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Early Stage Disease Prediction of Plant Disease using ML Algorithms

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ABSTRACT: The convolution neural network (CNN) is used with multiple pooling and convolution layers. The dataset of Hibiscus is used for training the model. After the model is trained it is tested accurately to validate the results. From the Hibiscus data we are using 40% of data, for testing purpose that contains images of healthy as well as diseased plants such as powdery mildew, scrub and multiple diseases**.** The model that has been proposed achieved 90-93% of testing accuracy. This study is focused on machine learning algorithm to detect disease in plant leaf. But, in future model can be implemented from other system to detect the disease lively or else drone can also be used.

KEYWORDS: Plant disease prediction, Machine learning, Convolution neural network, Data preprocessing, ML algorithms.

I. INTRODUCTION

Agriculture is the backbone of every economy. Our main focus is on improving the productivity. This is achieved by not taking the environmental effects into considerations, which has mostly appeared in the degeneration of environment. In India because of the raising demand of food due to increased population which in turn leads to increased demand of food, due to which advance in agriculture sector are required to meet.

Plant disease is one of the significant factors which will indirectly reduce the agricultural product by both quantity and quality. Humans can be affected either directly or even indirectly by health or by even economically due to effect of plant disease the major impact of plant disease is when decrease the crop yields if will result in the reduction of food available to the humans, which will lead to starvation in few cases. Crop diseases also have censorious effect on the quality of agricultural products.

Plant disease is a physiological abnormality. The outward changes in the physical appearance are the certain symptoms shown when a plant suffers from any disease show visible effects which can be categorized into willingspot, powdery mildew, galls and dryness. Various fungi types, bacterial types, viruses and probably other agents can be caused by plant disease. Farmers or specialists will be recognizing the plant disease and will be diagnosing them with naked eye which will be consume a lot of time, cost will be very more(expensive) and incorrect. Therefore, prediction and classification of plant disease provides more accurate and quick methods. Photos of the symptoms of infected plants are utilized for plant disease detection and for study, teaching, analysis etc.

Plant leaf shows various symptoms for various different diseases and this is the one of the common way for plant disease detection. Recognizing plant disease is almost important in order to prevent infections of uninfected ones. Identifying and treating plant disease was alone by an expert through hit naked eye wear be would manually examine the plants and this process is costly not affordable and also very flow. Due to this automated plant disease. The systems needed which is a major growing area.

Disease defection through an automated technique is helpful as it will reduce the overall work of watching plants and at an early stage itself it will defect the symptoms of disease.

II. RELATED WORK

Santhosh Kumar S, et.al (2019) [1] explained the significance of illness recognition for both plants and human beings. It was imperative to deliberate proper input to demonstrate the effects of plant infections & techniques in agricultural sector. It was necessary to design an efficient technique for detecting and recognizing different

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plant diseases to help cultivators and pathologist in disease analysis. This study described the impact of image processing in farming sector. Several types of diseases were taken into account in this study for more research. Harvey Wu, et.al (2019) [2] summarized Adam variant of the stochastic gradient descent optimization algorithm where has the model of lower accuracy of 95.1% which represents correct and incorrect classifications.Ushadevigandi, et.al(2020) [3] explained Supervised, Unsupervised, semi-Supervised, Reinforcement learning method where more investigations have to be made in these techniques for achieving better prediction system. RanjitaThapa, et.al(2020) [4] explained K-means clustering method where the accuracy is 97% and there was unavailability of annotated diseases data. Mohamed Loey, et.al(2020) [5] explained Image Preprocessing: Color constancy algorithm detected diseases like rust, septoria and tan spot problem when dealing with early diseases. Marwan AdnamJasim, et.al(2020) [6] explained CNN and ANN algorithms whereaccuracy is 94-95%. Kshyanaprava Panda Panigrahi, et.al(2020) [7] explained NB, KNN, DT, SVM and RF where accuracy is 79.23% and drawback is that it is not applicable for all the datasets. NilambhiseShreyakathet,Mast.Sagar , et.al(2020) [8] explained Tensor flow and keras frameworks and the system is implemented on Android where the model is basically tested on some types of plant species with some type of diseases. Murk Chohan, et.al(2020) [9] explained CNN and simple ANN where this system is trained on plant dataset with only 38 classes it could tell if the plant has a disease or not and the accuracy of 95%. S. Arivazhagan, et.al(2020) [10] explained Color co-occurrence methods with SVM Classifier where the training samples can be increased and shape feature and color features along with the optimal features can be given as input condition of disease identification. SmitaNaikwadi, et.al(2020) [11] explained The color co-occurrence texture analysis method has developed the use of spatial gray-level dependence matrices where Better result of detection can be obtained with the large database and advanced feature of color extraction.

