e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 6, Issue 7, July 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.54

6381 907 438 6381 907 438 ijmrset@gmail.com www.ijmrset.com

International Journal Of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

Predicting Rice Crop Diseases Using VGG16 Model with Machine Learning

Ramya M[1], Prof. Prashant Ankalkoti[2]

PG Student, Dept. of Master of Computer Applications, Jawaharlal Nehru New College of Engineering, Shivamogga, India[1]

Assistant Professor, Dept. of Master of Computer Applications, Jawaharlal Nehru New College of Engineering, Shivamogga, India[2]

ABSTRACT: Agriculture-related recent research focuses on recognizing and categorizing of diseases using pictures of plant leaves. In this project work, we propose a technique for early detection of diseases like blast and blight in rice crops using one of the Machine learning algorithms. Disease identification is crucial for preventing losses in agricultural production and reducing losses. The study focuses on rice plant diseases, image dataset size. The well trained model to forecast the illness in rice crops leaf is developed using the VGG16 algorithm. As the signs of the blast and blight disease are detected using features of the rice crop, the model is trained using the diseased image data set. The trained model gives a prediction if the processed image contains any signs of disease or not. It is necessary to identify diseases in order to limit losses and prevent losses in agricultural productivity. The effectiveness of the proposed model has been validated against a dataset and simulation results, with the VGG16 model showing superior results over recently presented methods, with a maximum accuracy of above 96% when applied on the test dataset.

I. INTRODUCTION

In many nations, agriculture is an essential form of revenue for human beings, who gather different food plants according to the demands and conditions of the land. Natural disasters, a lack of supplies, and plant diseases are challenges that farmers must deal with. Such issues can be reduced by technological facilities, increasing food output and obviating the requirement for specialists.

One of the most significant issues affecting the agricultural sector is the prompt detection of plant diseases and pests. Since rice accounts for around 70% of the country's total crop and 93% of its grain production, it is crucial to identify rice illnesses as soon as feasible to preserve the long-term viability of the rice industry. One of the largest challenges in the agriculture industry is recognizing and categorizing plant diseases and pests. Agricultural damage from insects mostly reduces agricultural production. The categorization of insects is a challenging endeavor due to their intricate construction and strong connections between various species throughout their emergence. Early identification and classification of insects in crops is crucial, especially when using biological control and effective pesticides to prevent.

The complicated illness known as rice crop disease is brought on by bacteria and fungus in the micro biome. Unusual colour changes in rice grains can be brought on by elements including harmful fertilization, bad weather, and an imbalance in the nutrients in the soil. Premature harvesting, strong winds, and insect pest infestations are other causes. Machine learning algorithms are being used to identify illnesses in crops such as rice as a solution to these problems. Farmers can increase rice yield and lower the chance of crop damage by addressing these problems.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

II. LITERATURE REVIEW

Key literatures gathered from extensive survey listed below.

Ramesh Et al [1] propose a neural network using the Jaya algorithm to identify and classify diseases in rice leaflets. The network distinguishes patients and non-infections using hue and saturation sections, converting RGB photos to HSV images, and using images of light, germs, wool, and blasts from the farm as examples. This strategy tries to minimize the lives of farmers while safeguarding the production of agriculture.

G. K. V. L. Udayananda1 et al. [2] An in-depth discussion of the use of machine learning for recognizing diseases in rice plants. This paper examines diseases of rice plants and Deep Learning methods for detection, examining the advantages as well as drawbacks of several methods in the literature. It gives a thorough overview of current illnesses and how they impact rice plants.

W Liang et al [3] proposed based on CNN, a revolutionary rice blast identification method. Using a Deep Convolutional Neural Network, Rice Blast Disease Recognition.

T R Shahidi et al. [4] Rice Leaf Disease Detection Using different machine learning algorithms including that of KNN(K-Nearest Neighbour), J48(Decision Tree), Naive Bayes and Logistic Regression.

