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# PLANT LEAF DISEASEDETECTION

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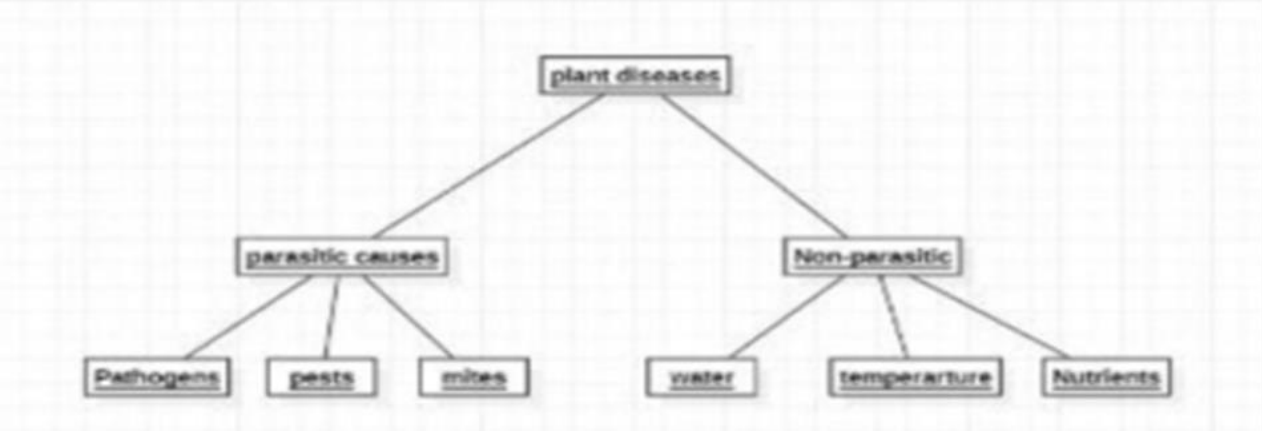
## ABSTRACT:

Plant diseases brought on by various pathogenic agents are the primary reason for the decline in the quality of agricultural productivity. One industry that significantly affects the way of living and financial standing of people is agriculture. incorrect administration results in agricultural produce losses. The plant's health is negatively impacted by diseases, which has an impact on its development. It is essential to monitor the development of the crop to ensure that there is little loss. A subset of deep learning called convolutional neural networks is primarily used for signal processing, picture segmentation, and image classification. The primary goal of the suggested work is to identify a solution to the detection issue of 38 different classes of plant diseases using the simplest method while utilizing the least amount of computing resources to produce superior results to the conventional models. deployment of the VGG16 training model. It is extremely difficult for farmers to identify and manage plant diseases. Early detection of plant diseases is crucial so that farmers can act appropriately and quickly to prevent future losses. Our strategy is centered on the use of image processing to identify plant diseases. By uploading a leaf photograph to the system, our suggested software will assist farmers in identifying plant illnesses. A set of algorithms built into the system can determine the disease type. Several processing stages are applied to the user's input image to identify the disease, and software then provides the user with the results.

## INTRODUCTION:

The size and productivity of an agricultural land base affects a nation's economic growth. Most people are dependent on agriculture. This is one of the factors contributing to the importance of plant disease detection in the sector of agriculture, as the presence of the disease in a plant is relatively normal. Depending on the resources available and the fertility of the land, farmers plant a variety of crops. Crops may be affected in specific ways by changes in environmental factors such as rainfall patterns, atmospheric temperature, soil fertility, and the frequency and severity of extreme weather. The conditions can lead to several illnesses, some of which can wipe out the entire crop if adequate precautions are not taken. If necessary, precautions are not followed in this area, plants may suffer major impacts that have an impact on the quality, quantity, and

productivity of the output. To prevent crops from these illnesses, farmers employ the appropriate pesticides, insecticides, and herbicides. There are numerous other infections that farmers fail to accurately identify. Disease control procedures can be a waste of time and resources and can result in additional plant losses if the illness and its cause are not correctly identified. Hence, accurate illness diagnosis is essential. The disorders have a wide variety of causes. Both parasite and non-parasitic causes are classified. Pathogens [Viruses, Bacteria, Fungi], Pests, and Weed are the causes of parasites. Water, temperature, radiation, and nutrients are examples of non-parasitic causes.