III. METHODOLOGY

I. The first stage in the process of image analysis is the image acquisition where an image is captured using a camera or phone. When an image is captured using phone it makes a user friendly.
II. The second stage is image pre-processing. There are 2 types of pre-processingdigital and analog pre-processing. Image's pre-process is the removal of unwanted features in an image. The major steps involve are image acquisition, normalization, enhancement, pigmentation and morphology.
III. The third stage is the segmentation used where separating images into pixel and their similar attributes. It transfers low level image to high level image and it mainly helps in image interpretation process. It involves both contextual and non-contextual.
IV. The fourth stage is feature extraction here new sets of features are created. And this process mainly deals with moving unwanted noise and image. Here are choosing the features only for the image analysis process, the speed and effectiveness are enhanced during this process.
V. The fifth stage is classification process here the number of classes are categorized from the data. When the new observation comes, we have to identify to which class this new observationbelongsto.Transistors/MOSFETs as switches.
VI.

IV. MODELING AND ANALYSIS

CNN which is a popular approach where multiple layers are trained robustly. It is said to be highly efficient. For classification, CNN is applied for construction of a computational for as which it transforms the unorganized image inputs into correct categories of output and operates on the unorganized image input. In general, this structure is made up of 7 layers namely input, convolution, pooling, non-linear, normalized, SoftMax and fully connected layer. But in our project, we are using 4 layers which are input layer, pooling layer, non-linear layer and SoftMax layer.

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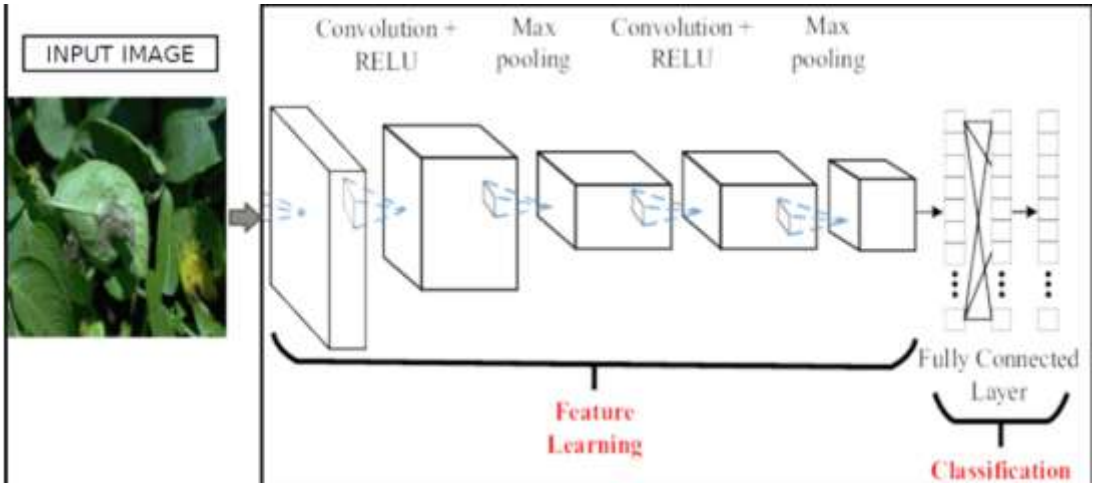

