2ND INTERNATIONAL CONFERENCE ON SUSTAINABLE COMPUTING AND DATA COMMUNICATION SYSTEMS

ICSCDS 2023

23-25, March 2023 - Erode, India

Proceedings

organized by

Shree Venkateshwara Hi-Tech Engineering College

Erode, India

2nd International Conference on Sustainable Computing and Data Communication Systems (ICSCDS-2023)

23-25, March 2023

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Proceedings of the International Conference on Sustainable Computing and Data Communication Systems (ICSCDS-2023)
DVD Part Number: CFP23AZ5-DVD; ISBN: 978-1-6654-5579-4

Disease Detection in Paddy Crop using Machine Learning Techniques

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***Abstract*—India ranked second in world, in rice production after China, with an annual production of about 124 million metric tons in the year 2021-2022. The loss of agricultural economy and losses in the community are therefore significantly influenced by diseases in the paddy plant. It is very difficult for the farmers to detect and recognize the various symptoms and diseases in paddy. So, the major challenge is how one can effectively control the diseases by detecting the symptoms earlier. Keeping this challenge in mind this paper proposes a better and effective solution for the detection and identification of diseases in paddy plants using machine learning techniques. In recent times SVM, K-NN, A-NN and CNN are some of the popular approaches used in similar kind of studies. According to researches done all these techniques have certain demerits. SVM are not suitable in large datasets, for K-NN the computation cost is high, in A-NN approach, training examples may contain errors and training data is noisy and CNN faces the challenge of overfitting. The team has proposed a model for paddy plant disease detection using the CNN approach with MobileNetV2 and transfer learning technique that will classify the diseases from the photos captured with an accuracy of 99.98%. The model focuses on Training more data and Data Augmentation to combat the challenge of overfitting. Previously it took many iterations or epochs to train the complete model and to achieve a high accuracy. In this case it will take only five to eight iteration or epochs to achieve a superb accuracy. It saves a lot of computation power and time. Farmers can quickly take action to protect their crops with this approach and will find it to be of great benefit.**

Keywords—Transfer learning, Convolutional Neural Network, Image Processing, Machine Learning, Paddy crop disease.

I. Introduction

More than half of the world's population eats rice as their primary food. Its production is affected by several issues brought on by the weather, problems with the environment, soil, viruses, fungus, or different species of animals like mice, locusts, leafhoppers, etc. The diseases put the agriculture industry at risk because they could result in food shortages and a financial crisis. [1]. Therefore, for good crop yield generation, accurate disease detection in paddy plant is required. Farmers' use of visual analysis results in inaccurate disease detection. It takes time and can damage crops from a small area to the entire field. Because of these, experts and researchers are now considering use of new techniques, with the aid of emerging technology, such as image processing, to address the problems faced and obtain a more accurate yield after the disease has been identified.[2][3]

Convolutional Neural Network (CNN), part of the deep learning method, employs a neural network approach to analyze images. There are many layers in CNN, and they may be further divided into an input layer, many hidden layers, a pooling layer, a completely linked layer, a normalizing layer, and an output layer. There is no single best CNN structure for all purposes, and numerous tests are required to achieve the highest accuracy results. In addition, the sequence of the various hidden layers may vary depending on the situation in each experiment. [4] [5]

The suggested model identifies the illnesses that a paddy plant is susceptible to. The six types of paddy diseases—Hispa, Brown Spot, Leaf Blast, Sheath Blight, Bacterial Leaf Blight and Grassy Stunt —have received primary attention in the model developed. The proposed model can determine whether a plant is healthy or whether it has a disease. In order to forecast and categorise diseases, this model uses CNN. It was picked due to how well it analyzes images. The chosen dataset has 6 classes, 5 of which are related to diseases and 1 to health. The suggested model enlarges the image before using it to derive results in accordance with that.[6]

Because of the extensive library packages available and because it is implemented in Anaconda and Jupyter Platform, this model is written in Python.

II. Related Work And Background Study

Suraksha et.al, had described an approach that might perhaps aid farmers in spotting infections in their rice crops early on, stopping their spread, and eventually increasing agricultural productivity. Data mining techniques can be used to analyse the extracted features, which may reveal patterns and relationships that are not readily apparent by manual inspections. The innovative use of algorithms for image processing to extract features from images of the