Plant Disease Identifier

Submitted in the partial fulfillment of the requirements

for the degree of B.Tech in Computer Engineering

by

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(Under the ambit of D. Y. Patil Deemed to be University)

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CERTIFICATE

This is to certify that, the Mini Project-IV report entitled

Plant Disease Identifier

is a bonafide work done by

Harsh Shah (20CE1265)

Parth Gawande (20CE1135)

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and is submitted in the partial fulfillment of the requirement for the degree of

B.Tech in Computer Engineering

to the

D. Y. Patil Deemed to be University

Supervisor	Project Co-ordinator
(Mrs. Saguna K. Ingle)	**(Dr. Aditi Chhabria)**
Head of Department	Principal
(Dr. Amarsinh V. Vidhate)	**(Dr. Mukesh D. Patil)**

Mini Project Report - IV Approval

This is to certify that the Mini Project - IV entitled ***"Plant Disease Identifier "*** is a bonafide work done by ***Harsh Shah (20CE1265)***, ***Parth Gawande (20CE1135)***, ***Schuyler Furtado (20CE1165)***, and ***Mehul Mishra (20CE1303)*** under the supervision of ***Mrs. Saguna K. Ingle***. This Mini Project is approved in the partial fulfillment of the requirement for the degree of ***B.tech in Computer Engineering***

Internal Examiner :

1. . . . .

2. . . . .

External Examiners :

1. . . . .

2. . . . .

Date : . . . /. . . /. . . . . .

Place : . . . .

DECLARATION

I declare that this written submission represents my ideas and does not involve plagiarism. I have adequately cited and referenced the original sources wherever others' ideas or words have been included. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action against me by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Date: ____________________

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Abstract

In order to preserve crop health and productivity, plant disease testing is a crucial responsibility. The development of new technologies has increased the possibility for computer vision and machine learning to identify mild diseases. A computer software named a plant disease identification model analyses digital photographs of leaves, stems, or fruits to find any signs of disease using image processing and machine learning methods. These models can reliably diagnose diseases and assist farmers in taking the necessary precautions to reduce disease risk and increase crop output and quality. An open dataset of plant photos was used to train a residual network (ResNet34) to carry out this classification assignment. The test set results for the proposed ResNet34 model showed 99.40 percent accuracy, proving the model's viability. Overall, the technique fortraining the ResNet model on the open image dataset provides a good way to detect crop diseases using automated networks on a large global scale.

Contents

List of Figures

Chapter 1

Introduction

1.1 Overview

Plant disease-induced growth inhibition may have an adverse impact on yields. The economic harm is estimated to be up to 20 billion dollars annually across the world. When investigating a variety of situations, researchers encounter their most difficult obstacle due to geographic variations that could make correct identification more challenging. Traditional methods likewise primarily rely on specialists, experience, and manuals, but most of them are costly, time-consuming, and challenging to pinpoint. For the sake of agriculture's economic and ecological benefits, it therefore seems vital to create a quick and reliable way to identify plant illnesses [1].

1.2 Motivation

One of the key sectors that affects a nation's economic development is agriculture. The bulk of the population in countries like India depend on agriculture for their livelihoods. Many new technologies are being introduced into agriculture, such as machine learning and deep learning, to make it simpler for producers to increase and enhance their yields, stop the spread of disease, and reduce revenue loss.

1.3 Problem Statement and Objectives

It is easier and more effective to learn about the plant that is impacted in a short amount of time with better prediction and with fewer side effects in order to improve the process of forecasting plant diseases with Res-Net 50. To successfully utilise technology with the goal to monitor the spread of disease, halt it, and prevent monetary damages.

1.4 Organization of the report

The report is organised as follows: The Chapter 2 reviews the literature. Chapter 3 focuses on defining the system's issue. That includes problem categorization, proposed technologies, device architecture, and hardware/software requirements. On the other hand, Chapter 5 describes the inference and future work on the technique to be utilized as a more improved model.

