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Plant Disease Detection Using Hybrid Approach

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ABSTRACT: Plant infections adversely affect the agrarian area. These illnesses bring down the efficiency of the yield and gives tremendous misfortune to the ranchers. For accuracy horticulture it is vital to recognize sicknesses in the plants to save agrarian yield and limiting the utilization of pesticides. Detection of diseases at early stage can be done using Image processing domain. Detection of diseases like) Apple Scab, b) Squash Powdery Mildew, c) Apple healthy, d) Blueberry healthy, e) Corn (maize) Cercospora leaf spot Gray leaf spot, f) Grape Black Rot, g) Grape Healthy, h) Grape Leaf Blight, i) Orange Huanglongbing (Citrus Greening), j) Peach Bacterial Spot, k) Bell Pepper Bacterial Spot, l) Potato Late Blight, m) Raspberry healthy, n) Strawberry Leaf Scorch, o) Tomato Leaf Mold, p) Tomato Mosaic data can be done using Deep Learning and Machine Learning techniques. Convolution Neural Network (CNN) can be used for feature extraction, extracting features for the plant disease images. Further for the classification of diseases various machine learning algorithms such as Random Forest. In this paper we achieved the 92.46% accuracy on 100 epochs.

KEYWORDS: Plant Disease Detection, Convolutional Neural Network, Neural Network, Deep Learning, Image Processing, Random Forest

I. INTRODUCTION

Farming is one of the main areas in the Indian economy. It is the foundation of the country's advancement. One of the serious issues looked by the horticulture area is tracking down the sicknesses in the plants. In the days of yore, illness distinguishing proof is finished by experienced individuals. In far off regions, it is undeniably challenging for ranchers to contact the specialists. Environmental change is additionally one of the major explanations behind plant infections. In huge ranches, assuming the illness is not perceived brilliantly there is a gigantic misfortune in farming creation. In the help community, they can't see the issue precisely looked by the rancher thus in some cases they might give wrong ideas to the ranchers with respect to the plant illness. This may likewise prompt the obliteration of the yield. These days, there is colossal development in the Machine Learning (ML) calculations, Man-made reasoning, and Computerized Picture Handling (Plunge) methods. To help the ranchers, it is vital to distinguish various sicknesses in plants during the beginning phase. In this way, there is a need to coordinate these new advances to incorporate into present day techniques. The harvest yield will be diminished due to the spreading of sicknesses in plants. These infections might cause a change looking like the plant, make harm the plants, shows the impact on the variety and surface of the leaves and its impact on the natural products, and so forth. There are a few likenesses between the qualities of the infections. So it is extremely hard for the ranchers to recognize the illnesses in the plants with their unaided eye and they can't envision the seriousness of the illness totally and thus on occasion it might prompt outcome in wrong infection recognition. Due to the less experienced or unpracticed ranchers, there may be issues in managing the illnesses of the plants. Subsequently, there is a need to create current strategies which will help the ranchers to recognize the illnesses in beginning phases and furnish the answers for manage those illnesses.

II. LITERATURE SURVEY

G. Madhulatha et al. [1] stated that the principally center around finding the plant infections and which will lessen the harvest misfortune and consequently expands the creation proficiency. Our proposed work identifies the side effects of plant illnesses at the exceptionally starting stage and orders plant infection based on the side effects utilizing a Profound Learning (DL) procedure.

Sunil S. Harakannanavar et al. [2] proposed that the tests of tomato leaves having messes are thought of. With these problem tests of tomato leaves, the farmers will effortlessly find the infections in view of the early side effects. Right off the bat, the examples of tomato leaves are resized to 256×256 pixels and afterward Histogram Evening out is utilized to work on the nature of tomato tests. The K-implies bunching is brought for apportioning of data space into Voronoi cells. The limit of leaf tests is extricated utilizing shape following. The various descriptors viz., Discrete



Wavelet Change, Head Part Investigation also, Dark Level Co-event Grid are utilized to remove the enlightening elements of the leaf tests. At last, the extricated highlights are grouped utilizing AI approaches, for example, Backing Vector Machine (SVM), Convolutional Brain Organization (CNN) and K-Closest Neighbor (K-NN). The precision of the proposed model is tried utilizing SVM (88%), K-NN (97%) and CNN (99.6%) on tomato cluttered examples.

