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Plant Disease Prediction System Using Deep Learning

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ABSTRACT: In farming practices one of the important and monotonous tasks is to identify presence of diseases in crops. To identify presence of diseases needs a regular time and labours with great knowledge of farming. In these days, Plant house technique in agrobusiness is widely implemented method of farming. In plant-house farming we deliver essential quantity of water and fertilization to plants which will translate into large amount give over. The absence of air circulation is origin for breeding ground which leads to insects. To control this, we require steady crop monitoring which helps to prevent plants from diseases. Accordingly, crop monitoring specifications such as temperature and crop growth status are important for effective farming which helps to indicate the required amount of water and nutrients needed for the plant at the correct time. This process also indirectly helps to reduce the occurrence of disease and prevent plants from the large amount of spread. This research work concentrates on one of the important challenges in farming, such as disease detection and prediction. Disease in crop plants affects amount of manufacturing from farming, so a model is helps in automating a method for plant disease prediction and guiding farmers to take appropriate measures in advance to prevent plants from diseases. Therefore, interested with this difficult concern, goal is to recommend a remedy to monitor plants and detect plant disease as early as possible. Computerized plant illness discovery techniques is suitable for detecting early-stage disease symptoms on large farms. The dataset required at this time contains images of different plants consisting of healthy and infected leaves. deep learning, Machine learning is helpful while training model to detect plant diseases. In this research we considered cotton plant leaves to detect disease.

KEYWORDS: Plant-house; Plant monitoring; machine learning; deep learning;

I. INTRODUCTION

The wealth not only of India but most of countries rely on farming. There are lots of ultra-modern approaches in agrobusiness, one of the recognized methods of agrobusiness is Plant-house. That requires automated and computerized technique which help to reduces a lot of observation work from Poly-house. Diseases Detection using plant leaves helps with plants growth also it will help in spreading diseases to other plants. Observation parameters such as soil wetness, humidity and weather condition beneficial in effective agriculture at all phases of plant progress.

Farmers face many problems such as climate change, disease prediction and detection, phenology identification and crop harvesting and farm productivity. Research work in this paper focus on one of the biggest problems namely disease detection or prediction. Identifying diseases in plants is a very difficult job and if not controlled in accurate way, then it may lead to a decrease in turn over. It requires an enormous quantity of labour, proficiency in plant viruses, and altogether requires an extreme period lag. To solve the problems caused by infected crops affecting farming, an approach to disease detection and prediction is required. Therefore, plant image feature extraction and deep learning model is used while plant disease identification. This research paper describes technique to detecting plant illnesses by plant leaf drawings.

Image processing is a part of signal processing that helps to take out image features or needful data of plant picture. Machine learning an important section of artificial intelligence to perform a particular task that works automatically and computationally with the help of provided instructions.

One of the important goals in machine learning used to recognize information for training as well as fitting same training dataset in model and it may help people. Therefore, it helps in making good decisions and predict the accurate outcome with the help of training dataset. Leaf colour, amount of leaf damage, leaf area, surface etc. the properties required in classification purpose.

This research helps to analyse those various properties of plant images to spot various diseases in plant leaf to achieve high amount of accuracy. Traditionally, the detection of plant diseases is completed with the help of pictorial review of plant leaf or with the help of chemical procedures by specialist. This requires a huge crew of specialist along

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with continuous monitoring on plants, it require a good amount of cost while implementing it in huge agricultural land. Therefore, processing of image with machine learning techniques is involved in plant disease recognition. This research may consider technique to predict plant illnesses by using plant leaves. Processing of plant image is a part of signal processing that helps to remove required image properties using plant leaf picture. Machine learning, the secondary section in artificial intelligence that helps computationally and extract information to perform a particular and necessary task.

Therefore, it may help in making good decisions and predicting accurate result using the high amount of training data. Leaf colour, amount of leaf damage, area of leaf, and leaf texture are the properties needed to perform classification algorithm. This research will help in analysing various features of the plant picture to identify various plant leaf illnesses to accomplish the great and high amount of accuracy.