Figure 1: CNN Internal Architecture

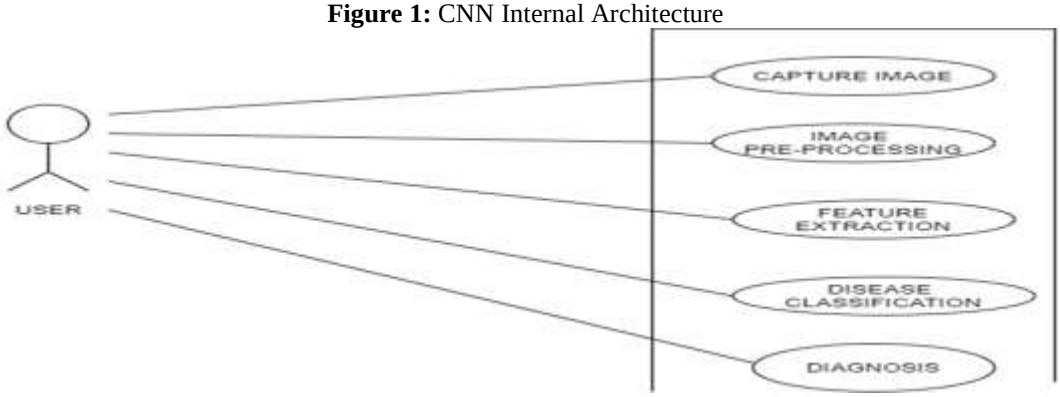

Figure 2: Use case diagram

In figure 2, it describes that initially, the user used to capture the images for predicting the leaf disease. In the next step image pre-processing occurs where image sizing happens and changes thecolor from BGR to RGB value then in the next step the feature extraction followed by disease classification and diagnosis.

V. RESULTS AND DISCSSION

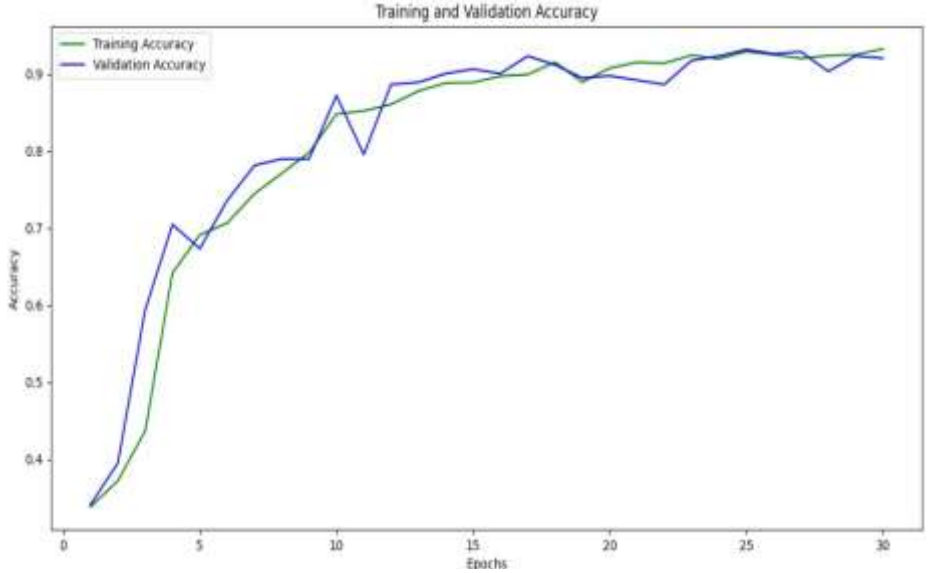

Figure 3: Accuracy VS Training

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Figure 3 shows the accuracy vs training graph where the training accuracy and validation accuracy are shown . In our project we are using 30 epochs and green line represents the training and blue indicates the validation. Here the main thing is finding the accuracy