Chapter 2

Literature Survey

2.1 Survey of Existing System

Various methods for detecting plant diseases have been studied by the researchers. However, we are still a long way from having an automated system that would make training and handling this issue simple. Different levels of research have been conducted regarding the use of computational technologies to identify crop diseases. Under certain constraints and limitations, ideas based on machine learning techniques can frequently be successful, but numerous problems still need to be addressed before they can be effectively utilised in the real world [2].

The four primary phases in the article's explanation of the popular identification procedure are outlined below: To mask and delete the green pixels, use a custom threshold having first creating the colour conversion model for the input RGB image. For generating usable segmentations, texture analysis is performed during the segmentation process. The disease is finally identified by a classifier on the obtained features. About 500 leaf samples from the database have been employed in studies to demonstrate how accurate the suggested approach is [3]

Presently available deep learning-based techniques for detecting plant diseases and pests are used for specific datasets, many of which are not freely available. The application performance of various common algorithms has been gradually enhanced by the continual growth of deep learning, and the algorithms' mAP, F1 score, and FPS have all grown. The intricacy of the images of infectious illnesses and pests in published research and the real-time field disease and detection of pests based on mobile devices, however, still differ. Future studies must make progress with datasets that are greater more intricate, and more realistic [4].

Four essential steps play a role in establishing the work process, based to the writers of the article; Since RGB is used for colours reproduction, the first step is to develop a colour shift model for the input RGB image. HSI is employed for coloured descriptors before and after conversion, such as in transforming RGB photographs. The second stage includes masking and eliminating green pixels using a threshold. The third step involves segmenting the image as well as unmasking the green pixel using the pre-measured level and the results from the earlier stage. Segmentation will be carried out in the end or fourth the primary stage [5].

2.2 Limitations of Existing System or Research Gap

Following the recognition of green pixels, authors mask these pixels utilising an established threshold value. Between 83 percent and 94 percent accuracy has been achieved. Authors have worked on identifying two diseases, tomato yellow leaf curl virus (TYLCV) and tomato yellow leaf curl disease (TYLCD), in tomato plants using tomato leaves. Some researchers have worked on particular plants to identify the diseases. Previous research on classifying plant diseases employed multiple conventional machine learning methodologies by Arivazhagan [2].

The accuracy of the study results is still unsatisfactory in some cases. It needs more optimization. The segmentation must be specified first. You need to expand the data to get more accuracy. It covers just a few illnesses, Hence, the scope of the research should be broadened to include a wide range of disorders. Possible reasons for misclassification are: signs of unusual plants, need to improve traits, need more training examples to cover more patients, estimation of line pain to be accurate. To close these studies, a new method using image segmentation for automatic detection and classification of leaf diseases is proposed [6].

To recognise different tomato leaf diseases, a total of four pre-trained deep learning architecture, such as VGG16, VGG19, ResNet, and InceptionV3, were utilised. To attain the best result, they modified the network parameter. On laboratory and field images, respectively, they achieved the highest performance accuracy using InceptionV3 of 99.60 percent and 93.70 percent. The characteristics were extracted using VGG16. Multiclass SVM was implemented for classification. They employed three alternative colours model images—RGB, YCbCr, and HSV—to evaluate the adaptability of the model performances. They obtained a maximum accuracy of 99.4 percent using RGB pictures [7].

Chapter 3

Proposed System

3.1 Problem Statement

To improve the process of predicting plant disease through machine learning model. It is simpler and better to learn about the plant that is affected in a short amount of time with better prediction and with fewer side effects in order to improve the process of forecasting plant diseases.

3.2 Proposed Methodology/Techniques

A Convolutional Neural Network (CNN) with transfer learning (ResNet50) model-based Deep Learning approach is advised for the automatic detection and identification of plant diseases. The pooling and categorization of picture information is illustrated using the predefined neural network model Res-Net 50. The ResNet-50 model for CNN architecture training and testing for illness detection uses a dataset collected from leaf image datasets. The suggested strategy will make it easy to detect and identify plant diseases.

