Rice Leaf Disease Prediction Using Machine Learning

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Abstract

The automated In the realm of agricultural data, detection and cure of rice leaf diseases are greatly needed. In this case, machine learning crucial and does a good job of handling the challenges of identifying leaf diseases. In this research, describe a brand-new machine learning-based approach to disease identification in rice. Here, We considered various kinds of diseases that affect rice leaves and have classified these diseases using various machine learning approaches. In this study, we first extract the characteristics from photos of rice leaf disease. The photos were then classified using a many ML algorithms 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.

INTRODUCTION

Agriculture is a significant among the Indian economy and is responsible for a second-place contribution to rice production. a large majority of Indian states, including Tamil Nadu, West Bengal, Punjab, Uttar Pradesh, Assam, Bihar, etc., cultivate rice. The involvement of the agriculture sector to the overall GDP is roughly 19.9%. In India, rice is among the food grains that is most commonly consumed. 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 can be hard recognise between various infections that can harm a specific rice crop. Expert networks for robotic data handling on 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 has a feed-forward virtual brain network with distinct secret input, and final layers. one another. The convolutional layer, the pooling layer, the normalisation layer, and the fully connected layer constitute the covert layer. It also includes a number of automatically learnable parameters (weights) through which it Without explicit programming, a system of computer algorithms known as "machine learning" is able to learn from experience and improve itself. Artificial training is a part of data, that uses statistical methods and information to forecast a useful result to generate actionable insights.

The innovation is founded on the idea that an automated system can produce accurate results simply by learning from the examples in the data. mining data and Bayesian predictive modelling have a close connection to machine learning. The computer receives input in the form of data and produces results using an algorithm.

The innovation is based on the idea that an artificial intelligence (AI) It's able to give exact findings simply by learning from data (i.e., examples). Machine learning is closely related to data mining and Bayesian predictive modelling. The computer receives input in the form of data and produces results using an algorithm.

A frequent issue with machine learning is making suggestions. All Netflix counsel for clients that have user's previous viewing history, an account is created. Tech businesses are utilising unsupervised learning to improve user experience with tailored recommendations.

II. Literature Survey:

YingbinZo[1] Over the past five decades, China's The main cause for the more than triple increase in rice cultivation is improved grain yields rather than expanded planting areas. The growth is claimed 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 yourself the amount of rice consumed per person doesn't change, China will need to produce 20% more rice by 2030 to keep up with demand. its domestic demands as its population grows. 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 3 of the key 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. If the employees titled maybe effectively fix the issue, but also increase the recognition's precision. First, in this study, we extract the attributes of 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 utilised to determine the SVM model's ideal parameters. Consequently, the experimental findings, when the penalty parameter is the average correct Incidence of rice injury reporting recognition model using deep learning SVM is 96.8%, with the kernel parameter g = 50. v 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. A couple had done this. main reasons: to cut down on the paper's length and because techniques for working with roots, seeds, and fruits hold certain distinctive qualities which need 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] Tools for computer vision are often used. in agricultural research, and they have significant potential, particularly in the field of plant protection, which ultimately leads to crop management. The study outlines a software prototype approach with images of several rice plants to find issues facing rice afflicted. Digital cameras are used to take pictures of diseased rice crops that receive care after utilising image-growing and image-segmentation techniques to determine the sick plant portions. Following that, a neural network was utilised to classify the affected portion of the leaf. The techniques developed in this system are accustomed to a range of sick rice plants and include both alteration of pics soft computing.

In this study, Zhang[5] Wei The tool of Srm refers to vector support vector. discussed. for identifying illnesses of cucumber leaves. A new experimental programme Was suggested. 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.

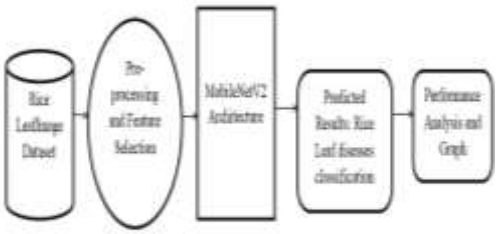

Fig. 1. Proposed Architecture

III. 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 could be used with classification jobs. In this method, an array of pictures of rice leaves with various diseases on them is to instruct the SVM classifier. The classifier determines the type of sickness by using an assortment of bits that were removed 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 are the traits that retrieved from the images has a substantial effect on how well the SVM classifier performs. In the event that the features are not representative of the underlying data, the classifier's accuracy will be reduced. Not least among others, the current system might not be scalable because the SVM classifier might not capable of effectively handle enormous datasets.

 Despite these drawbacks, it's been established 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 several of the shortcomings of the current system by utilising

IV. 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 Several of the present system's flaws system. The accuracy, scalability, and adaptability are improved by applying deep learning techniques to the suggested system. and a more effective design. The system makes advantage of MobileNetV2 architecture, a mobile device-optimized neural network with convolutions (CNN) that is lightweight. The Python programming language and Many libraries, such as TensorFlow, Keras, etc., are utilised to create the suggested system.

V. Implementation

Dataset: Prediction of Rice Leaf Disease's initial module We designed the technique employing machine learning to retrieve the input dataset. The first crucial step towards actually creating a machine learning model is the process of data collection. This stage is critical since the amount and quality of data we can gather will determine how effectively the model performs. In-fact lots of ways to 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. As a way to construct Split the training and test data in order to use the principal theory as well as additional tools such as panda, numpy, matplotlib, and tensor flow. using Sklearn, convert images into arrays of numbers using PIL, and more, we must firstimport the appropriate libraries.

Retrieving the images: The photos being retrieved from the dataset and converted into a format that might utilised for both training and testing the example in this module. This calls for reading, resizing, and normalising the pixel values of the photos. The photos as well as the retrieval of their labels. After that, the images should be resized to (224,224), as they must be alike in size so they can be spotted. Next, use images to create the numpy array.

Dataset division: The dataset will be split into training and testing sets for this module. Build Train and Study 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. Build test and learning sets. 80 percent train data, 20 percent test data.

VI.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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