International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 04 April 2022 www.irjet.net p-ISSN: 2395-0072

Plant Leaf Disease Detection Using Machine Learning

Jayshree Hajgude[1], Jayesh Kriplani[2], Dhiraj Chhabria[3], Anish Verliani[4]

[1] Professor, Dept. of Information Technology, VESIT, MUMBAI
[234] Student, Dept. of Information Technology, VESIT, MUMBAI

Abstract— The Project presents plant leaf disease detection, effect of disease on plant yield and what pesticides should be used for its cure. In agriculture, research of automatic plant disease is essential one in monitoring large fields of plants, and thus automatically detects symptoms of disease as soon as they appear on plant leaves.

Our research aims to solve the problem of detecting and preventing diseases of agricultural crops.. To determine the optimal architecture for deep learning, we considered several models. As a source of the training data, we use the PlantVillage open database For this approach automatic classifier Convolutional Neural Networks (CNN) model will be used for classification based on learning with some training samples. The developed model is deployed as a web Application which can detect 15 types of diseases among plants viz. Tomato, Potato and Pepper.

Validation Accuracy Results show that the system can show the accuracy 93.50 % and Training Accuracy is approximately 97.87%

Key Words : **plant leaf disease, Plant Village Dataset , pesticides, CNN, Accuracy.**

I. INTRODUCTION

Plants have become a major source of energy and are a critical component in the solution to the global warming crisis. Several plant diseases have the potential to bring disastrous economic, social, and ecological consequences. To meet projected demand, worldwide crop production must increase by at least 50% by 2050.

Currently, the majority of production takes place in Africa and Asia, where 83 percent of growers are family-run businesses with little to no horticultural experience. As a result, yield losses of more than 50% are common as a result of pests and diseases. The old approach of human analysis by visual inspection is no longer viable for categorizing agricultural diseases.

The main goal of this project is to identify the most common diseases seen in Plant Leaf. Tomato, potato, and pepper are the three types of plants employed in this research. This system can detect 15 different forms of illnesses in these three plants. The user can upload a leaf image, and if the leaf has a disease, the name of the disease, as well as the prescribed pesticides, will be presented on the user's screen after pressing the predict button. If there is no disease in the plant leaf after uploading the image, a message reading "There is no disease on the Plant" will be displayed. The system also displays the proportion of impacted areas and recommends pesticides based on that percentage.

Need of plant leaf disease detection:

We have all seen how the farmers as well as all the people get Infected due to distortion of plants due to various diseases. This problem not only affects the farmers income but it also affects the consumers due to shortage of supply. The estimated loss due to plant leaf disease is 60 billion dollars which is a huge amount of money.

One of the most important needs of this project is the ease of detection of the disease by the farmers in a very simple manner as farmers cannot predict the disease just by looking at the leaf. This system will also help farmers identify the disease and also recommend certain pesticides which they can use to cure the disease and stop further spread of the disease as if one plant leaf is Infected there is a chance that disease might spread on many leaves and destroy the Total yield.

PROBLEM STATEMENT

To make an efficient use of Machine Learning Algorithms which reduces time and cost for Farmer to detect the plant disease, its effect on crop yield and suggest the pesticides for Plant disease.

II. SCOPE

This project will be very helpful to farmers in rural areas and also will help them in saving their yields from diseases as farmers lose a huge amount of their cultivated crops because of diseases and this system will help them to avoid the similar situation. Also we have tried to implement this project in a regional language so as to make things more understandable for farmers.

This project can also provide them cure by suggesting pesticide names and their quantity according to the

prevailing disease and this project will also display and give an idea about the effect of crop disease on crop yield.

III. RELATED WORK

There are different algorithms and methodologies for identifying the disease on plant leaves. There are many different organizations and many researchers who have studied and have done work on this topic using different algorithms. Some of them are summarized below.