This type of observation method requires a huge team of qualified experts and ongoing supervision of these experts, which is quite expensive, especially for large farms. Meanwhile, in certain nations, farmers lack access to necessary resources and even the knowledge that they can speak with specialists. High fees are charged by consulting professionals, which many farmers find to be unaffordable. This procedure takes a lot of time and is lengthy. The suggested method can be useful in these circumstances for keeping an eye on vast fields of crops. It may be simpler to identify diseases by utilizing image processing to detect signs on plant leaves. We can predict diseases and avert significant losses by using image processing, image segmentation, and image enrichment. It will be advantageous to find plant diseases early on because they can be managed.

## LITERATURE SURVEY:

1) A Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm-based method for tomato leaf disease detection and classification is presented by M. Sardogan, A. Tuncer, and Y. Ozen. The dataset contains 500 photos of tomato leaves with four symptoms of illnesses. For automatic feature extraction and classification, we modeled a CNN. For study on plant leaf diseases, color information is frequently used. In our approach, three channels based on RGB components are subjected to the filters. The output feature vector from the convolutional component was input into the LVQ to train the network. The experimental findings demonstrate the effectiveness of the proposed strategy in identifying four different tomato leaf diseases.

[2] K. Jayaprakash and S. P. Balamurugan This study presents an optimal segmentation with Alexnet based feature extraction for plant leaf disease diagnosis (OSAFEM-PLDD) technique. With the help of leaf photos, the suggested OSAFEM-PLDD technique aims to identify and categorize various plant diseases. The OSAFEM-PLDD technique involves fuzzy filtering (FF) based pre-processing to remove the noise and improve the image quality. In addition, chicken swarm optimization (CSO) with Kapur's thresholding-based segmentation approach was employed for the detection of affected leaf regions. Moreover, AlexNet method was utilized for deriving a useful group of feature vectors and ultimately, functional link neural network (FLNN)based classification model is applied to execute effective plant disease diagnosis.

[3] A. Lakshmanarao, M. R. Babu and T. S. R. Kiran Humans rely on agriculture as a major source of sustenance. As a result, finding plant diseases has become a top priority. There are established ways to recognize plant disease. However, plant pathologists or agriculture experts have typically used empty eye inspection to find leaf disease. This method of identifying plant leaf disease generally involves a large team of experts with extensive knowledge of plant diseases, and it can be subjective, expensive, and time-consuming. Using a software solution that has undergone experimental evaluation, plant leaf diseases can also be found. Deep learning and machine learning have become popular in recent years. Machine learning is also not an exception in the agricultural industry. In this study, we used "Convnets" to detect and categorize plant diseases.

[4] S. V. Militante, B. D. Gerardo and N. V. Dionisio Apple, corn, grapes, potatoes, sugarcane, and tomatoes were among the plant varieties that the technology was specifically developed to detect and identify. The technology can also identify several plant illnesses. The researchers were able to train deep learning models to detect and recognize plant diseases and the absence of these diseases using 35,000 images of healthy and diseased plant leaves. The system was able to detect and identify the plant variety and the sort of diseases the plant was infected with up to 100% accuracy, and the trained model has obtained an accuracy rate of 96.5%.

[5] S. H. A. Silviya, S. B, P. B. Shamini, A. Elangovan, M. A. R and N. V. Keerthana the research of automatic disease diagnosis is growing in popularity. It helps with crop field monitoring and the detection of parasite infestation on the leaves. This article's objective is to identify crop damage that lowers crop losses and, as a result, boosts production effectiveness. Our suggested framework uses simply a Convolutional (DL) technique to detect leaf illnesses at an early stage and identify crop diseases based on symptoms. The system's suggested method uses a CNN to identify disease with the greatest degree of accuracy. The output of the system's graphical user interface displays the outcome at the end. The system operates better, according to the experimental data.

[6] S. Kumar, R. Kumar and M. Gupta Apple output is significantly reduced by illnesses and pests. It might be difficult for farmers to distinguish between different apple diseases because their symptoms can be very similar and manifest simultaneously. In order to solve these issues, Leaf Disease Prediction (LDP) in apple agriculture is crucial. An overview of the taxonomy of apple plant diseases is included in this work, along with information on their symptoms, causes, and effects. The study's findings showed that the automatic method for identifying and categorizing apple plant diseases is still in its infancy. Consequently, a new effective model is needed for the identification and classification of apple plant leaf disease so that the farmer can avoid financial loss and allow them to increase the Production of Apples.