Shima Ramesh [3] proposed that this paper utilizes Irregular Backwoods in distinguishing among sound and sick leaf from the informational collections made. Our proposed paper incorporates different periods of execution specifically dataset creation, include extraction, preparing the classifier and characterization. The made datasets of ailing and solid leaves are aggregately prepared under Irregular Woodland to order the infected and solid pictures. For separating highlights of a picture author use Histogram of an Arranged Inclination (Hoard). By and large, utilizing AI to prepare the enormous informational collections accessible openly gives us an unmistakable method for distinguishing the illness present in plants in a giant scope., Decision tree classification algorithm.

Sammy V. Militante [4] stated that in this paper, the framework was intended to distinguish and perceive a few plant assortments explicitly apple, corn, grapes, potato, sugarcane, and tomato. The framework can additionally recognize a few infections of plants.

III. PROPOSED METHOD AND ALGORITHM

A. Proposed Methodology:

In a proposed system, we are proposing experiment on plant disease like) Apple Scab, b) Squash Powdery Mildew, c) Apple healthy, d) Blueberry healthy, e) Corn (maize) Cercospora leaf spot Gray leaf spot, f) Grape Black Rot, g) Grape Healthy, h) Grape Leaf Blight, i) Orange Huanglongbing (Citrus Greening), j) Peach Bacterial Spot, k) Bell Pepper Bacterial Spot, l) Potato Late Blight, m) Raspberry healthy, n) Strawberry Leaf Scorch, o) Tomato Leaf Mold, p) Tomato Mosaic. We combine the two algorithms which are a Convolutional Neural network for feature extraction and classification of plant disease from random forest. We are going to solve accuracy issue in diagnosis of disease with accurate stage predictions.

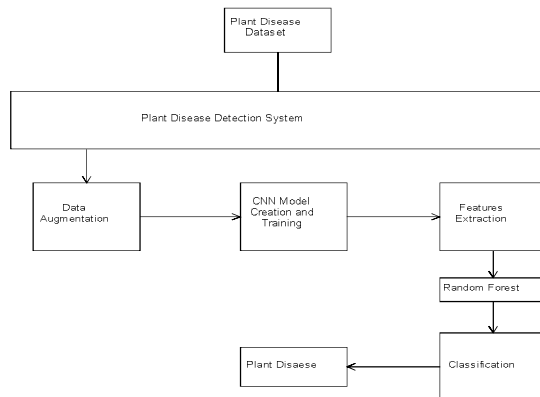


Fig1. Proposed Architecture

1. Dataset Gathering

In this paper we gathered the data from kaggle platform. There are total 862 images with different 16 categories. After gathering we split the dataset into two categories training and testing. The training folder contains 800 images and 62 images for testing.

2. Dataset Pre-processing

In pre-processing we are resized the image into 224*224 size.

3. Data Augmentation

In data augmentation we simply increase the size of training dataset. It means that we rotate the image, zoom and changes the brightness of image.

4. Model Creation and Training

In this step we create the model with 128 kernels with relu activation function. We set the 100 epochs for training.

B. Algorithms

1. CNN

Convolutional Neural Networks (which are additionally called CNN/ConvNets) are a kind of Artificial Neural Networks that are known to be tremendously strong in the field of distinguishing proof just as picture order.

Four main operations in the Convolutional Neural Networks are shown as follows:

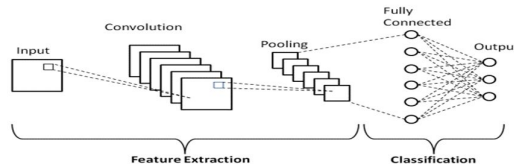


Fig2. CNN Architecture

(i) Convolution

The standard usage of the Convolution movement in the event that there ought to be an event of a CNN is to perceive fitting features from the image which goes probably as a commitment to the essential layer. Convolution keeps up the spatial interrelation of the pixels This is done by satisfaction of picture features using miniscule squares of the image. Convolution condition. Each image is viewed as an organization of pixels, each having its own value. Pixel is the humblest unit in this image lattice. Permit us to take a 5 by 5(5*5) structure whose characteristics are simply in twofold (for instance 0 or 1), for better understanding. It is to be seen that photos are all around RGB with potential gains of the pixels going from 0 - 255 i.e 256 pixels.

(ii). ReLU

ReLU circles back to a simple level. All things considered, it is a movement which is applied per pixel and abrogates all of the non-positive potential gains of each and every pixel in the part map by nothing.

