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Rice Leaf Disease Detection using Deep Learning

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Abstract: A wide range of bacterial, viral, or fungal diseases can damage rice leaves, significantly reducing rice yield. Finding the causes of rice ailments in the leaves is essential to feeding the world's massive population. However, the recognition of rice leaf rot depends on the settings and background of the image capture. Convolutional neural network (CNN) driven model is one of the most popular study topics in rice leaf disease detection. However, the existing CNN-based models only learn large network parameters and perform much worse in terms of recognition rates on different datasets. In order to detect rice leaf illnesses, we lower the network parameters and introduce a unique CNN-based method in this research. Using a special dataset of 4199 images of rice leaf diseases, multiple CNN-based models are trained to identify five common rice leaf diseases. The recommended model achieves the best levels of 99.78% training accuracy and 97.35% validation accuracy. An independent set of pictures of rice leaf disease is used to evaluate the effectiveness of the proposed model, yielding the highest accuracy of 97.82% and an area under the curve (AUC) of 0.99. Additionally, based on binary classification trials, our proposed model achieves identification rates of 97%, 96%, 96%, 93%, and 95% for Blast, Brown spot, Bacterial Leaf Blight, Sheath Blight, and Turgor, respectively. These results demonstrate the effectiveness and superiority of our approach over the most sophisticated CNN-based algorithms for recognizing rice leaf

I. INTRODUCTION

India is referred to be the "land of agriculture" because so many people are employed in this industry here. For us, agriculture is vital. One of the key factors affecting the status of the domestic market in our country is crop production. Changing weather patterns, population growth, and unstable political climates forced agricultural corporations to search for novel, low-cost, high-yield technologies. Plant or crop health is critical to achieving food safety and sustainability in agriculture. But the plants can readily contract infections for a number of causes, which can cause major societal and economic problems. Crop disease is a common source of crop productivity loss that can affect crop development, yield, and quality. To avoid contaminating the soil, it's critical to recognize the illness and use specific pesticides as soon as feasible. Plant diseases can be identified early by a variety of methods. It's customary to diagnose plant illnesses with the unaided eye, however for large harvests, this method is unreliable and ineffective. The primary goal of this work is to identify rice leaf diseases through research and diagnosis, as well as to identify the condition so that appropriate preventive actions can be performed. Growing over

104.80 million tons of land across multiple Indian states, rice is one of the most significant food crops in our country. It is a crop with several uses and a high nutritious content. Being the second-largest producer of rice in the world, our country's rice-growing region is constantly expanding. It is high in protein and carbohydrates and has a good quantity of minerals and dietary fibre. Plant diseases are typically caused by bacteria, viruses, fungus, pathogens, and other microbes. Due to their susceptibility to illnesses caused by fungus and viruses, rice leaves provide an ideal medium for pathogen dissemination in this varied field environment. In Figure 1 below, various rice leaf diseases are illustrated. Diseases have become a worry since farmers are unable to identify leaf illness with the naked eye, particularly for rice plants. They need to see a specialist, which costs money and takes time, to determine the precise ailment. The most common diseases that harm rice leaves are brown spot, Hisa, leaf blast, and healthy. Consequently, the identification of disease in foliage is an important topic with several benefits for crop surveillance in large areas. Rice disease of the leaves can affect yield and quality by damaging the outer green layer of the leaves. The key to managing different rice diseases is promptly and precisely determining the type of disease and then putting the appropriate corrective measures in place. Deep learning networks and digital image processing techniques enable disease identification precise, rapid, and low-effort. Advances in computer vision can be used to increase and improve plant protection. The content of the paper is arranged as follows: In Section 2, we will discuss a number of previous research that have employed deep learning models, machine learning strategies, and image processing techniques to diagnose illnesses in rice plant leaves. The third portion delves into the several deep learning approaches that were explored for the purpose of detecting rice leaf disease. The experiment's results are concluded and future prospects are explored in the last section. In this study, we are creating an automated method to detect fungal diseases in rice plants, which are the main cause of rice plant mortality.