[7] V. A. Metre and S. D. Sawarkar It is crucial to recognize and protect plants from these diseases at the earliest stages because they pose a serious risk to the supply of food. The traditional methods took a lot of time since they required subject-matter experts. To identify and treat plant diseases that affect plant leaves, a variety of disease identification methodologies using different domains have been proposed in the literature. This is because technology is advancing daily and has many benefits in the field of plant leaf disease detection. Even though many of the current methods have produced superior outcomes, obstacles still stand in the way of optimizing the plant leaf disease detection process.

[8] M. Pei, M. Kong, M. Fu, X. Zhou, Z. Li and J. Xu Unsupervised images of plant leaf pests and diseases are used to address the issue that existing datasets on plant leaf diseases are difficult to obtain, contain a limited number of diseases, and are unable to identify the damaged areas of leaves. To identify and locate the aberrant areas of plant leaves, this work applies the concept of image restoration and a deep learning correlation model. The experimental findings demonstrate that the img_AUCROC and pixel_AUCROC level anomaly identification and localization generate good outcomes, which have an impact and serve as a benchmark for other peers.

[9]M. A. Jasim and J. M. AL-Tuwaijri We have chosen specific plant species for our work since they are the most prevalent worldwide and in Iraq in particular. These species include tomatoes, peppers, and potatoes. 20636 pictures of plant diseases may be found in this data set. We used the convolutional neural network (CNN) in our proposed system to classify plant leaf diseases into 15 different categories, including 12 classes for diseases of various plants that were found to exist, such as bacteria, fungi, etc., and 3 classes for healthy leaves. As a result, we were able to achieve very high accuracy in both training and testing, with accuracy values of (98.29%) for training and (98.029%) for testing for all employed data sets.

[10]H. Q. Cap, K. Suwa, E. Fujita, S. Kagiwada, H. Uga and H. Iyatomi vital for minimizing economic losses and lessening the severity of the world food crisis. There are some quick and precise computer-based techniques that have been used to identify plant diseases. To the best of our knowledge, all of those approaches, however, only accept a narrow range image as their

input, often one or a small number of targets are in the image frame. They are therefore time-consuming and challenging to use for on-site wide-range photos (such as pictures or movies from a stationary security camera). In this research, we present a deep learning-based leaf localization method using wide-angle on-site pictures. Our method achieves a detection performance of 78.0% in F1-measure at 2.0 fps.

[11]A. Suljović, S. Čakić, T. Popović and S. Šandi Farmers spend a lot of time observing and detecting diseased plants, often by looking at and analyzing plant leaves. Poor plant disease management, such as late detection or the application of the incorrect pesticides, frequently results in crop damage, which lowers the quality of food. Artificial intelligence and machine learning could be used to solve this issue by analyzing digital images of leaves to find plant diseases. As the leaf is the best indicator of whether the plant is healthy or not, by applying machine learning we can create prediction models to detect the condition of the leaf in a shorter period of time and possibly prevent or reduce the losses. This paper describes experimenting with Detectron2 software library and Faster R-CNN neural