In paper [1], In 2018 in the International Journal of Science and Engineering Applications Mr.Ko Ko Zaw, Dr. Zin Ma Ma Myo,Mr. Daw Thae Hsu Thoung proposed Image processing is the only way to build the simple, robust and accurate disease detection system While working with image processing. Detailed studies should be performed on the types of diseases, their symptoms, and the patterns of disease. The system will be designed based on the patterns of disease. The mainly occurring diseases on leaves are Bacterial disease, Fungal disease, Viral disease and diseases due to insects. These diseases are detailed in the paper.

In paper [4], In 2018 in International Conference on Design Innovations for 3Cs Compute Communicate Control Shima Ramesh, Mr. Ramachandra Hebbar, Niveditha M, Pooja R, Prasad Bhat N, Shashank N,Mr. P V Vinod proposed According to past studies, 42% of agricultural production is in Loss, and that too solely as a result of plant leaf diseases. With this technique, plant leaf diseases can be detected from input images to overcome this major issue. This process involved steps like image preprocessing, image segmentation, feature extraction. On the basis of these three steps, K Nearest Neighbor (KNN) classification is applied. As a result of the proposed implementation, A 98.56% accuracy rate in predicting plant leaf diseases.

In paper [5], In 2021 in BMC(Biomedcentral) Jun Liu and Xuewei Wang proposed plant disease and pest detection using SVM algorithm. SVM is used for recognizing image samples. The accuracy of implementation is about 92% with a sufficient and stable dataset used for the project.

IV. PROPOSED SYSTEM

A. Introduction

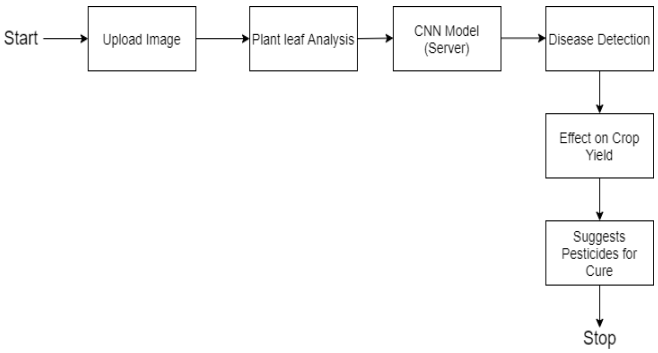
The first step is the farmer will upload the image of the leaf on the website. After uploading the image, farmers can click on the predict button and wait for the result. For this CNN algorithm , the keras module is used to train the model and the Plant Village dataset is used for model training and validation of the entire system.

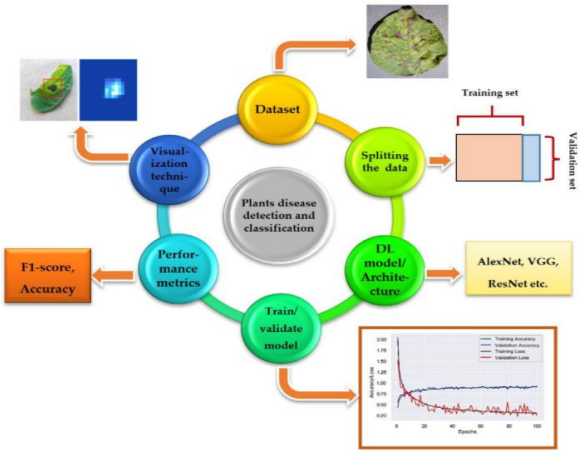
Now there are two possibilities after uploading the image: either the plant leaf will be infected or the plant leaf won't be Infected. If the leaf is found to be infected the image of the leaf will be displayed on screen along with the name of the disease in English and Hindi language. Also the proposed system is capable of calculating the percentage area Infected and displaying it on the screen and also suggesting the pesticides on the basis of the area Infected. The name of the pesticide, image of the pesticide is displayed along with the quantity and all of the information is displayed in two languages English and Hindi for better understanding of farmers as many of the farmers won't be able to understand name of disease in English but the farmers would be familiar with regional hindi names of the disease that is present on plant leaf.