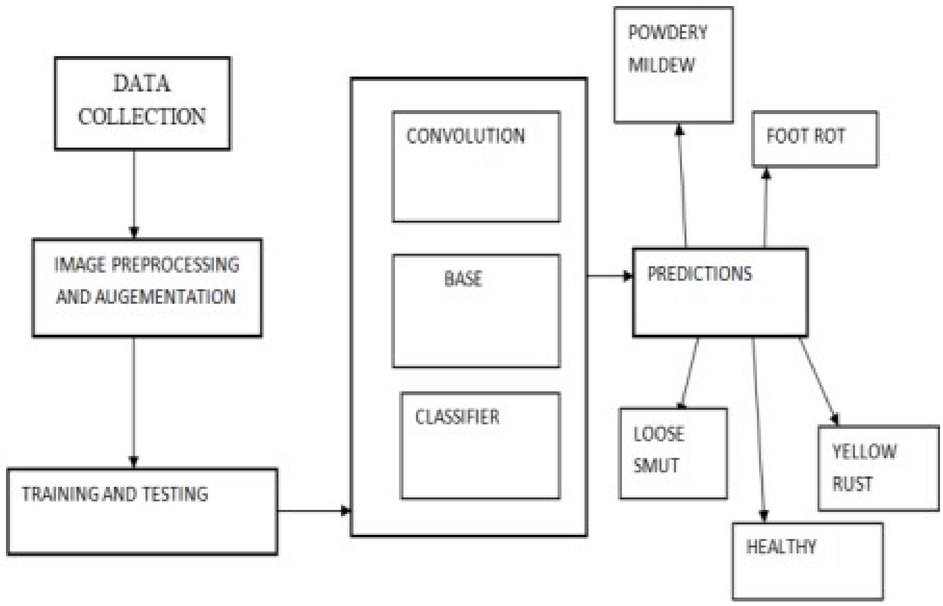

Figure 3.1: Flow Diagram

3.3 System Design

It will be compatible with any device with a good GPU and a newer version of Python installed. Users can run the system with a website interface on any device. The system will resize the image for better and easier prediction. The system will first identify a leaf from an image and then It will be possible to determine whether a plant is healthy or has contracted a disease utilising the developed machine learning model. The system will display the disease's name, its aetiology, and its preventative measures.

3.4 Details of Hardware/Software Requirement

The Hardware requirements for executing this model are:

- RAM – 4GB
- GPU – 2GB
- Operating System – Windows 10
- Processor – intel(R) Core(TM) i3
- Processor Speed – 3.60 GHz

The Software requirements used to develop this application are:

- Programming Language – Python
- Deep Learning Framework – TensorFlow
- pip version 19.0 or higher for Linux and Windows.
- pip version 20.3 or higher for MacOS.

Chapter 4

Results and Discussion

4.1 Implementation Details

We have used new-plant-diseases-dataset which comprises of 14 plants and 38 classes of healthy and sick leaf images. There are 70295 images for training and 17572 images for validation. The developed machine learning model is trained using ResNet since it has proved to be optimum option time-to-time. We combine our trained model with front-end to make it more accessible and convenient for users to use it for diagnosing diseases. When an image is given in the form of input , the system will resize the image in 256x256. The model will function better with a reduced image size. The resized image would be processed and used for making disease prediction.

Dataset used for the project. https://www.kaggle.com/datasets/vipoooool/new-plant-diseases-dataset

4.2 Result Analysis

The Results we have achieved are quite satisfactory, we have managed to put forth what we had initially planned. We trained our model for 2 epochs using ResNet since further training results cause overfitting on the training data. Overfitting generally occurs when a model learns the unwanted patterns of the training samples. Hence, training accuracy increases but test accuracy decreases.

```
Epoch [0], last_lr: 0.00812, train_loss: 0.8697, val_loss: 1.5542, val_acc: 0.6153
Epoch [1], last_lr: 0.00000, train_loss: 0.1597, val_loss: 0.0378, val_acc: 0.9884
CPU times: user 13min 28s, sys: 14min 52s, total: 28min 20s
Wall time: 34min 26s
```

Figure 4.1: epoch Summary

Shows Accuracy and Loss for every epochs respectively Screenshot shows the graphical view of accuracy and loss respectively. The trained model showed 98.8 percent accuracy. After every epoch accuracy increases.