II. RELATED WORK

Several aways has been developed to predict the farming yield and income results which is shown as below

Pratheepa. Et. al [1] have built an architecture using classification algorithm to warn of the cotton crop problem and also to identify the properties that influence the population mass of the problem, which additionally help farmers to implement strategies. pest control in time to help in reducing crop loss. Shiroop Madiwalar, Medha has discussed various techniques for image processing todetect plant disease in their research work [2]. The authors analysed characteristics of colour and texture of plant leaf which helps in detection of plant diseases. The 110 RGB images dataset has been used for algorithm testing purpose. The classification model using features extracted from plant leaf images for were the mean and standard deviation of the RGB and YCbCr channels, the GLCM features (grey level co-occurrence matrix), the mean and standard deviation of picture convoluted using the Gabor filter. A SVM (support vector machine) is classification algorithm used while building a classification model. The writers determined that from normal leaves GCLM properties are effective in diseases prediction. Whereas colour characteristics as well as Gabor filter characteristics are assumed to be the greatest while sensing disease affected leaf and spots on the leaves, respectively. It also removed all important features and achieved the high accuracy of 83.34%. Rahman., et. al [3] provide method to detect crop turn over using machine learning classification model, where relationship in between ancient environmental outlines with making rates of crops is used to train the model, hence these models are compared with unidentified atmosphere variables to calculate its efficiency. Sharath D.M. developed bacterial blight detection system and pomegranate plant are used for testing by extracting features such as plant leaf colour, edges, mean, SD, homogeneity, entropy, correlation, variance, etc. To segment section of interest within picture authors have applied slice segmentation concept [4]. They used Canny edge detector which is required to remove the boundaries of the pictures. The writers were positively established a scheme that is useful to detect the level of infection in fruits. Garima Shrestha installed convolutional neural network to sense plant illness [5]. The writers effectively classified 12 plant illnesses with 88.80% accurateness. Data set with 3,000 high-resolution RGB plant leaf pictures were helped in this research. In this work 3 convolution blocks with pooling layers are used. This technique had increased cost of computational network. Similarly, F1 score in this model is 0.12, that is actually low due to the large quantity false negative forecasts.

III. METHODOLOGY

1. Required dataset:

Images of plant leaves might be healthy or diseased and they may be obtained from the cotton leaf dataset. There are 4 different types of diseased cotton plant leaves are used. considered for this work are healthy, curl virus, fusarium wilt, bacterial blight. The cotton leaves dataset may contain 2800 images of cotton plant leaf and they were helpful while training and testing the planned CNN model. This dataset may contain unhealthy as well as healthy cotton plant leave pictures.

2. Data pre-processing with feature extraction

Information pre-processing is a important task with all vision-based systems. Data pre-processing is a technique in data mining which helps in transforming raw data into a needful and effective format. For exact results, we need to remove some background noise before feature extraction. Feature extraction is a kind of dimensionality reduction in which a high amount of image pixels is rendered proficiently in such a way that important parts of the image is effectively taken.

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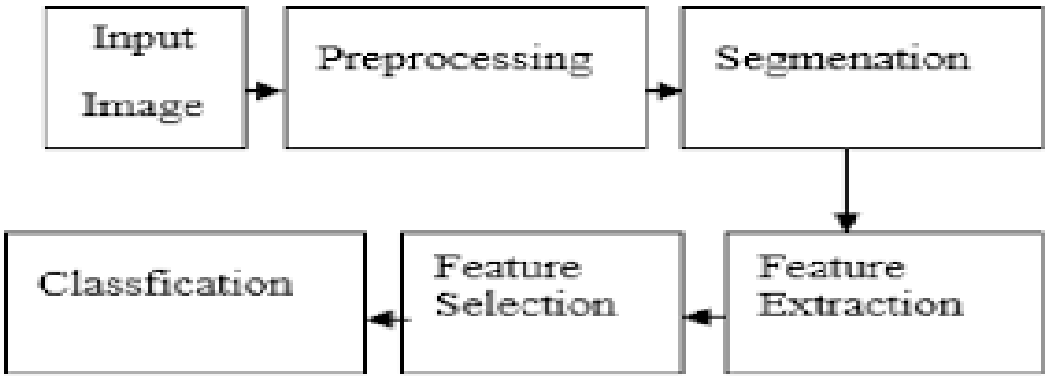


Fig 1. process of disease prediction

3. selection of Features

It is one of the vital stages in machine learning is feature selection. This process helps to reduce the amount of input variables while developing analytical model. It is required to reduce the amount of input variables to decrease the computational cost of modelling and, in few cases to expand model performance. This research choosing properties depends upon the correlation in the variables using target variable.