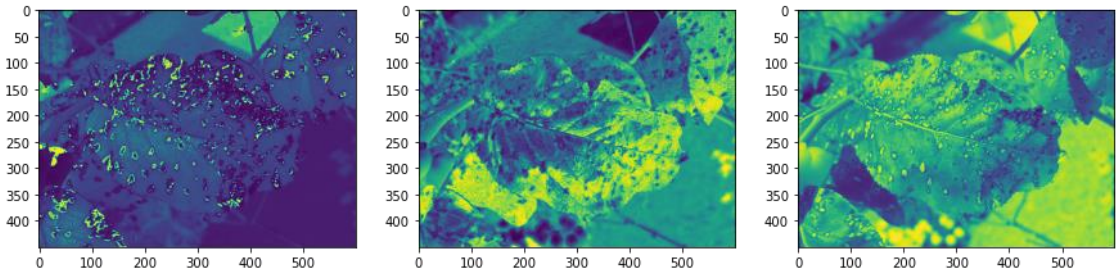
[12]V. V. Srinidhi, A. Sahay and K. DeebaThe process of diagnosing diseases nowadays is time-consuming, expensive, and dependent on human scouting. Compared to the current method, automatic disease segmentation and diagnosis from plant leaf photos can be somewhat useful. Image capture, pre-processing, and segmentation are the first steps in the automatic identification of plant diseases. These are followed by augmentation, feature extraction, and classification using models. This study employs EfficientNet and DenseNet, two Deep Convolutional Neural Network models, to accurately identify four kinds of apple plant diseases from photographs of apple plant leaves. "Healthy," "scab," "rust," and "multiple diseases" are among the classifications. Utilizing data augmentation and picture annotation techniques, such as Canny Edge Detection, Blurring, and Flipping, the dataset for apple leaf disease is enhanced in this study. Models utilising EfficientNetB7 and DenseNet are suggested based on an upgraded dataset, providing accuracy

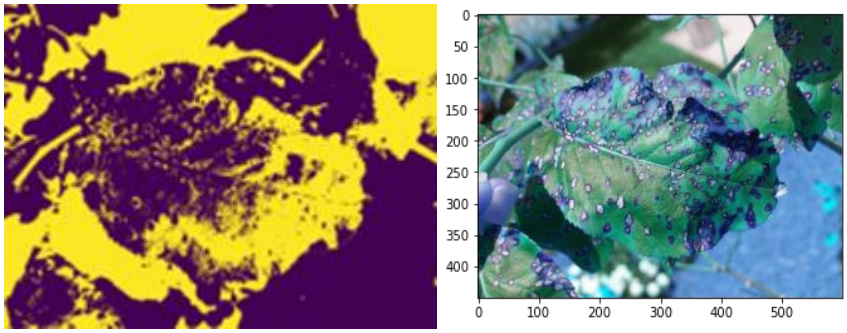
[13]N. Nisar, A. Awasthi, M. Chhabra and A. I. Abidi Plant diseases have an impact on and lower agricultural output in terms of quantity and quality. Nowadays, there is significantly more focus on plant disease identification when wide areas of crops are being monitored.The symptoms and indicators of various plant illnesses are visible in various plant parts, but leaves are thought to be the most observable plant parts for disease identification. Although there are many possible applications for pattern recognition in agriculture, this research focuses on the identification and categorization of illnesses. Plant leaf diseases can be identified using image processing techniques, which calls for the phases of picture acquisition, pre-processing, segmentation, feature extraction, and classification.

The research described above all concentrated on image processing, image segmentation, and neural networks. The suggested algorithms listed above have all been very well executed, and they can all be very beneficial to Farmers and us in the future.

## PROPOSED SYSTEM:

We suggest a technique for identifying diseases, wherein, if a leaf is damaged, the system we developed may display the names of illnesses, potential treatments, appropriate fertilizers, as well as details on the infection's origin. Farmers may learn more from this and take action to stop specific illnesses from reoccurring. Our approach makes use of image acquisition, image preprocessing, and image segmentation to pinpoint diseases and their causes. Utilizing the dataset from our proposed system, we look at images of plant leaves that are divided into different classes. We make an effort to predict the crop-disease pair for each class label using only the plant leaf's image. a representative sample of each crop-disease association in the dataset.





## CONCLUSION

Here we highlighted the concepts and techniques used by many other researchers and algorithms developers and proposed a new feature to the existing models. The ultimate goal is to limit the impact of plant diseases on agricultural production using image processing techniques. Moreover, it is important to understand the correlation between the disease's symptoms and its impacts on yield. A brief discussion of popular detection and classification techniques is

provided along with possibilities of extensions. We used cnn, keras and tensor flow to analyze the images in the dataset and image segmentation, preprocessing to process an image given by the user.

**Reference:**

[1]M. Sardogan, A. Tuncer and Y. Ozen, "Plant Leaf Disease Detection and Classification Based on CNN with LVQ Algorithm,"2018 3rd International Conference on Computer Science and Engineering (UBMK), Sarajevo, Bosnia and Herzegovina, 2018, pp. 382-385. 2018, doi: 10.1109/UBMK.2018.8566635

[2]K. Jayaprakash and S. P. Balamurugan, "Design of Optimal Multilevel Thresholding based Segmentation with AlexNet Model for Plant Leaf Disease Diagnosis," 2022 4th International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, 2022, pp. 1473-1479.