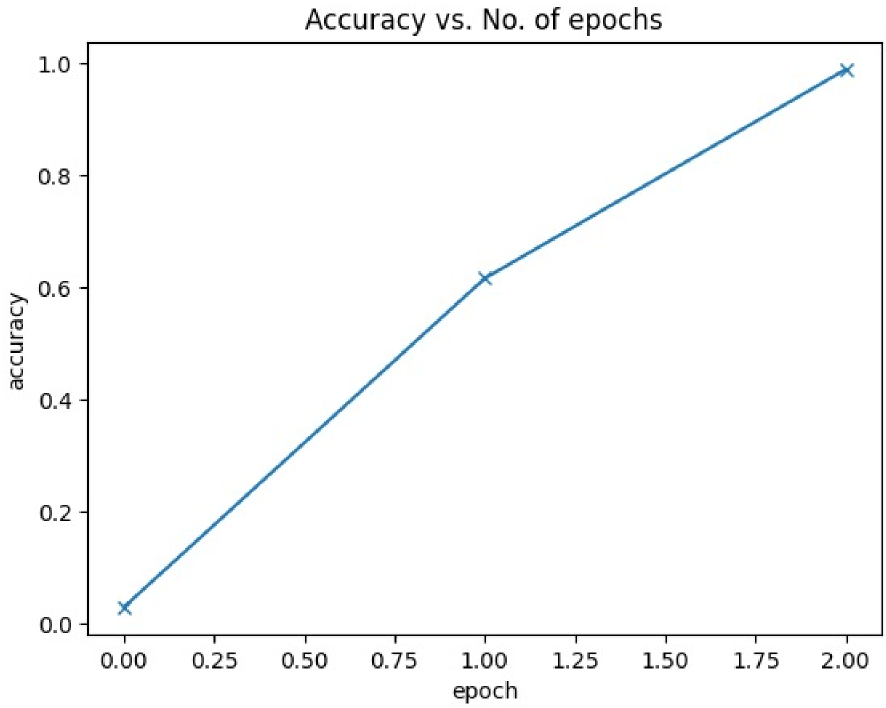

Figure 4.2: Accuracy vs No.of epochs

The trained model showed 98.8 percent accuracy as shown in Figure 4.2 which is capable enough to predicting disease accurately every time.