This type of sickness may emerge and spread due to a combination of climatic change and moisture on the leaves. The aforementioned graphic shows the entire process for the solution we have proposed. The first step is to obtain the image, this process of obtaining an image from a source is called image acquisition. Input can come from a variety of sources, including hardware like sensors and cameras. This is the most important phase in the entire process because processing cannot be completed without an image. This is the initial step of the process every time. The second step is gathering datasets. The dataset used in our approach consists of many images representing the four rice leaf diseases that we are anticipating. Finally, the images are arranged according to the diseases they depict. Using our technologies, we have investigated four illnesses that affect rice plants.

II. RELATED WORK

"Stack Ensemble-Based Automated Identification of Peanut-Leaf Diseases," As a major food crop, peanuts are directly impacted by leaf diseases, which reduce yield and quality. This work used a classic machine-learning method to ensemble the output of a deep learning model to identify diseases of peanut leaves, thereby resolving the difficulty of automatic diagnosis of these diseases. Healthy leaves, one-leaf rust disease, one-leaf leaf-spot disease, one-leaf scorch disease, and one-leaf combination of rust and scorch disease were the diseases detected in peanut leaves. Three different kinds of data-augmentation techniques were applied: rotation, scaling, and picture flipping. In this experiment, the deep- learning model performed more accurately than the traditional machine-learning methods. Furthermore, the utilization of a stacking ensemble and data augmentation improved the performance of the deep- learning model. Following ensemble using logistic regression, the F1 score of the dense convolutional network with 121 layers (DenseNet121) reached 90.50, and the accuracy of the residual network with 50 layers (ResNet50) reached 97.59%. In this experiment, the deep-learning model's F1 score rose higher than the logistic regression ensemble's. In this experiment, deeper network layers in deep learning networks, including ResNet50 and DenseNet121, produced better outcomes. This inquiry can help identify diseases that harm peanut leaves. "Recognition and identification of pests and diseases affecting rice using convolutional neural networks," By employing precise and quick pest and disease detection, farmers may dramatically reduce their financial losses and cure their rice plants on time. Recent developments in convolutional neural networks (CNNs) based on deep learning have led to a notable improvement in photo classification accuracy. In this work, deep learning-based techniques for recognizing pests and illnesses from photographs of rice plants have been developed, motivated by CNNs' impressive image classification ability. The following two contributions are made by this work: (i) To identify and detect rice-related pests and diseases, state-of-the-art large-scale architectures like VGG16 and InceptionV3 have been put into practice and improved. Experimental results show that these models perform well with real datasets. (ii) Since large-scale architectures are not suitable for mobile devices, two-stage small CNN designs have been presented and compared with the latest versions of memory-efficient CNN architectures, such as Mobile Net, Nas Net Mobile, and Squeeze Net. The experimental results show that the proposed design could achieve the desired accuracy of 93.3% with a significantly smaller model size—99% smaller than VGG16. "Classifying and detecting groundnut leaf disease using backpropagation algorithms," Agricultural items can degrade for a variety of causes, as multiple studies have shown. One of the primary causes of decreased yield is an attack by illness. Plant diseases are caused by bacteria, viruses, and fungi. The leaf disease completely destroys the leaf's quality. A prevalent ground nut disease is cercosporin. This is a type of disease that first affects the leaves of groundnut plants. The revised processing pattern consists of four main stages. Since RGB is used for color generation and color descriptors, an RGB refurbishment scheme is first created for the input RGB image. This RGB is then converted into HSV. Phase two is the separation of the plane. Next, the color features were implemented. The next stage is to detect leaf sickness using the back propagation approach. "Machine learning for plant disease detection.2018, the International Conference on Design Innovations for Three-Cs Computation, Communication, and Control. Food security is seriously threatened by crop diseases, but in many regions of the world, it is still challenging to recognize them rapidly because of a critical foundation. The emergence of accurate techniques in the field of leaf-based picture categorization has shown impressive results. Based on the generated data sets, Random Forest is used in this study to differentiate between healthy and diseased leaves. We propose an article that covers many implementation stages, such as feature extraction, dataset creation, classifier training, and classification. A Random Forest algorithm is trained on the generated datasets of infected and healthy leaves in order to categorize the photographs of damaged and healthy leaves. The Histogram of an Oriented Gradient is our preferred technique for extracting features from images (HOG). All things considered, we can use machine learning to train the big publicly available data sets, giving us a clear way to detect plant diseases on a tremendously large scale.