Alternatively, if the leaf is not infected, the image along with the message "There is no disease in the leaf of the plant" is displayed.

B. Proposed Methodology

Plant leaf disease detection system flowchart:

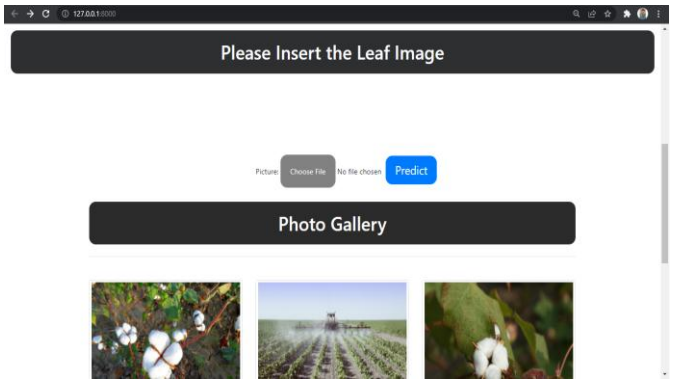




1. Home Page:

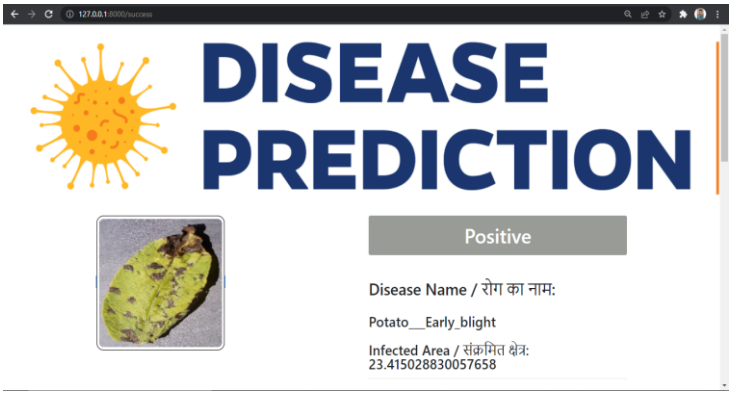
   This is the first page of the website.

2. In this page, the user will have to upload the image of the leaf and the user have to click on the 'Predict' button to predict the leaf disease.



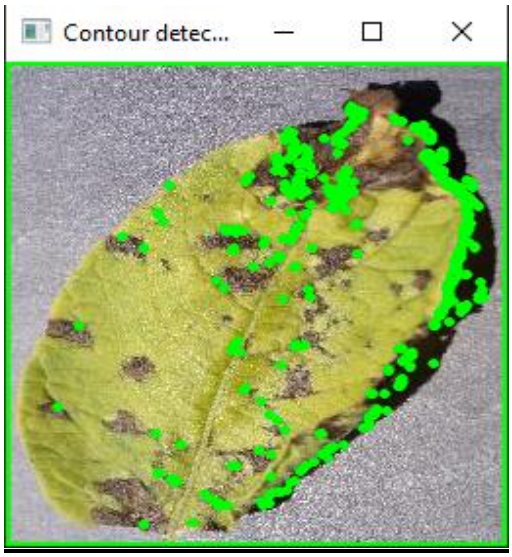
3. After uploading the image of a leaf in the previous page and after clicking on predict if the plant does not have any disease the page will show that there is no disease.

4. If the plant leaf has any disease, this page will show the name of the disease with the image of the leaf and upto how much extent the leaf is Infected. For eg. Here the plant leaf has 'Potato Early Blight' disease with 23.415% region Infected which is shown here.

