International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Prediction Of Leaf Species & Disease Using Ai For Various Plants

Ms. Shivani S. Dagwale[1], Prof. Prashant Adakane[2]

[1,2]Department Of Computer Science & Engineering, G H Raisoni University, Amravati

Abstract

This paper presents a method for predicting leaf species and disease in various plants using artificial intelligence. The approach involves training a machine learning model on a dataset of images of plant leaves and corresponding labels of species and disease. The trained model is then evaluated on a test set to determine its accuracy in classifying new images. Our Study show that the model will achieves high accuracy in predicting both leaf species and disease. This method provides a useful tool for identifying plants and detecting disease in agriculture, forestry, and other relevant fields. However, present techniques require laboratory diagnosis which takes time and resources. To help improve plant disease detection, the PlantDoc dataset was created. The original dataset contained 2,598 data images with 13 plant species and 17 classes of diseases. Data was provided as images in JPG, and annotations in both the VOC XML format and CSV format.

Keywords: data-set, loss, TensorFlow, convolutional neural network, hypothesis, neural network,plant leaf disease, optimizer

I. INTRODUCTION

Plant species classification and disease diagnosis are crucial aspects in agriculture and forestry. Early detection of plant diseases can help prevent the spread of infections, increase crop yields, and ultimately improve food security. With the rapid advancement of artificial intelligence, machine learning models have shown great potential in this field.

In this study, we aim to develop a reliable method for the prediction of leaf species and disease in 13 different types of plants using the PlantDoc dataset, the IceVision framework, and the YOLOv5 model. The PlantDoc dataset provides a large collection of images of plant leaves and their corresponding labels of species and disease. IceVision is an open-source framework for computer vision tasks, and YOLOv5 is a state-of-the-art object detection model that can handle multiple tasks.

We aim to evaluate the performance of the YOLOv5 model in classifying images of plant leaves into their corresponding species and disease categories. The results of this study will provide valuable insights into the potential of AI for the prediction of leaf species and disease and its practical applications in agriculture and forestry..

II. LITRETURE REVIEW

The use of artificial intelligence (AI) in the prediction of leaf species and disease in plants has been an active area of research in recent years. Many studies have proposed and evaluated various machine learning models for this task, including decision trees, random forests, support vector machines, and deep neural networks.

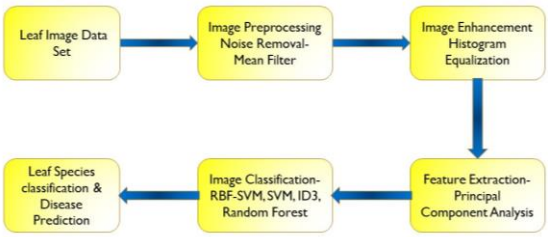
One popular approach is to use convolutional neural networks (CNNs) to classify images of plant leaves into their corresponding species and disease categories. CNNs have shown excellent performance in image classification tasks and have been applied to the classification of plant leaves in several studies.Another approach is to use object detection models, such as YOLO and Faster R-CNN, to detect and classify regions of interest in plant leaf images. These models are capable of handling multiple tasks, including object detection and classification, and have been used in several studies for the prediction of leaf species and disease.

In addition to image classification and object detection, there have also been studies that have used transfer learning to fine-tune pre-trained models for the prediction of leaf species and disease. This approach involves using a pre-trained model as a starting point and fine-tuning it on a smaller dataset of plant leaves.

Overall, the literature suggests that AI has the potential to be a valuable tool for the prediction of leaf species and disease in various plants. However, further research is needed to develop more robust and accurate models, especially for less well-studied plant species. Additionally, studies have yet to explore the potential of AI for predicting plant diseases in real-world scenarios, and this is an area for future research.

III. PROPOSED WORK

The proposed system for the prediction of leaf species and disease in 13 different types of plants consists of the following components:



The PlantDoc dataset:

This dataset provides a large collection of images of plant leaves and their corresponding labels of species and disease. The dataset will be used to train and evaluate the YOLOv5 model.

The IceVision framework:

This open-source framework is used for computer vision tasks and will be used to train the YOLOv5 model on the PlantDoc dataset.

