distinguish between diseased leaves and healthy ones or from the environment by using deep CNN.

***Index Terms* - Acquisition, Disease Diagnosis, Cotton Detection, Identification of plant diseases, Agricultural experts, Convolutional Neural Network, Pathogens.**

I. INTRODUCTION

Research results suggest that climate change may modify stages and levels of pathogen production; it may also alter host resistance, which leads to physiological changes in host pathogen interactions. The condition is further compounded by the fact that pathogens nowadays are quicker to spread worldwide than ever before. There can be emerging pathogens where they had previously been unidentified and where there is apparently no local knowledge to counter them. One of the basics of timely and proper treatment of plant diseases is of precision agriculture. It is Crucial to avoiding unnecessary expenditure of financial and other capital, while ensuring safer production, addressing the issue of long-term pathogen tolerance, and minimizing the adverse effects of climate change. In plants, there are several ways to detect pathologies.

II. LITERATURE REVIEW

A study stated that, in order to utilize the dynamic route of deep learning, they proposed short-term voltage stability. They managed the clustering algorithm to obtain short-term voltage stability to increase the reliability. It is stated that deep learning technique was applied to identify the leaf diseases in different mango trees. The re- searchers used five different leaf diseases from various specimens of mango leaf's, where they addressed nearly 1200 datasets. The CNN structure was trained with more than 600 images, where 80% are used for training and 20% are used for testing. Remaining 600 images were used to find the accuracy and to identify the mango leaf diseases which showed the feasibility of its usage in real-time applications. The classification accuracy can be further increased if more images in the dataset are provided by tuning the parameters of the CNN model. The research study states that the mechanism for the identification and classification of rice plant datasets are attention model accomplished the extraction of different features from the raw electro encephalography signals. Advancement of the clinical translation of the electro encephalography motor imaginary-based brain computer interface technology is applicable for varied request, where this system supports the paralyzed patients. The unusual achievements include the maximum accuracy and time- resolved predictions. To make an efficient and effective interface system, the human plays an important role. Graph convolutional neural networks, a novel deep learning framework, addressed the issues in order to differentiate the four-class motor imaginary intentions by mutually agreeing through the similarity of electro encephalography electrodes. To find the motor imaginary, four tasks are preferred with the prediction of highest accuracy.

III. RESEARCH AND METHODOLOGY

The system can plant diseases detect by analyzing image data. The synthesis of the system as well as real time image data can be evaluated, which is taken by any application. The system has training as well as testing phase for classification. Proposed Architecture of a plant disease detection system through following modules: acquisition, pre-processing, segmentation, feature extraction, and classification.

IV. RESULTS AND DISCUSSION

To analyze the performance of the model, the last result is achieved using parameters such as K-fold crossvalidation using 10 folds. RGB-colored image dataset with augmentation provides 15% best performance for the model. The researchers used the transferred learning CNN model and the grayscale dataset achieved 98.6% accuracy. However, color is the main and most decisive feature in cotton detection and classification; therefore, using a colored dataset takes a long time to train the model to add performance even if it is a complex layer. The number of epochs with 100 iterations and the Adam optimization method is very significant to boost the model performance by 10% and 5.2%, respectively. In the end, this developed CNN model achieves 98% of bacterial blight, 94% healthy, 97.6% of leaf minor, and 100% of spider mite, which are correctly classified. Additionally, the researcher has used different pre-processing techniques for noise removal. The main factors for the misclassification of the result exist between bacterial blight, healthy, and leaf miner. The overall performance of the model, as shown in the confusion matrix, is 96.4% accurate for diagnosis of leaf disease and pests of cotton plants.