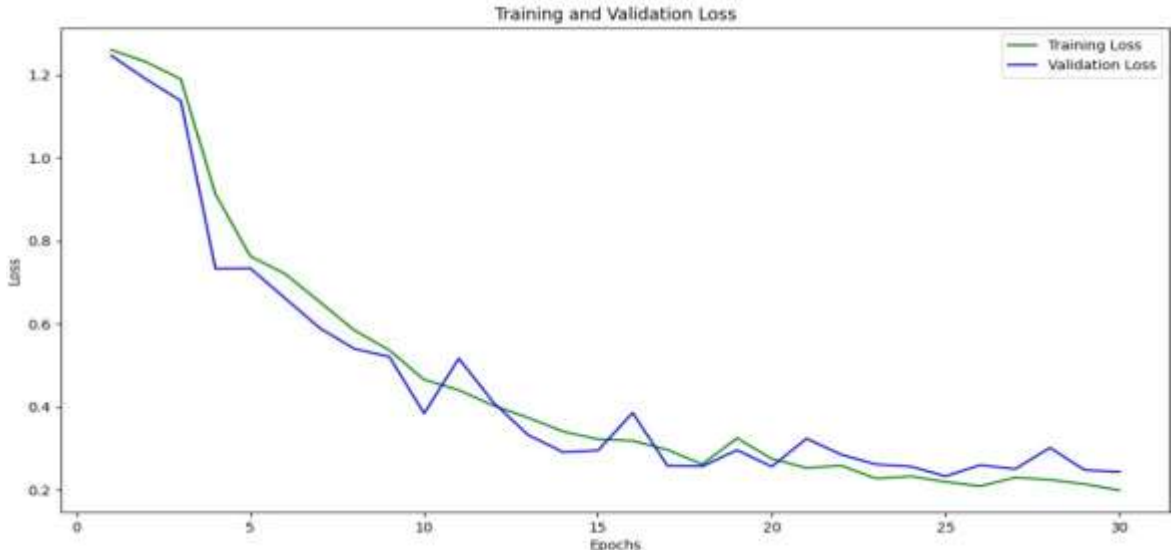

Figure 4: Loss VS Training

Figure 4 shows the loss vs training graph which shows the training and validation loss, the green line indicates the training loss and blue line indicates the validation loss . Here the main thing is finding the loss

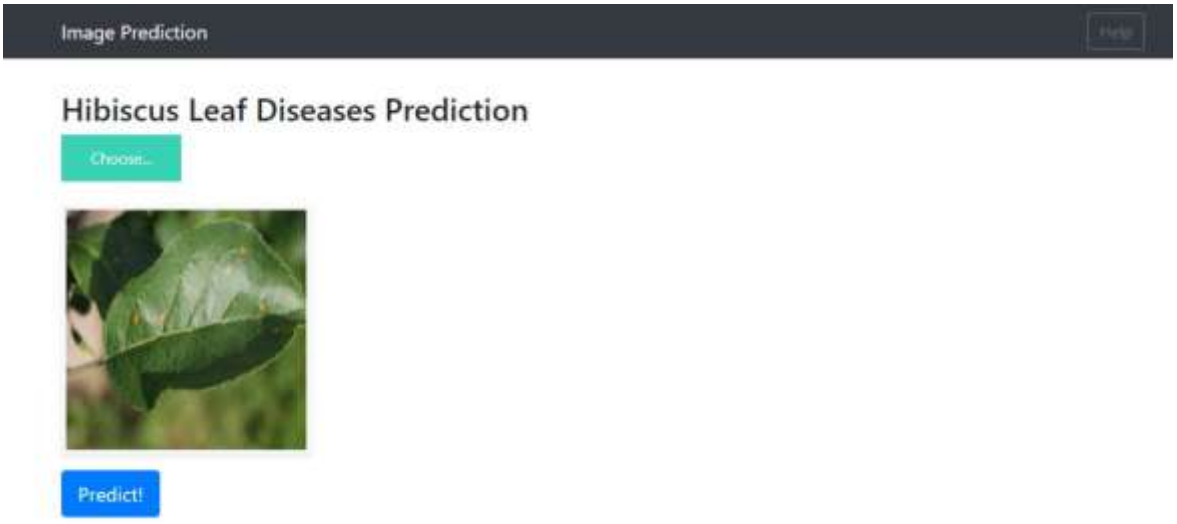

Figure 5: User Interface

Figure 5 represents the user interface that has the predict icon which is used to predict the type of disease found in the leaves.

