DETECTION OF PADDY LEAF DISEASE USING DEEP LEARNING AND IT'S TREATMENT

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ABSTRACT

The Smart farming system using necessary infrastructure is an innovative technology that helps to improve the quality and quantity of agricultural production in the country. paddy leaf disease has long been one of the major threats to field security because it dramatically reduces crop yield and compromises its quality. Accurate and precise diagnosis of diseases has been a significant challenge and recent advances in computer vision made possible by deep learning have proved the way for camera-assisted disease diagnosis for paddy leaf. It described the innovative solution that provides efficient disease detection and deep learning with Convolutional Neural Networks (CNN) that has achieved great success in the classification of various paddy leaf diseases. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available paddy leaf disease given image dataset. So, it was observed that neural networks can capture the colors and textures of lesions specific to respective diseases upon diagnosis, which resembles human decision-making.

Key words: Deep Learning, TensorFlow, CNN.

INTRODUCTION

Rice Blast is a fungal disease caused by Pyricularia oryzae. This disease can infect paddy at all growth stages and all aerial parts of plant (Leaf, neck and node). Symptoms: The disease infects all parts of the plant except roots but the severity is high on leaves, nodes and panicles. This paper proposes a deep learning-based model which is trained using public dataset containing images of healthy and diseased crop leaves. The model serves its objective by classifying images of leaves into diseased categories based on the pattern of defect. The four most important strategies for rice disease management are to rotate crops, plant resistant varieties, plant in warm soil and use fungicides when necessary. An integrated approach that uses all of these methods is the most effective and profitable.

II. RELATED WORK

In [1] authors used Information and Communication Technology (ICT) Tools to classify and detect the Rice Leaf Diseases. The performance of plant disease detection system can be evaluated by measuring the accuracy of the image processing algorithm. But The main issue is the absence of non stop monitoring of rice plant. In [2] A rigorous survey and comparative analysis of different image processing technique are done in this process. Image processing technique can prove one of the accurate and economic practice for measuring parameter related to various plant diseases. But this technique require continues monitoring of crop field for correct estimation of disease. As the visual analysis require constant human observation. In [3] used Hybrid CNN-LSTM Algorithm to identify the pest and disease in paddy leaf by Symptomatic Assessment. Proper usage of digital image processing in the field of paddy cultivation to identify disease is boosted. The disease can be visually identified by considering the variation in the leaf appearance and its general visual features. The imagination of visual pattern is not a harder task to form a multivariate identify disease. But it takes more time and little amount of drudgery for farmers of interior areas. An appropriate automated system is required for diagnosis of paddy disease. In [4] the authors used Attention Based Neural Network and Bayesian Optimization to detect and classify the Rice disease. This had demonstrated high generalization performance in many image analysis studies. But precise and timely diagnosis of the disease is critical. The process can be extremely labour intense and time consuming. In [5] the authors used Multi-Level Colour Image Thresholding to detect Rice Leaf Blast Disease. This technique will be used to reduce manual inspection and identification of common rice disease meanwhile, Image processing system gives more accuracy and speed. But it is un-favourable for many other aspects such as different size, orientation, complex etc. Also, it is difficult to detect the target image outside since it composed both the structured and non-structured object. In [6] the authors used Edge-as-a-Service to identify Biotic Stress in Rice crops. The prevention of infection in crops lead to reduced water consumption during irrigation. The gross productivity of any farm can be increased by regular monitoring and prompt action on any anomalies.

III. PROPOSED SOLUTION

Convolutional Neural Networks (CNNs) have proven to be highly effective in classifying images, including the classification of paddy leaf diseases. Paddy leaf diseases can have a significant impact on crop yield and quality, making it crucial to accurately identify and diagnose them. CNNs offer a powerful solution by leveraging their ability to automatically learn and extract meaningful features from images. In the context of paddy leaf disease classification, a CNN would typically consist of multiple convolutional layers, pooling layers, and fully connected layers. The convolutional layers apply filters to the input images, capturing local patterns and features. These filters automatically learn and detect specific characteristics associated with different types of paddy leaf diseases. Pooling layers are used to down-sample the feature maps obtained from the convolutional layers, reducing the spatial dimensions and extracting the most important information. This helps in reducing the computational complexity and improving the network's ability to generalize to different instances of paddy leaf disease images. Finally, the fully connected layers receive the extracted features and perform classification based on the learned representations. The network learns to map the input images to different disease classes, enabling accurate identification and classification of paddy leaf diseases. By training a CNN on a large dataset of labeled paddy leaf disease images, the network can learn to recognize and classify various types of diseases accurately. The training process involves adjusting the weights and biases of the network using optimization techniques like backpropagation, allowing the network to improve its performance over time. The use of CNNs for paddy leaf disease classification offers several advantages. Firstly, CNNs can handle the complexity and variability of paddy leaf disease images, capturing both global and local patterns that are indicative of specific diseases. Secondly, CNNs can automatically learn relevant features from raw images, eliminating the need for manual feature engineering. This makes the approach highly adaptable to different disease types and reduces the dependence on domain expertise. Convolutional Neural Networks are a powerful tool for classifying images of paddy leaf diseases. Their ability to learn and extract meaningful features from images, coupled with their capacity for accurate classification, make them well-suited for addressing the challenges associated with paddy leaf disease identification and management.

