A UNIQUE ALGORITHM ON ML AND DL MODULES FOR PLANT DISEASE DETECTION USING XCEPTION METHODS

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ABSTRACT:
Identification of diseases in plants is the key to assisting the losses in the yield and amount of product from agriculture. Analyses of plant conditions refer to examinations of patterns on the plant that can be seen with the naked eye. It's veritably delicate to cover the plant conditions manually. Utilizing an automated method to identify plant diseases is more beneficial because it eliminates the labor-intensive task of constantly tracking the crops being grown and recognizes diseases when they become apparent on plant leaves. This study offers algorithms for detecting plant diseases using machine learning and deep learning. Using the Xception model, Inception- ResNet- v2, and RF classifiers, classification is done in dataset images to identify illnesses on leaves. For the healthy and diseased sections of the leaf, the characteristics are uprooted. The xception model has an accuracy of 94 %.
Keywords: Plant Leaf, ML, DL, Inception-ResNet-v2, Xception model and Random Forest (RF), disease detection.

I. INTRODUCTION

Farming is a major source of income in India. Agriculture is critical to all countries' frugality. To survive in today's climate, agricultural development must be modernized. Bacterial and fungal infections both harm crops. This has a significant impact on the productivity of growers. Crop health is essential for maximum yield. Cultivation is the backbone of frugality in India. 50 percent of the population is directly or indirectly involved in farming [2]. Many different types of fruits, cereals, and vegetables are grown in India and exported to other countries. As a result, high-quality products with the highest possible yield are required. Because plant conditions must be met, the discovery of plant diseases is critical in the field of agriculture. Diseases can occur in plants [3].

Each disease is naturally produced, and it might negatively impact grains and veggies as well as efficiency, quality, and output volume. Therefore, correct labeling and recognition of leaf diseases may be essential in the prevention of agrarian degradation. Diseases similar to viral, fungal, and bacterial infections are carried by various grains and vegetable leaves. Downy Mildew, Black Mold, Alternaria alternata, Bacterial Scar, and Anthracnose are the most ubiquitous plant disease. The substance, color, form, and size of a diseased plant splint indicate the signs of the infection. Because most symptoms tend to be minor, disease identification is impossible due to mortal vision's limited capabilities [4].

Disease symptoms appear first on the leaves because they are the most vulnerable part of the plant. Crops must be disease-checked from the start of their entire lifecycle until they are all set for harvesting. Theconventional naked-eye surveillance approach was initially utilized to protect plants from disease, and it's a time-consuming procedure requiring professional to manually cover agricultural crops. Disease detection with our own eyes will always be difficult. Continuous crop monitoring is required to accomplish this. This is a time-consuming task. When the crop is large, this becomes prohibitively expensive. Agrarian experts are not qualified to diagnose

diseases and find solutions because of this difficulty. Growers will benefit greatly from an automated system that can identify plant conditions.

Several approaches have been proposed to improve the results of plant condition classification, including modified performances of well-known ML (Machine Learning) models. The machine-learning process can be either supervised or unsupervised [5]. When a machine is tutored and trained on a well-labeled image dataset of a diseased pair, this is referred to as supervised learning. That is the data that was previously labeled with the appropriate disease groups. The more advanced or large the dataset, the more accurately the machine learns. As a result, we can confidently forecast the future of machine learning in agricultural processes, especially in this aspect of plant-leaf diseases. The typical approach to plant disease detection for vast crops is naked-eye inspection, which is inefficient. It is more effective, less time-consuming, and more precise to identify plant diseases using digital image processing with machine learning. The Xception model, Inception- ResNet- v2, and Random Forest are among the deep learning and machine learning models used in this system. This method saves time, trouble, labour, and fungicide use. I'm hoping that by taking this approach, I'll be able to make a small donation to farming.

II. LITERATURE SURVEY

Umut bariş Korkut, Mer berke goktürk, Oktay Yildiz, et al. [6] describe image processing and machine learning approaches for autonomous diagnosis of plant illnesses. Crop quality and output are dependent on the rapid and accurate detection of plant diseases. By early identification and action, the expense of plant illnesses can be reduced, as can unnecessary pharmaceutical usage. Images of leaves from diverse plant species were obtained for this study, and the transfer technique was used to extract characteristics from the photos. The suggested model obtained 94% success using multiple machine-learning approaches.