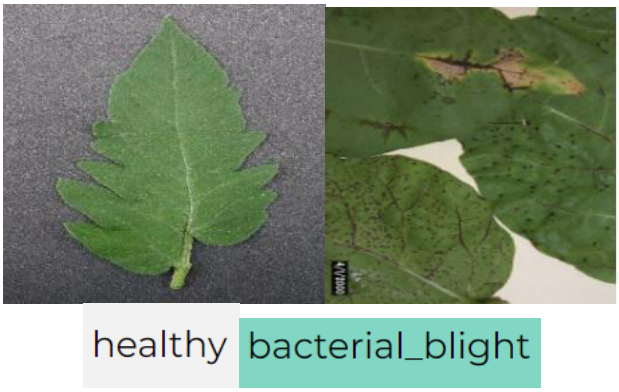
4 Classification technique

The random forest classification technique is used to detect tasks. It is part of joint learning, which helps in predicting output for multiple basis estimators. Usually, decision trees are used to accomplish greater precision. But it is subjected to overfitting problems. However, to conquer such problem, a random forest classification technique is helpful, that is a grouping of various decision tree matrix. Every tree is trained with the help of various subgroups of the full data, it helps to decrease overfitting. It also helps in increasing classifier correctness or accuracy. We have divided data set into a training dataset (70%) to fit the model and testing dataset (30%) for validation. The Kfold cross validation method used to discover the correctness or accuracy matrix. The technique is used to find the precision on a complete data set without any bias. Once data is fitted, f1-score, correctness, recall, and precision are calculated from the testing dataset to analyse model performance. confusion matrix and ROC curve is designed which helps in analysing false positive as well as false negative.

IV. RESULT

The important aim of this planned work to diagnose and verify whether leaves are diseased or healthy and also return the name of disease plant is diagnosed with to the farmer. GPU helps in training the models also test it on the testing dataset. We have used 2000 pictures to train and 800 pictures to validate. All images from dataset are labelled. Deep learning model is used for classification with an accuracy up to 96-98 percent. We can improve the accuracy when trained with a huge number of images and by implementing pre-trained CNN models.

The result of the Dense Net CNN technique is shown below by showing healthy and diseased leaf images as input and the model forecasts the result as healthy and bacterial blight.



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The model accuracy and model loss of Dense Net model for the training and testing cotton plant images data is shown as below

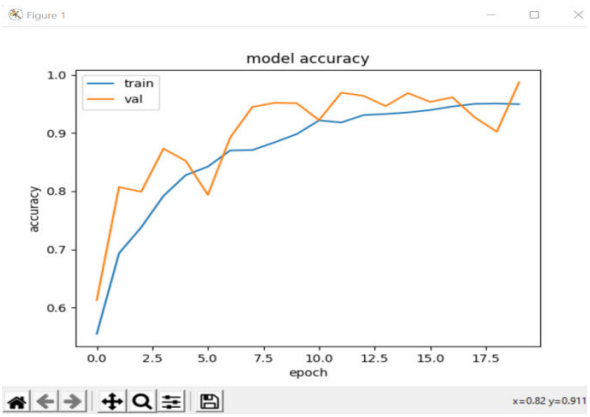

Fig. Model Accuracy

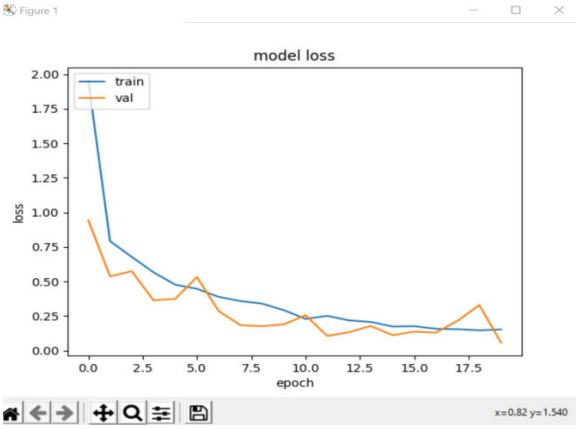

Fig. Model Loss

V. CONCLUSION AND FUTURE WORK

In this paper, we used cotton leaf Pictures and generated outputs with the help of system. We have effectively established an artificial intelligent system to detect plant illnesses. This system has accomplished average accurateness of 97%. Furthermore, this projected system is computationally effective because of usage of processing of images as well as deep learning model. The cotton plant pictures in datasets may increase and processed to improve forecast outcomes. The data set is extended as well as polished using improved quality images to improve the correctness. In future work we will test same system with the help of various plant leaves and also record the accuracy of the same and also compared the results.

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