R R. Atole et al. [5] A Multiclass Deep Convolutional Neural Network Classifier for Detection of Common Rice Plant Anomalies using AlexNet deep network. Which gives 91% accuracy.

Tejas Tawade et al. [6] developed Rice Plant Disease Detection and Classification Techniques like CNN, SVM, KNN algorithms.

Shruti aggarwal et al. [7] they proposed a rice crop disease detection using Artificial Intelligence and Machine Learning techniques using integrated pest managements, support vector machine(SVM), convolutional neural network(CNN).

Intan Yuniar Pubasari et al. [8] have developed rice plant disease detection using convalutional neural network using deep learning, which is frequently used to analyse the visual images which gave the accuracy of 91%.

Mafiul Hasan Matin et al. [9] has developed rice crop detection using AlexNet ans its classifies the disease using deep learning technology.

Jamye Garcia Arnal Barbedo et al. [10] developed a techniques that detecting, qualifying, classifying plant diseases using digital images.

Different types of rice diseases:

To better understand the many infections and how they affect rice plants, distinct types of rice plant diseases are classified. Understanding the cognitive frameworks and procedures involved in recognizing these viruses is aided by this section

1. **Bacterial Leaf Blight:** Little bluish-green specks are how the lesions are seen. Under conditions of moisture, the lesions quickly expand to become unique spindle-shaped spots with a grey center and a dark brown edge.

2. **Brown spot:** Fungal infections, which damage plants with an abundance of water, limited ventilation, and sunlight, cause brown blotches on leaves.

3. **Leaf Smut:** A result of the fungus Entyloma oryzae is a common but somewhat unimportant disease of rice. Sori, or slightly elevated, angular, black dots, are produced by the fungus on both sides of the leaves. It can also, albeit seldom, leave stains on the sheaths of leaves.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

Figure 1: Different types of rice crop diseases

III. METHODOLOGY OF PROPOSED SURVEY

The goal of this systematic study is to offer an overview of the various machine learning techniques used to identify rice plant diseases using photos of infected rice plants.

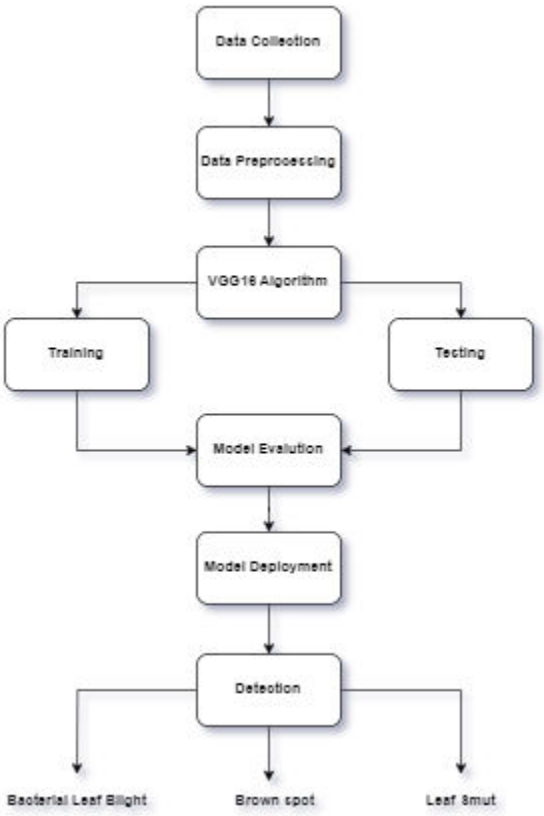

Figure 2: Process flow steps

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

Data collection:

It is the act of obtaining and analyzing information on certain variables in a predetermined, methodical way so that one may subsequently analyze results and respond to pertinent queries. Here, we've gathered pictures of several rice crops that are sick with various illnesses.

Data pre- processing:

By reducing size, adjusting lighting, and increasing attributes that are crucial for the study, image preprocessing is a technique used to prepare pictures for analysis. Here image are reduced to 224*224.