Using 500 natural photos of rice from the empirical area, Y. Lu, S. Yi, N. Zeng, Y. Liu, and Y. Zhang et al. [7] suggested a CNN-based new rice disease diagnosis model with image pre-processing that identifies and recognizes rice illnesses. Furthermore, the suggested model outperformed the typical machine learning approach in terms of accuracy due to the 10-fold cross-validation scheme, practicality and efficiency, faster response rate, and identification ability.

R Anand, S Veni, J Aravinth, et al. [8] provide a method for diagnosing plant leaf illness as well as a methodology for disease discovery. The suggested study aims to identify brinjal diseases in plants via image analysis and artificial neural approaches. As a result of significant vegetable illnesses, productivity has dropped drastically. This study is more interesting because 85-95% of illnesses, such as Pseudomonas solanacearum, Cercospora, and Tobacco Mosaic, target brinjal leaves rather than the entire plant (TMV). In this study, neural networks are used for categorization. Artificial neural networks based on the suggested model are highly efficient at identifying leaf diseases.

III. PLANT DISEASE DETECTION

Figure 1 depicts the design of Deep Learning and Machine Learning models for Plant Disease discovery. For our study performance analysis, we used leaf photos of Cherry, Grape, Maize, and Apple from the Kaggle dataset, which included healthy and diseased leaf images. The collection comprises photos of leaves infected with four different illnesses. This dataset contains 600 photos of healthy and unwell leaves that will be used to build the leaf disease identification and detection model.

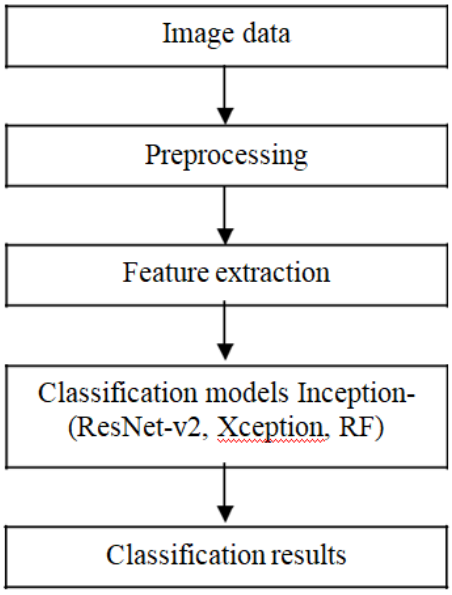

Fig. 1: ARCHITECTURE OF PLANT DISEASE DETECTION

The preprocessing method is used to reduce noise and enhance picture characteristics. Image enhancement is used to pre-process the photos. It improves visual characteristics by translating input intensity to the new value. During picture pre-processing, RGB photos are turned into HSV images since dealing with HSV (Hue, saturate, value) makes it much easier to separate the colors.

Feature extraction properly characterizes a large quantity of data. The leaf choices needed to classify illnesses, such as structure, texture, and colour, are uprooted. The grey-level matrix technique is used to investigate texturing alternatives. These alternatives are derived from an arrangement of data points related to others in the specified position.

Deep learning classifiers Inception-ResNet-v2 and Xception, and machine learning classifier Random Forest, are utilized sequentially in this technique. Inception-ResNet-v2 is a Convolutional neural network trained on photos from the ImageNet database. The 164-layer network can categorize photos into 1000 item categories, including the keypad, mice, pencil, and numerous creatures. As a consequence, the network has learned detailed visual features for a diverse set of pictures. The system takes a 299-by-299 picture as input and delivers a list of calculated class probabilities as output. accuracy. Accuracy and Precision metrics are used to compute deep learning and machine learning analysis. Xception is a 71-layer Convolutional neural network. A pre-trained version of the network trained on over a million photos from the ImageNet database may be loaded. Random Forest (RF) is a regression and classification machine learning technique. It is an aggregation approach that makes predictions by combining numerous decision trees. The technique generates several trees, each of which predicts a certain amount of data and features at random. The final forecast is formed by merging all of the trees' predictions, which helps to prevent overfitting and increase model accuracy. Accuracy and Precision metrics are used to compute deep learning and machine learning analysis.

IV. EXPERIMENTAL RESULTS

This section discusses the categorization findings of Cherry, Grapes, Maize, and Apple leaf photos obtained by doing a series of tests on the dataset. 50% of the leaf photos were utilized for training and the other 50% for testing. The comparison of the Accuracy and Precision characteristics is used to explore the best analytical outcomes of plant disease detection.