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Figure 6: Description for the precaution to be taken

Figure 6 shows precautions to be taken when the disease is detected is a type of disease and along with that it also shows the symptoms for the disease type that is present in the Hibiscus leaves.

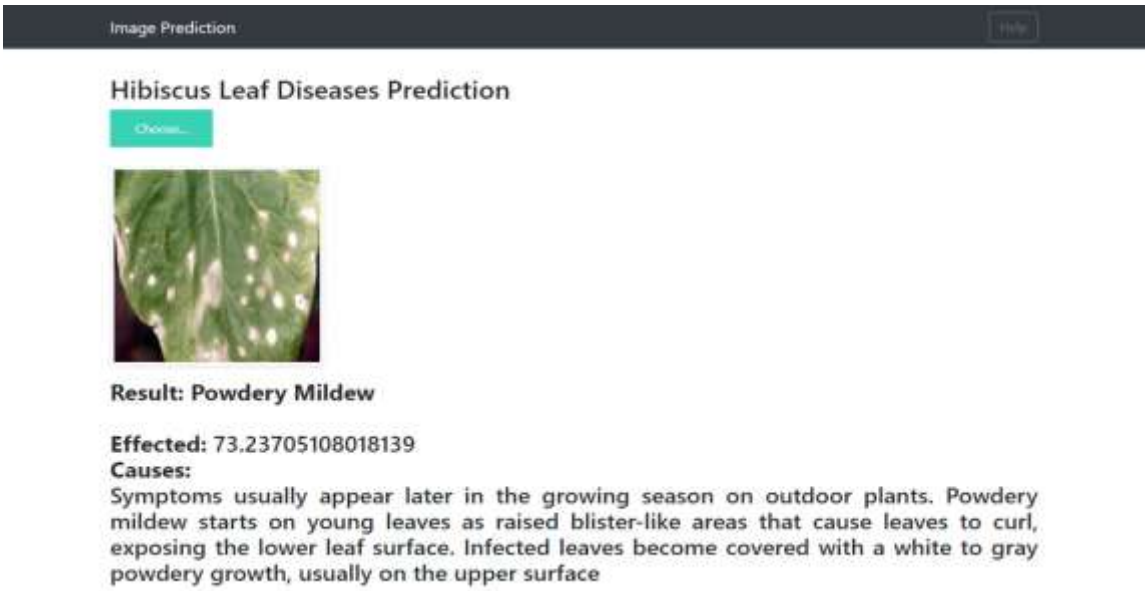

Figure 7: Predicted percentage

Figure 7 predicts how much percentage of the leaf is affected out of 100%.

VI. CONCLUSION

Our main goal was to identifying the plant leaf disease detention using machine learning. This paper presents a review of various disease classification strategies for hibiscus disease detection. We conducted this work to obtain the results by using CNN algorithm. The CNN algorithm is used to identify crop diseases at an early stage. Machine learning methods are used to train the model, which aids in making appropriate disease detection. So the algorithm was tested on three different which influence on the plants they are powdery mildew, shot hole, and multiple diseases. The best results were obtained with very little computational effort, demonstrating the

efficiency of the proposed system in recognizing and classifying crop diseases. We obtained best results of 90-93% another benefit of this approach is that plant disease can be done on improving. Future work can be done on improving accuracy and more dataset and also in future model can be implemented from other system to detect the disease of plant lively or else drone can also be used..

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