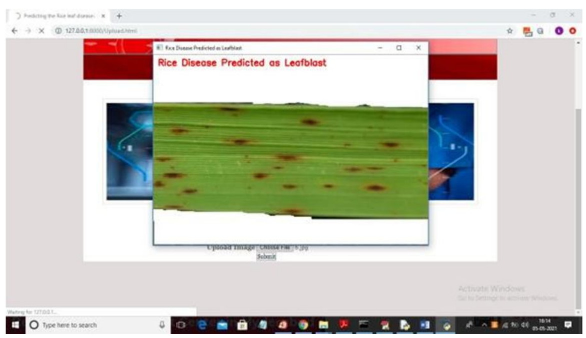
III. METHODOLOGY

In order to carry out this project, we have created the subsequent modules.

1) Login: Since this is an online program, the user must first create an account using the username "admin" and password "admin.
2) Train CNN Algorithms: After login user can use this model to train regular CNN and VGG16 CNN with above rice disease dataset and after training model we will compute both models' accuracy on test data.
3) submit Rice Image: With the help of this module, users will be able to submit pictures of rice leaves, and the program will be able to determine whether the leaves are diseased or in good condition.

IV. RESULT AND DISCUSSION

Click the "Login" option in the upper screen to view the login screen below.



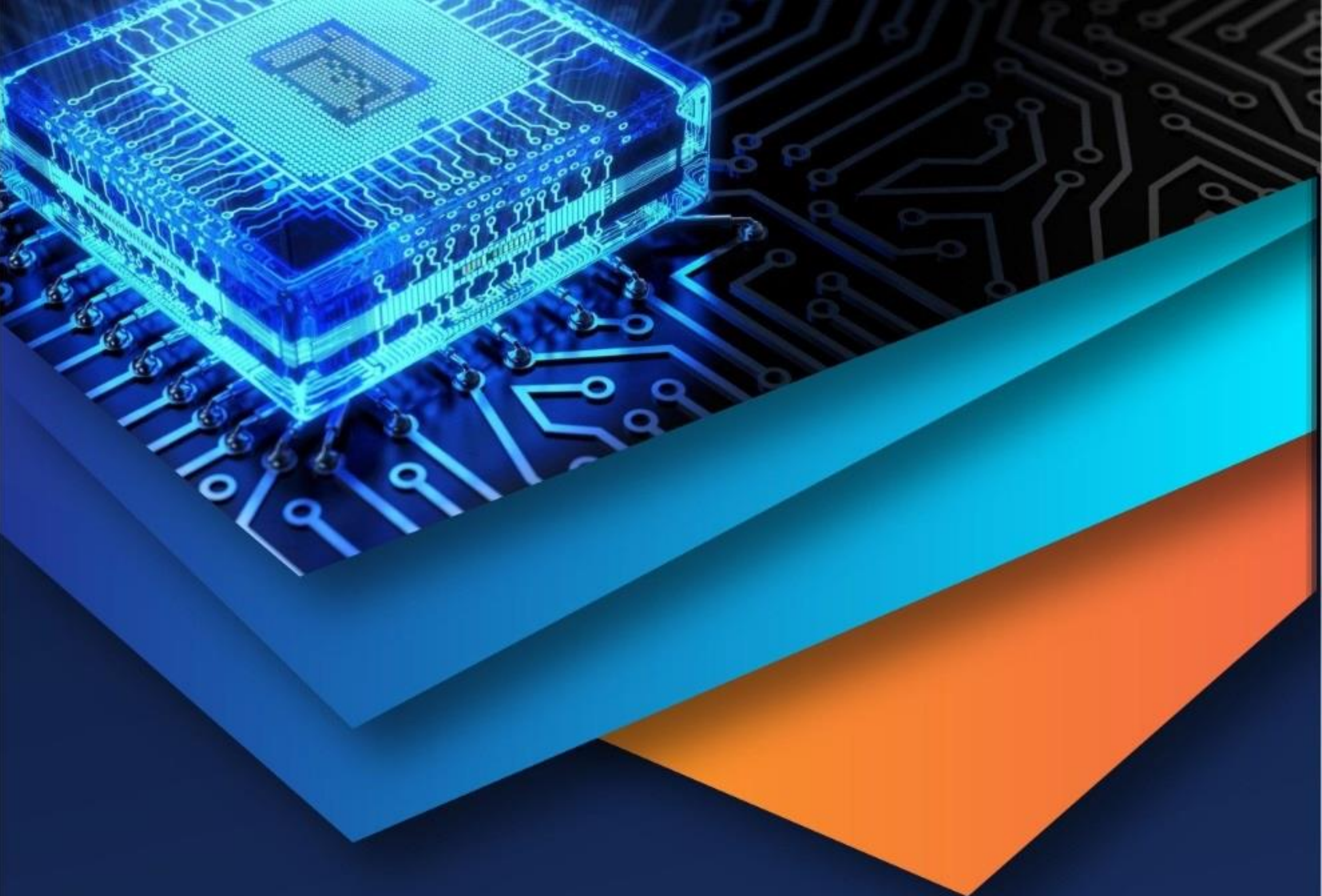
The disease was identified as "Leaf Blast" in the upper screen of the uploaded image.

V. CONCLUSION

In this study, we used a variety of digital learning algorithms to classify four distinct rice leaf diseases. To process the dataset of different damaged rice leaves, we used a handcrafted 5-layer convolutional network along with many common deep learning algorithms, including as VGG19, VGG16, Exception, and Resnet. We discovered that the 5-layer convolution net outperformed the others in terms of rice leaf detection. Fig. 6 suggests that the accuracy of our proposed 5- layer CNN model is approximately 6% greater than that of