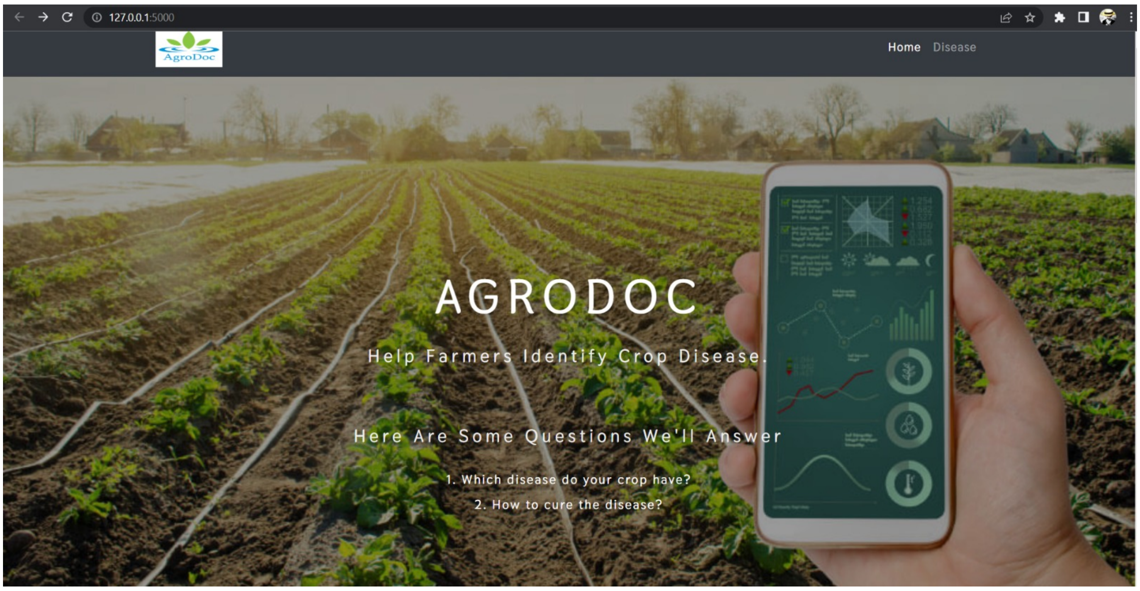

Figure 4.3: Home Page

Figure 4.3 is the Home Page of our website, which provides a brief overview of our system.

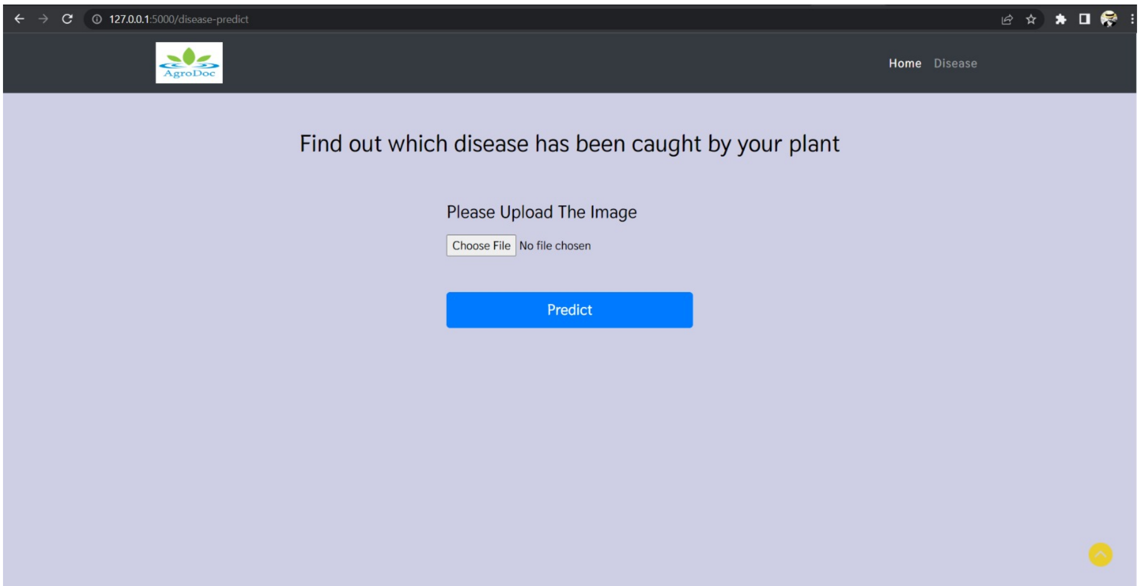

Figure 4.4: Disease Predictor Page

As you can see in Figure 4.4 Users can upload image of leaves to identify which disease they might have.