[3]A. Lakshmanarao, M. R. Babu and T. S. R. Kiran, "Plant Disease Prediction and classification using Deep Learning ConvNets," 2021 International Conference on Artificial Intelligence and Machine Vision (AIMV), Gandhinagar, India, 2021, pp. 1-6.doi: 10.1109/AIMV53313.2021.9670918

[4]S. V. Militante, B. D. Gerardo and N. V. Dionisio, "Plant Leaf Detection and Disease Recognition using Deep Learning," 2019 IEEE Eurasia Conference on IOT, Communication and Engineering (ECICE), Yunlin, Taiwan, 2019, pp. 579-582. doi: 10.1109/ECICE47484.2019.8942686.

[5]S. H. A. Silviya, S. B, P. B. Shamini, A. Elangovan, M. A. R and N. V. Keerthana, "Deep Learning based Plant Leaf Disease Detection and Classification," 2022 4th International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2022, pp. 702-710. doi: 10.1109/ICIRCA54612.2022.9985548.

[6]S. Kumar, R. Kumar and M. Gupta, "Analysis of Apple Plant Leaf Diseases Detection and Classification: A Review," 2022 Seventh International Conference on Parallel, Distributed and Grid Computing (PDGC), Solan, Himachal Pradesh, India, 2022, pp. 361-365. doi: 10.1109/PDGC56933.2022.10053320

[7]V. A. Metre and S. D. Sawarkar, "Reviewing Important Aspects of Plant Leaf Disease Detection and Classification," *2022 International Conference for Advancement in Technology (ICONAT)*, Goa, India, 2022, pp. 1-8. Doi: 10.1109/ICONAT53423.2022.9725870.

[8]M. Pei, M. Kong, M. Fu, X. Zhou, Z. Li and J. Xu, "Application research of plant leaf pests and diseases base on unsupervised learning," *2022 3rd International Conference on Computer Vision, Image and Deep Learning & International Conference on Computer Engineering and Applications (CVIDL & ICCEA)*, Changchun, China, 2022, pp. 1-4.

doi: 10.1109/CVIDLICCEA56201.2022.9824321

[9]M. A. Jasim and J. M. AL-Tuwaijari, "Plant Leaf Diseases Detection and Classification Using Image Processing and Deep Learning Techniques," *2020 International Conference on Computer Science and Software Engineering (CSASE)*, Duhok, Iraq, 2020, pp. 259-265. doi: 10.1109/CSASE48920.2020.9142097.

[10]H. Q. Cap, K. Suwa, E. Fujita, S. Kagiwada, H. Uga and H. Iyatomi, "A deep learning approach for on-site plant leaf detection," *2018 IEEE 14th International Colloquium on Signal Processing & Its Applications (CSPA)*, Penang, Malaysia, 2018, pp. 118-122. doi: 10.1109/CSPA.2018.8368697.

[11]A. Suljović, S. Čakić, T. Popović and S. Šandi, "Detection of Plant Diseases Using Leaf Images and Machine Learning," *2022 21st International Symposium INFOTEH-JAHORINA (INFOTEH)*, East Sarajevo, Bosnia and Herzegovina, 2022, pp. 1-4. doi: 10.1109/INFOTEH53737.2022.9751245

[12]V. V. Srinidhi, A. Sahay and K. Deeba, "Plant Pathology Disease Detection in Apple Leaves Using Deep Convolutional Neural Networks : Apple Leaves Disease Detection using EfficientNet and DenseNet," *2021 5th International Conference on Computing Methodologies and Communication (ICCMC)*, Erode, India, 2021, pp. 1119-1127. doi: 10.1109/ICCMC51019.2021.9418268

[13]N. Nisar, A. Awasthi, M. Chhabra and A. I. Abidi, "Image based Recognition of Plant Leaf Diseases: A Review," *2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*, Palladam, India, 2020, pp. 373-378.

doi: 10.1109/I-SMAC49090.2020.9243434