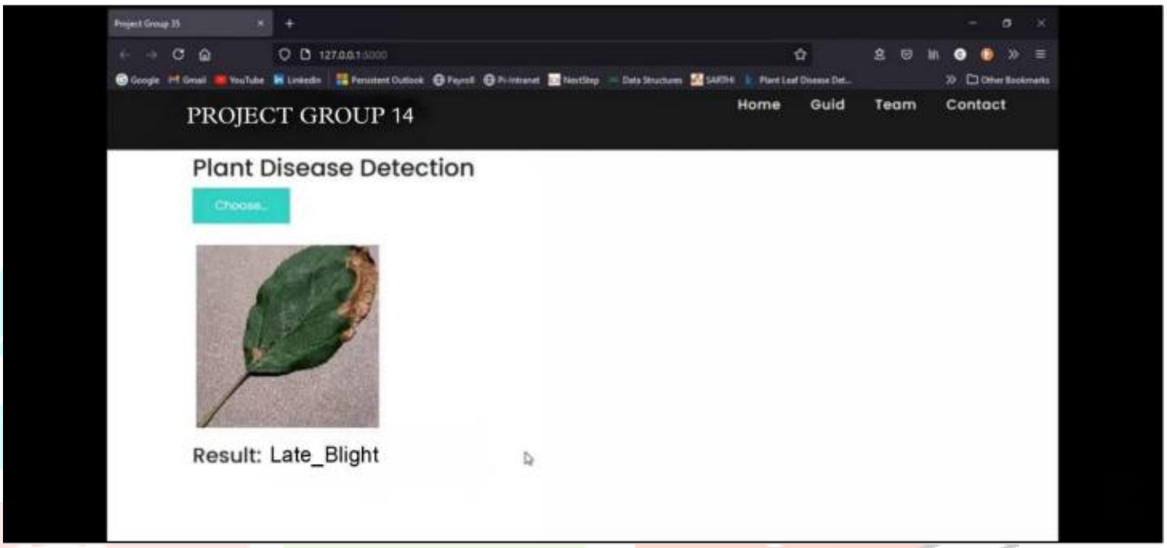

Fig.1.1 Output

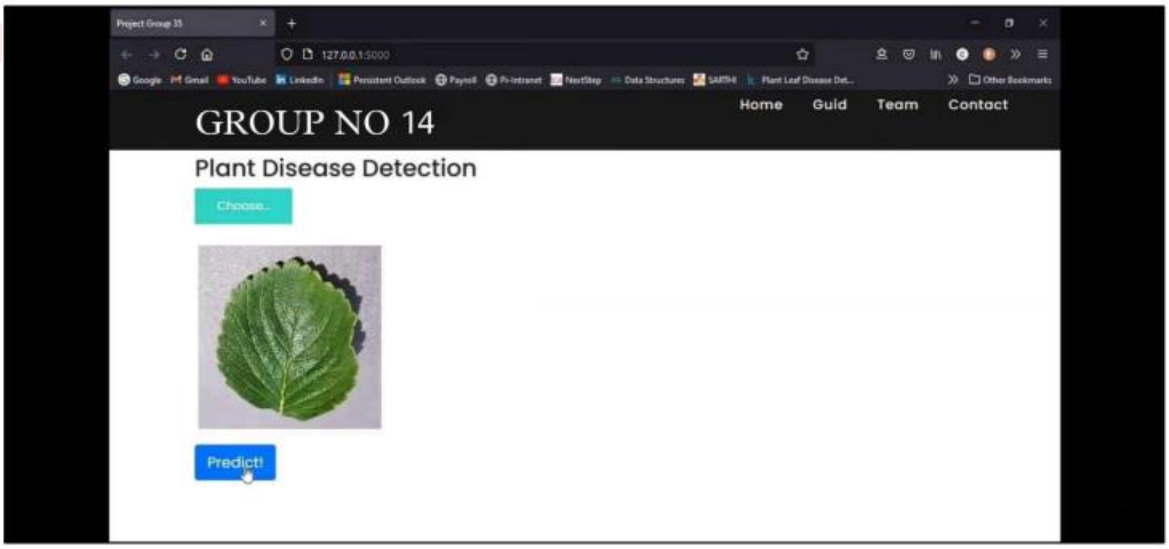

Fig.1.2 Output

V. CONCLUSION

Specialized Model were developed using deep learning, traditional machine learning algorithms using image processing for identification of plant diseases using healthy and infected images of leaves. This can help the farmer for proper production of good quality crops. Based on high level performance, it becomes evident that Deep Learning CNN are highly suitable. Deep Learning is recent research technique for image processing and pattern recognition.

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