PREDICTION OF RICE DISEASE OF THE LEAF

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Abstract

In the sphere of agriculture, automated detection and diagnosis of rice leaf diseases is widely required. data.Here, machine learning is crucial and does a good job of handling the challenges of identifying leaf diseases. In this research, we describe a brand-new machine learning-based approach to disease identification in rice. Here, we have taken into account different diseases that affect rice leaves and have classified these diseases using various machine learning approaches. In this research, we first extract the characteristics from photos of rice leaf disease. The photos were then classified using a various machine learning methods approaches, and it was discovered that a quadratic SVM classifier had an accuracy of 81.8%. In order to distinguish between various forms of rice illnesses, shape characteristics including area, roundness, area tolesion ratio, etc. were also utilised. The outcomes were favourable and satisfactory.

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1. Introduction

An important sector of the Indian economy is agriculture. and is responsible for a second-place contribution to rice production., most of the Indian states including Tamil Nadu, West Bengal, Punjab, Uttar Pradesh, Assam, Bihar, etc., cultivate rice. The contribution of the agriculture sector to the overall GDP is roughly 19.9%. In India, One of the most often used grains of food is rice. Diseases have an impact on the quality and growth of rice plants, which therefore affects how profitable farming is. With their limited knowledge from experience, Farmers could be unable to distinguish the various diseases that can affect a certain rice crop. Automatic data processing expert system for this precise and early diagnosis of plant illnesses The powerful deep learning algorithm has been applied to agriculture to address a variety of problems, including weed and seed identification, classification of plant illnesses, fruit counting, root segmentation, etc. Deep learning is a development in machine learning that successfully trains a large quantity of data, automatically picks up on the features of the input, and produces results based on predetermined rules. CNN does a good job of digesting the visual data. It is a feed-forward artificial neural network with input, hidden, and output layers that are all different from one another. The convolutional layer, the pooling layer, the normalisation layer, The hidden layer is comprised of the completely connected layer. It also has a collection of weights that can be automatically learned. Without explicit programming, a system of computer algorithms known as "machine learning" is able to learn from experience and improve itself. Machine learning is a subset of artificial intelligence that employs statistical techniques and data to predict a result that can be used to produce useful insights.

The idea behind the innovation is that a computer can learn from data (i.e., examples) and provide correct results all on its own. Machine learning is closely related to data mining and Bayesian predictive modeling. The computer processes data as input and uses an algorithm to produce results. The idea behind the innovation is that a computer can learn from data (i.e., examples) and provide correct results all on its own. Machine learning is closely related to data mining and Bayesian predictive modeling. The computer processes data as input and uses an algorithm to produce results. One of the common machine learning problems is making recommendations. Every recommendation made by Netflix to subscribers who have an account is based on what they have already watched. Tech businesses are utilizing unsupervised learning to improve user experience with tailored recommendations.

Literature Survey

YingbinZo [1] over the past five decades, China's rice production has more than tripled, primarily as a result of improved grain yields rather than expanded planting areas. This growth has been attributed to the creation of high-yielding varieties and enhanced crop management techniques including irrigation and nitrogen fertilisation. However, China has seen a plateau in rice yield during the last ten years. If rice consumption per capita remains the same, Due to population growth, China would need to produce 20% more rice by 2030 to meet domestic demand. The Chinese rice production system has a number of trends and issues that make it difficult to sustainably raise total rice production, making this a difficult endeavour. A reduction in arable land is one of the main trends.

Jiang, Feng, and others. [2] Identification and forecasting of diseases affecting rice leaves has always been a research priority in the area of agricultural informatics. Currently, the fields of pattern recognition and support vector machine (SVM) technologies are hot study areas. Together, they may not only effectively fix the issue, but also increase the recognition's precision. First, in this study, we extract the features from the photos of rice leaf disease using convolution neural networks (CNNs). The SVM approach is then used to categorise and forecast the particular disease. The 10-fold cross validation approach is used to determine the SVM model's ideal parameters. The experimental results show that when the penalty parameter is The average correct recognition rate of the rice illness recognition model based on deep learning and SVM is 96.8%, with the kernel parameter g = 50. Compared to conventional back propagation neural network models, this accuracy is higher. This study offers a fresh approach for the continued investigation of crop disease diagnostics through deep learning. Onyejegb, L. N.[3] The methods used to identify, measure, and categorise plant diseases from digital photographs in the visible spectrum are surveyed in this work using digital image processing techniques. Although disease symptoms might appear anywhere on a plant, only approaches that focus on the outwardly evident symptoms in leaves and stems were taken into consideration. This was done for two main reasons: to cut down on the paper's length and because techniques for working with roots, seeds, and fruits have some unique characteristics that call for a more in-depth analysis. According to their objectives, the chosen ideas are categorised into three groups: detection, severity quantification, and categorization. According to the primary technological solution applied in the algorithm, each of those classes is further separated. This essay is anticipated to. Sil Jaya[4] Machine vision techniques are widely used in agricultural research, and they have significant potential, particularly in

the field of plant protection, It eventually results in crop management. The article describes a software prototype method for identifying rice diseases using images of various diseased rice plants. Digital cameras are used to take pictures of diseased rice plants, which are then processed utilising image-growing and image-segmentation techniques to identify the sick plant portions. Following that, a neural network was utilised to classify the affected portion of the leaf. The methods created in this system, which include image processing and soft computing, are applied to a range of sick rice plants.