VGG16 Algorithm:

A convolutional neural community version for picture reputation is referred to as VGG16. It stands out because it uses only 16 layers with weights rather than a big number of hyper-parameters. It is regarded as one of the top designs for vision model systems.

i. **Convolutional layer**:

It is a preliminary element of CNN. The extracted features are taken from the input picture. The two kinds of data are combined mathematically by convolution. The input data may be transformed using convolution. Convolution is used to generate the map of the future.

ii. **Max pooling**:

The dimension of the feature maps is cut in half when pooling layers are used. Average pooling and maximal pooling are the two different types of pooling layers.

iii. **Fully connected:**

The input to the fully connected layer is the final feature map outputs or max pooling layer matrix outputs. The fully linked layers' inputs are flattened into vectors with one column.

Training phase:

JPEG or PNG formatted photos of leaves are gathered, subjected to convolutional neural network (vgg16) processing, and then reshaped. After training, the convolutional neural network generates an encoded model file based on the information it has extracted. **Generate model file** is generated Using the parameters field, you may create input environment variables.

Testing phase:

The system receives the input picture. It will be adjusted and resized. This is put up against the model file produced for training purposes. The conclusion will be reached after comparison.

Model Evaluation:

Analyse the performance of the trained model using the testing dataset. Calculate metrics to assess how successfully the model diagnoses illnesses affecting rice crops, such as accuracy, precision, recall, and F1 score.

Model Deployment and Detection:

Save the trained model weights and architecture for later usage after you're pleased with the performance of the model. The model may be used as a stand-alone application or integrated into an existing system for rice crop disease identification.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

RESULTS

We ran tests to see whether the VGG16 models could identify the different types of rice leaf diseases. The training procedure was carried out 10 times to account for variations in the random data partition of the picture sets into the training and validation sets. The average was used to compute the final results.