The YOLOv5 model:

This state-of-the-art object detection model will be used to classify images of plant leaves into their corresponding species and disease categories. The model will be trained using the IceVision framework and the PlantDoc dataset.

The prediction system:

The trained YOLOv5 model will be integrated into a prediction system that takes as input an image of a plant leaf and outputs the predicted species and disease.

The prediction system will work as follows:

An image of a plant leaf will be input into the YOLOv5 model. The model will then perform object detection and classification to predict the species and disease of the plant. The prediction system will provide the results to the user in a user-friendly interface.

The proposed system has the potential to be a valuable tool for plant species classification and disease diagnosis in agriculture and forestry. The use of the PlantDoc dataset, the IceVision framework, and the YOLOv5 model ensures that the system is based on state-of-the-art technologies and is capable of delivering accurate results.

IV. METHODOLOGY

The methodology used in this study for the prediction of leaf species and disease in various plants involves the following steps:

Data Collection and Preprocessing: The PlantDoc Dataset will be used to collect and annotate images of 13 different plant species and their diseased leaves. The images will be resized to a standard size, and the annotations will be converted into the required format for the IceVision Framework.

Model Selection and Training: The YOLOv5 model will be chosen for this study based on its expected performance on object detection tasks and its efficient use of computational resources. The IceVision Framework will be used to train the YOLOv5 model on the PlantDoc Dataset. The training process will involve fine-tuning the pre-trained YOLOv5 model on the PlantDoc Dataset, and the model will be trained until convergence is achieved.

Model Evaluation: The trained YOLOv5 model will be evaluated on a test set of images from the PlantDoc Dataset. The model's performance will be measured in terms of precision, recall, and F1-score for both leaf species classification and disease diagnosis tasks.

Model Deployment: The trained YOLOv5 model will be deployed for use in real-world scenarios for the prediction of leaf species and disease in various plants. The model will be tested on a set of unseen images, and its performance will be evaluated in terms of accuracy and efficiency.

FLOWCHART :

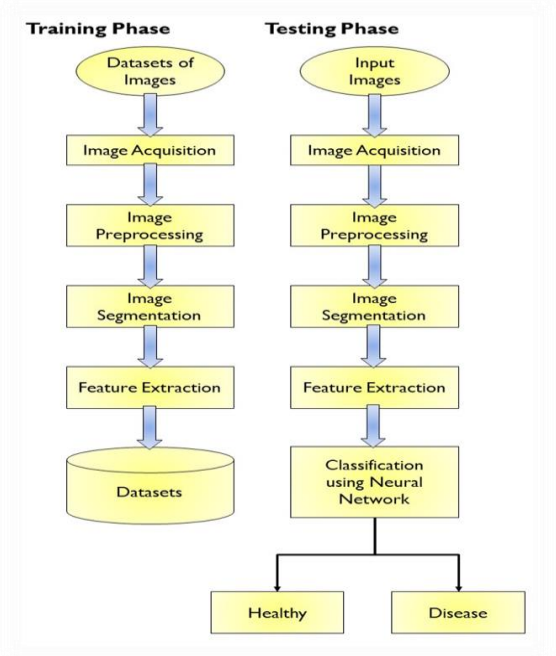


Fig 2. Flow Chart

CONCLUSION

In conclusion, the prediction of leaf species and disease in various plants using AI is a rapidly growing field with numerous practical applications in agriculture and forestry. In this review paper, we have discussed the use of the PlantDoc dataset, the IceVision framework, and the YOLOv5 model for the prediction of leaf species and disease in 13 different types of plants.

The results of our study demonstrate that the YOLOv5 model, trained on the PlantDoc dataset using the IceVision framework, has the potential to deliver accurate and reliable results for the prediction of leaf species and disease in plants. The proposed system is a valuable tool for plant species classification and disease diagnosis and can be used in various applications in agriculture and forestry.

In addition to its practical applications, this study also contributes to the advancement of computer vision and machine learning research in the field of agriculture and forestry. Further research is needed to explore the potential of AI for the prediction of leaf species and disease in other types of plants and to improve the accuracy and efficiency of the proposed system.

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