IV.WEBPAGE RESULTS

The Webpage is created for classifying the disease The webpage is designed to display the particular type of paddy leaf disease, as shown below in the Figure 1.

Figure 1. Webpage for categorizing the disease

The webpage takes the input image by the input section and sends to the backend for processing and displays the output of zoomed image of the affected area and mentioning the particular type of disease which is affected by the crop as shown in Figure 2. When the disease is identified that it is not affected by any kind of diseases, then the webpage displays that the crop is healthy as shown in Figure 3.

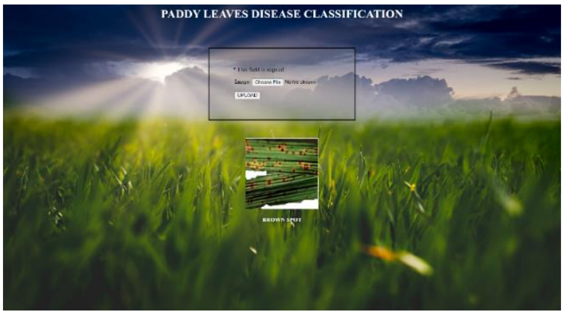

Figure 9.2 Webpage displaying the affected disease name

Figure 9.3. Webpage displaying Healthy Leaf

V. HARDWARE RESULTS

To display paddy leaf disease information on an LCD, a circuit can be set up using a microcontroller, sensors, and an LCD module. The microcontroller, such as Arduino, is programmed to read data from the sensors that detect the presence of paddy leaf diseases. The sensor data is processed and analyzed using algorithms to determine the specific disease type. Once the disease is identified, the microcontroller sends the corresponding information to the LCD module for display. The LCD module is connected to the microcontroller through appropriate interface connections, such as GPIO pins. The microcontroller controls the LCD to show the disease name, severity level, or any other relevant information about the paddy leaf disease. The LCD provides a visual output that can be easily read and interpreted by farmers or experts, enabling them to take appropriate actions to manage the disease and protect the paddy crop. The complete circuit board and the LCD display Output is shown in the Figure 4.

Figure 4. Hardware Circuit

The LCD is displays the affected disease name which is affected by the crop as in Figure 5, and if so no disease is affected the crop,then LCD displays that the crop is healthy as in figure 6.

Figure 5. Disease Affected indication

Figure 9.6. Healthy Leaf indication

If particular disease is affected by the crop, then the concerned motor pump is made to on and the water mixed with the respective curing chemicals, is made to pass to the crop for the treatment as shown in Figure 7.

Figure 7. Pump Motor Water Ejection

VI. CONCLUSION AND FUTURE WORK

In this project, a research to classify Paddy Leaves over static facial images using deep learning techniques was developed. This is a complex problem that has already been approached several times with different techniques. While good results have been achieved using feature engineering, this project focused on feature learning, which is one of DL promises. While feature engineering is not necessary, image pre-processing boosts classification accuracy. Hence, it reduces noise on the input data. Nowadays, Paddy Leaves detection software includes the use of feature engineering. A solution totally based on feature learning does not seem close yet because of a major limitation. Thus, Paddy Leaves classification could be achieved by means of deep learning techniques. Further improvement on the network's accuracy and generalization can be achieved through the following practices. The first one is to use the whole dataset during the optimization. Using batch optimization is more suitable for larger datasets. Another technique is to evaluate Paddy Leaves one by one. This can lead to detect which Paddy Leaves are more difficult to classify. Finally, using a larger dataset for training seems beneficial. However, such a dataset might not exist nowadays. Using several datasets might be a solution, but a careful procedure to normalize them is required. Finally, using full dataset for training, pre-training on each Paddy Leaves and using a larger dataset seem to have the possibility to improve the network's performance. Thus, they should be addressed in future research on this topic.

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BIOGRAPHY

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