the other popular deep learning models. Additionally, we discovered that by adjusting the training parameters, such as learning percentage, the number of epochs, and optimizer techniques, a manually constructed model with fewer layers than the other traditional models can obtain noticeably higher accuracy. As illnesses are diagnosed more precisely, farmers will find it easier to protect their crops. We'll broaden the scope in the future to include more diseases and algorithms, which will improve the comprehensiveness, ease of use, and speed of disease diagnosis.

REFERENCES

[1] Sruthi, P., Premkumar, L." Attribute- based storage supporting secure de- duplication of encrypted data in cloud", International Journal of Recent Technology and Engineering, 2019, 7(6), pp. 418–421
[2] Shirisha, N., Bhaskar, T., Kiran, A., Alankruthi, K."Restaurant Recommender System Based on Sentiment Analysis",2023 International Conference on Computer Communication and Informatics, ICCCI 2023, 2023
[3] Sasi Bhanu, J., Kamesh, D.B.K., Durga Bhavani, B., Saidulu, G." An Architecture on Drome Agriculture IoT Using Machine Learning", Cognitive Science and Technology 2023, Part F1493, pp. 635–641
[4] Y. Ambica, Dr N. Subhash Chandra MRI brain segmentation using correlation based on adaptively regularised kernel-based fuzzy C-means clustering Int. J. Advanced Intelligence Paradigms, Vol. 19, No. 2, 2021



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