Accuracy

The proportion of correct guesses to total forecasts is referred to as accuracy. Accuracy is defined as the capacity to correctly predict the result of a problem.

Precision

The positive predictive value or precision is the ratio of the number of accurate positive scores to the total number of positive scores predicted by the classification algorithm indicated in equation (2)

True Negative (TN) - A proportion of accurately diagnosed healthy leaves.

True Positive (TP) - The fraction of sick leaves classified properly.

False Positive (FP) - The fraction of fresh leaves that are misidentified as sick leaves.

False Negative (FN) - A proportion of sick leaves are misidentified as healthy leaves.

The performance of plant disease discovery using Machine Learning and Deep Learning methods has been evaluated, and the comparison findings are shown in the table below.

Table: Comparative Performance Analysis

Parameters	Accuracy	Precision
Xception	94	-
Inception-ResNet-v2	58	-
RF	73	85

Graphical representation of Accuracy and Precision values of the three classifier models are shown in below Fig. 2.

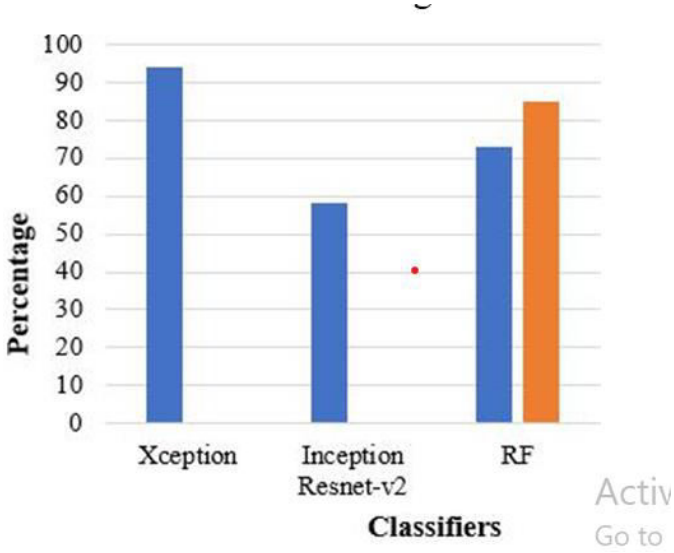

Fig. 2: Performance Comparison

The Unhealthy leaves of Cherry, Grapes, Maize and Apple plants are represented in below Fig. 3.

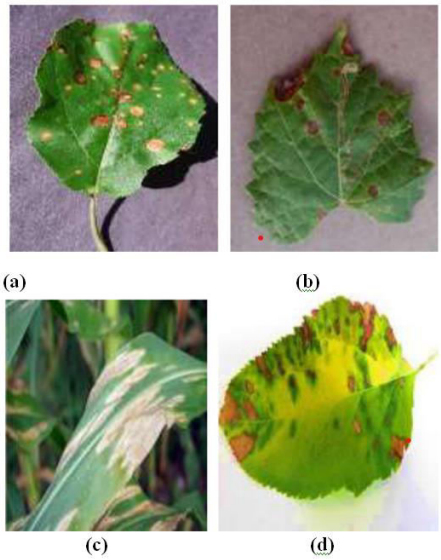

Fig 3: UNHEALTHY LEAVES OF (a) CHERRY (a) GRAPES (c) MAIZE (d) APPLE

Therefore from the results, it is clear that the Deep Learning Xception model has high efficiency than the other models Inception-ResNet-v2 and Random Forest (RF) in terms of Accuracy and Precision. The xception model achieves 94% of Accuracy.

CONCLUSION

In this paper Machine Learning and Deep Learning, models for Plant Disease detection are represented. Agriculturists are having difficulty manually recognizing illnesses in plants. Farmers also do not have easy access to professional counsel. It is beneficial for farmers to have an automated technique for identifying plant illnesses. The combination of machine learning and deep learning models as the Xception model, Inception-ResNet-v2, and Random Forest (RF) are used in this method. Accuracy and Precision are two performance parameters used in this study. Thus, from the results, it is clear that the Deep Learning Xception model has higher efficiency than Inception-ResNet-v2 and Random Forest (RF) in terms of Accuracy and Precision. The Xception model achieves 94% of Accuracy.

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