(iii). Pooling or sub-sampling

Spatial Pooling which is moreover called sub-testing or down examining assists in decreasing the components of every component with planning yet even simultaneously, holds the most significant information of the aide.

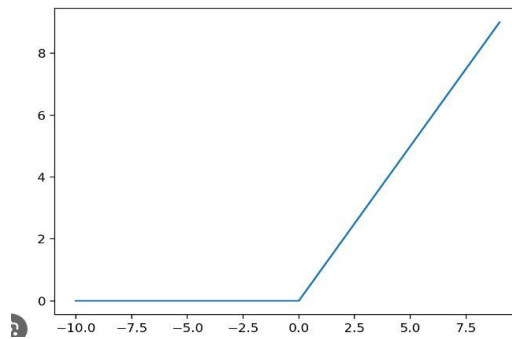


Fig3. Relu Activation

iv) Flattening

Subsequent to pooling is done, in the long run our 3D element map is changed over to one dimensional component vector.

2. Random Forest

An irregular woodland is an AI method that is utilized to tackle relapse and grouping issues. It uses outfit realizing, which is a strategy that joins numerous classifiers to give answers for complex issues. An irregular woods calculation comprises of numerous choice trees. The 'woods' created by the irregular timberland calculation is prepared through stowing or bootstrap totaling. Sacking is a group meta-calculation that works on the exactness of AI calculations. The (random forest) algorithm establishes the outcome based on the predictions of the decision trees. It predicts by taking the average or mean of the output from various trees. Increasing the number of trees increases the precision of the outcome.



IV. EXPERIMENTAL RESULTS

In our experimental setup, as shown in table 1, the total numbers of 800 of trained images for 16 categories where 62 new images were tested. These images go through CNN framework by following feature extraction using our image processing module. Then our trained model of classification of plant disease get classifies the image into specifics category through random forest model. We get the accuracy 92.46% at 100 epochs as shown in figure4 and figure5.

Table1. Classification of Data

Sr. No.	Category	Number of Images
1	Training	800
2	Testing	62

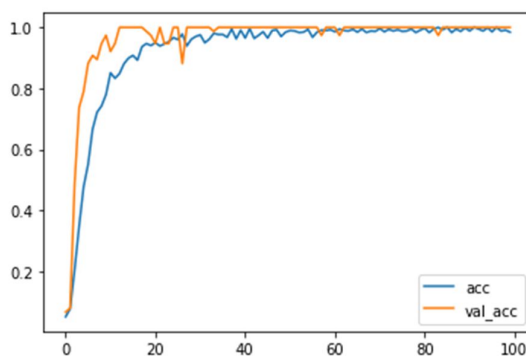


Fig4. Accuracy Graph

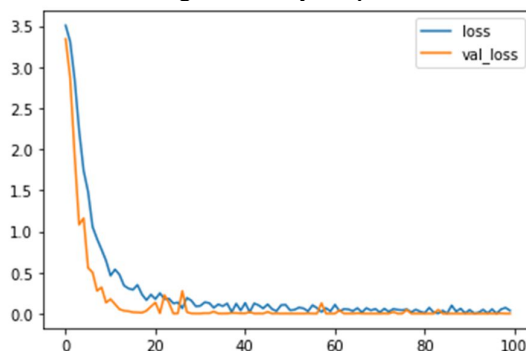


Fig5. Loss Graph

V. CONCLUSION

We are going to invent multi plant disease detection system over machine learning and CNN techniques which solves existing accuracy problem as well as reduce death rates by type diseases of plants like Apple Scab, b) Squash Powdery Mildew, c) Apple healthy, d) Blueberry healthy, e) Corn (maize) Cercospora leaf spot Gray leaf spot, f) Grape Black Rot, g) Grape Healthy, h) Grape Leaf Blight, i) Orange Huanglongbing (Citrus Greening), j) Peach Bacterial Spot, k) Bell Pepper Bacterial Spot, l) Potato Late Blight, m) Raspberry healthy, n) Strawberry Leaf Scorch, o) Tomato Leaf Mold, p) Tomato Mosaic. For future work, we can implement this technique on some more diseases with rich dataset. Increasing the number of diseases and dataset used for the process can improve the accuracy. In this paper we achieved the 92.46% accuracy on 100 epochs.

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