In this study, Zhang[5] Wei Support vector machine (SVM) is discussed as a tool for identifying illnesses of cucumber leaves. A new experimental programme has been suggested that uses each spot of leaves as a sample rather than each leaf due to the minimal number of samples. Radial Basis Function (RBF), polynomial, and sigmoid kernel functions were also utilised in the trials to do comparison assessments. The findings demonstrated that, for classifying cucumber leaf illnesses, the SVM method based on RBF kernel function and using each spot as a sample produced the best results.

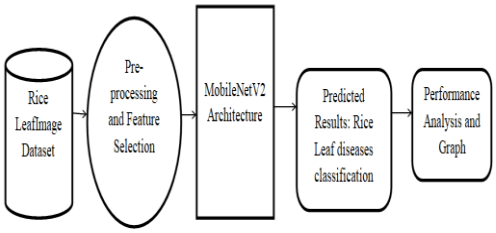

Fig. 1. Proposed Architecture

Existing Model

The current technique for predicting rice leaf disease makes use of a classifier called a quadratic support vector machine (SVM). A well-liked machine learning method called SVM can be applied to classification jobs. In this method, The SVM classifier is trained using a dataset of images of rice leaves with various diseases on them. The classifier determines the type of sickness by using a collection of features that were taken from the photos. The current system's Quadratic SVM output had an AUC of 0.92 and an accuracy of 81.8%. As noise reduction techniques were not applied to the dataset used during the preprocessing stage, the accuracy is a little low. The dataset also contains an unbalanced number of photos showing rice leaf disease. In addition, we have only taken global. The current system has a number of drawbacks. First, it relies on labor-intensive and error-prone manual feature extraction from the photos. Second, the accuracy of the features that were retrieved from the images has a significant impact on how well the SVM classifier performs. The accuracy of the classifier will be impacted if the features are not indicative of the underlying data. Last but not least, the current system might not be scalable because the SVM classifier might not be able to effectively handle enormous datasets. Despite these drawbacks, it has been demonstrated that the current approach is successful in identifying the type of illness in rice leaves. There is always opportunity for improvement, though, and the proposed system seeks to solve some of the shortcomings of the current system by utilising

2. Proposed Methodology

The dataset for the suggested system includes four different disease types: brown spot, sheath blight, rice leaf blast, and bacterial leaf blight. Bacterial Leaf Blight: When a leaf is harmed, bacteria cause the injured area to grow inches long. The colour will initially be yellow before changing to brown and dark brown. Brown spot is a condition that affects plant leaves and is recognised by juvenile, round, brown patches on the leaves. Wheat and rice plants are primarily affected by this disease. Mature plants have reddish borders that are visible. Rice Blast: It causes leaves to develop an oval-shaped area with white dots and black edges. Leaf nodes may also exhibit symptoms. Sheath Blight - Affects the plant's stem and leaves. The proposed approach for machine learning-based rice leaf disease prediction intends to solve some of the shortcomings of the current system. The accuracy, scalability, and adaptability of the proposed system are enhanced using deep learning techniques and a more effective design. The system makes advantage of MobileNetV2 architecture, a mobile device-optimized convolutional neural network (CNN) that is lightweight. The Python programming language and a number of libraries, including Keras,

TensorFlow, etc., are used to create the suggested system.

Implimentation: Dataset: Prediction of Rice Leaf Disease's initial module We designed the technique to obtain the input dataset using machine learning. The process of collecting data is the first significant step towards the actual building of a machine learning model. This is a crucial phase since how well the model performs will be influenced by how much more and better data we can collect. There are many methods for gathering the data, including manual interventions and online scraping. The project contains our dataset, which is housed in the model folder. All researchers refer to the dataset from the well-known standard dataset repository kaggle. There are 1,396 photos of rice leaves in the dataset.The dataset is cited by Importing the necessary libraries Python will be the language we use for this. In order to build the primary model, partition the training and test data using Sklearn, turn photos into arrays of numbers using PIL, and use other libraries like pandas, numpy, matplotlib, and tensorflow, we must first import the appropriate libraries.

Retrieving the images: The photos will be retrieved from the dataset and converted into a format that can be utilised for both training and testing the model in this module. This calls for reading, resizing, and normalising the pixel values of the photos. The photos and their labels will be retrieved. The photos should then be resized to (224,224) since they all need to be the same size for recognition. Then, create a numpy array from the photos.

Dataset division: The dataset will be split into training and testing sets for this module. Create Train and Test subsets of the dataset. 80 percent train data, 20 percent test data. This will be done to validate the model's performance, test the model on omitted data to assess its correctness, and train the model on a subset of the data. Create train and test datasets. 80 percent train data, 20 percent test data.

3. Conclusions

Modern agricultural and industrial food production processes incorporate computer vision and AI frameworks at various levels. Given that rice plant illnesses have the potential to cause large losses in the agricultural industry, these frameworks can be utilised to more accurately identify the multiple diseases afflicting the rice crop. These frameworks can be employed efficiently enough to safely automate tiresome jobs, generating enough data for later studies.The results of the system project show the potential of deep learning algorithms and effective architectures for predicting rice leaf disease. Farmers will find the proposed system to be a useful tool because it has improvements in accuracy, scalability, flexibility, user-friendliness, and efficiency over the current method. and academics who study agriculture.Using deep learning algorithms and a more effective architecture, the project "Rice Leaf Disease Prediction Using Machine Learning" proposes a revolutionary method for identifying and forecasting diseases of rice leaves. The suggested system outperformed the current system, which makes use of a quadratic SVM classifier, with training accuracy of 98.34% and validation accuracy of 95.21%.

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