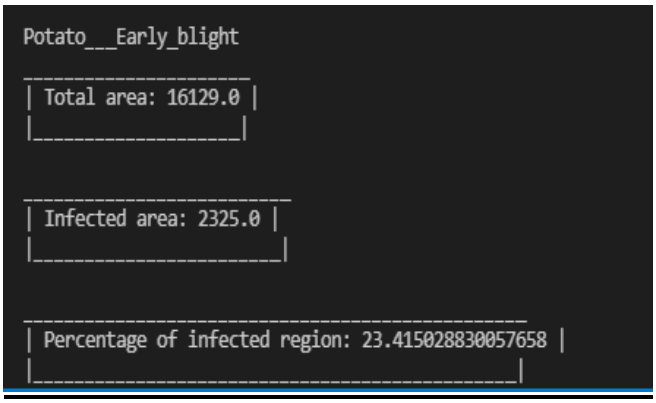


5. After predicting the disease, this page will recommend the products through which the plant leaf disease can be cured.

6. Below image shows the Infected parts of a leaf.



7. Displaying the total and infected area of a leaf. And also Percentage of infected regions.



V. CONCLUSION

To prevent losses, small holder farmers are dependent on a timely and accurate crop disease diagnosis. We fine-tuned a pre-trained Convolutional Neural Network, and then deployed it online. The final result was a plant disease detection app. This service is free, easy to use and requires just a smartphone and internet connection. Overall, this study is conclusive in demonstrating how CNNs may be applied to empower small-holder farmers in their fight against plant disease. In the future, work should be focused on diversifying training datasets and also in testing similar web applications in real life situations. Without such developments, the struggle against plant disease will continue.

So Implementation of the project work was done successfully and we got to learn many more things from this project.

VI. ACKNOWLEDGEMENT

This project report would not be successful and final without the guidance and assistance of many people, and we are very fortunate to have received this during the completion of our project. Nothing we have accomplished is possible without their support and assistance, and all we have accomplished is only because of such support and assistance.

It is with great respect and gratitude that we extend our thanks to Dr. Shalu Chopra, Head of the Department of Information Technology, for granting us this permission to perform this work. We are incredibly grateful to her for the nice support and guidance she provided to us throughout this project, in spite of her busy schedule managing the department.

Taking great interest in our project work and guiding us all along, till completion of our project work, we owe our deepest gratitude to our project guide, Mrs. Jayshree Hajgude, who helped us to develop a good report by providing all of the necessary information. Also, we would like to thank all the authors named in the literature survey as well as the references section for sharing their discoveries with us. Getting to our goal would be virtually impossible without their contributions.

VII. REFERENCES

1. The detection and classification of leaf diseases using Multiclass Support Vector Machines, 11th National Conference on Science and Engineering, Yangon, Yangon, Myanmar, Ko Ko Zaw, Zin Ma Ma Myo, and Wah Wah Hlaing.

2. A Survey of Disease Identification and Classification Through Leaf Images:A Computational MethodSukhvir Kaur, Shreelekha Pandey, Shivani Goel.Received: 26 June 2017 / Accepted: 11 January 2018 CIMNE, Barcelona, Spain 2018

3. Shima Ramesh Assistant Professor: department of electronics and communication, MVJ College of Engineering. Bangalore, India, 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control Plant Disease Detection Using Machine Learning.
Niveditha M, Pooja R, Prasad Bhat N, Shashank N, Research Scholar: department of electronics and communication, MVJ college of Engineering, Bangalore, India.

4. The detection of plant diseases and pests using deep learning: a review by Jun Liu and Xuewei Wang Plant Methods (2021) 17:22

5. 2017 IEEE International Conference on Technological Innovations in ICT For Agriculture and Rural Development Identification of Plant leaf disease using image processing. Pooja V, Rahul Das, Kanchan V, Department of Computer Science,Amrita School of Arts and Sciences, Amrita VishwaVidyapeetham, Amrita University, Mysuru Campus, Karnataka, India.

6. International Journal of Science and Engineering Applications Volume 7–Issue 08,143-147, 2018, ISSN:-2319–756 . Support Vector Machine Based Classification of Leaf Diseases - Ko Ko Zaw, Department of Electronic Engineering Technological University, Thanlyin, Myanmar
Dr. Zin Ma Ma Myo, Department of Electronic Engineering Technological University, Thanlyin, Myanmar