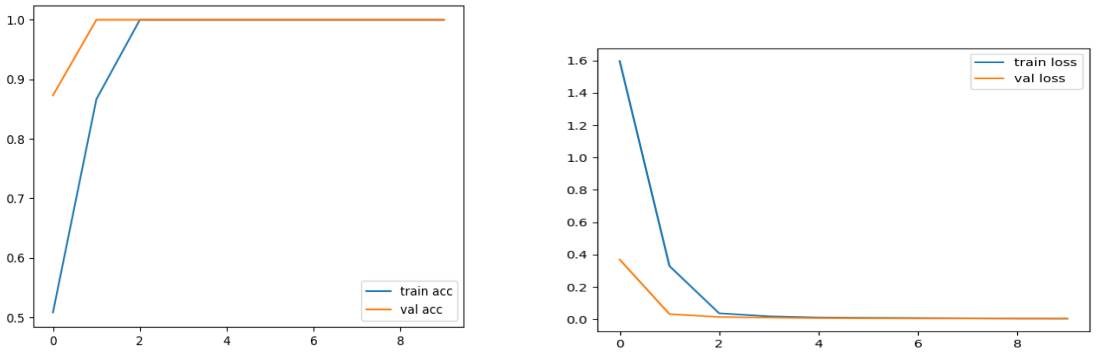

Figure 4: Obtained at training period

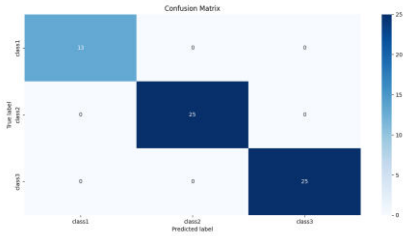

Figure 5: Confusion matrix for VGG16 model

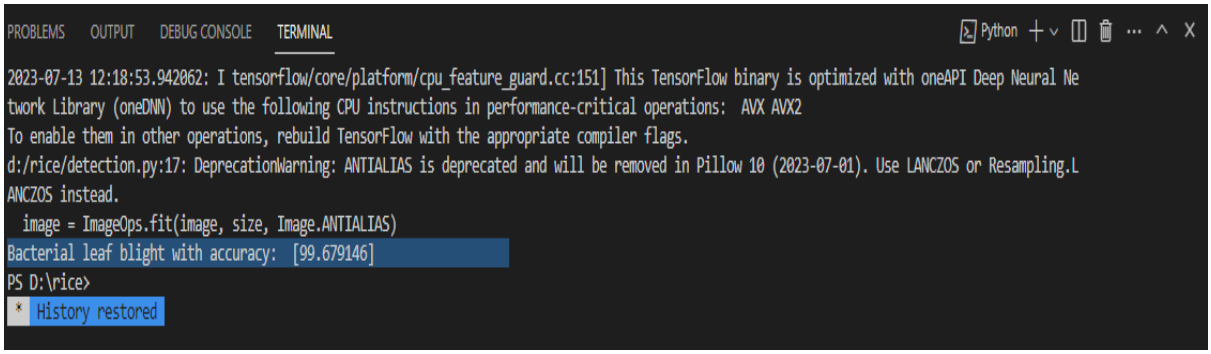

Figure 6: Final result with accuracy

IV. CONCLUSION AND FUTURE WORK

We have seen various plants and fruits, such as rice, tea, mango, paddy leaves, cassava, sugar beet, maize seedling, and orange, among others, have been the subject of current studies on disease detection and categorization.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54||Monthly, Peer Reviewed & Referred Journal |

| Volume 6, Issue 7, July 2023 |

In this review study, we examined current works on the detection of many rice and other plant diseases, such as Bacterial Leaf Blight are Detection using VGG16 algorithm, Leaf Blast, Brown Spot, Sheath Blight, and Leaf Scald.

REFERENCES

[1] S. Ramesh, D. Vydeki "Recognition And Classification of Paddy Leaf Diseases using Optimized Deep Neural Network with Jaya Algorithm" in "Journal of Information Processing in Agriculture, published by Elsevier", vol. 6, issue 3, Sep. 2019.
[2] G. K. V. L. Udayananda · Chathurangi Shyalika, P. P. N. V. Kumara, "Rice plant disease diagnosing using machine learning techniques a comprehensive review", 3 October 2022.
[3] Wan-jie Liang; Zhang, H.; Zhang, G.; Cao, H. Rice Blast Disease Recognition Using a Deep Convolutional Neural Network. Sci. Rep.2019, 9, 2869.
[4] T R Shahidi, Kawcher Ahmed, Syed Md. Irfanul Alam, Sifat Momen "Rice Leaf Disease Detection Using Machine Learning Techniques" in "International Conference on Sustainable Technologies for Industry 4.0 (STI)," December 2019
[5] Ronnel R. Atole "A Multiclass Deep Convolutional Neural Network Classifier for Detection of Common Rice Plant Anomalies" in "(IJACSA) International Journal of Advanced Computer Science and Applications", Vol. 9, No. 1, 2018.
[6] Tejas Tawade, "Rice Plant Disease Detection and Classification Techniques : A Survey" in "International Journal of Engineering Research & Technology (IJERT)" Published by "IJERT" Vol. 10 Issue 07, July-2021.
[7] Shruti Aggarwal "Rice Disease Detection Using Artificial Intelligence and Machine Learning Techniques to Improvise Agro-Business", Published 24 June 2022.
[8] I Y Purbasari1 , B Rahmat and C S Putra PN "Detection of Rice Plant Diseases using Convolutional Neural Network" in 2021 IOP Conf. Ser.: Mater. Sci. Eng.
[9] Mafiul Hasan Matin, Amina Khatun, Md. Golam Moazzam, Mohammad Shorif Uddin," An Efficient Disease Detection Technique of Rice Leaf Using AlexNet", Journal of Computer and Communications, Vol. 8,2020
[10] Jayme Garcia and ArnalBarbedo, "Digital Image Processing Techniques for Detecting, Quantifying and Classifying Plant Disease", "Springer Plus – a Springer Open Journal", vol. 2, pp. 1-12, 2013.

Impact Factor
7.54

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com