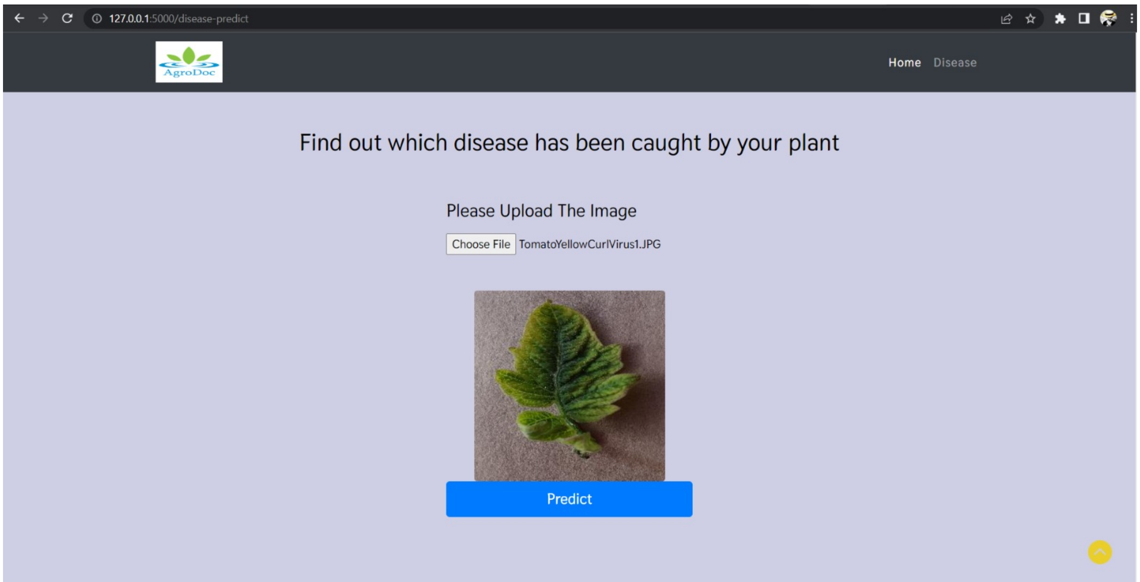

Figure 4.5: Testing the System

As shown in Figure 4.5 predicting disease we can choose an image and upload for disease detection.

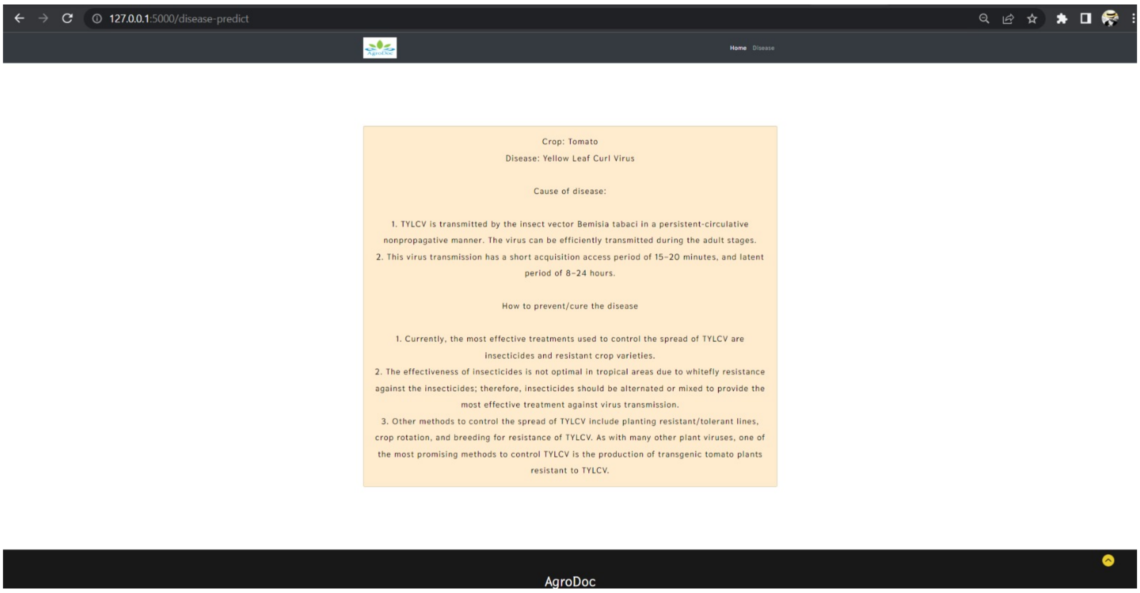

Figure 4.6: Predicted Result

After uploading the image, Our system will identify the disease and potential causes of the disease . Additionally, our system will suggest various treatments and disease prevention strategies as shown in Figure 4.6 Predicted result.

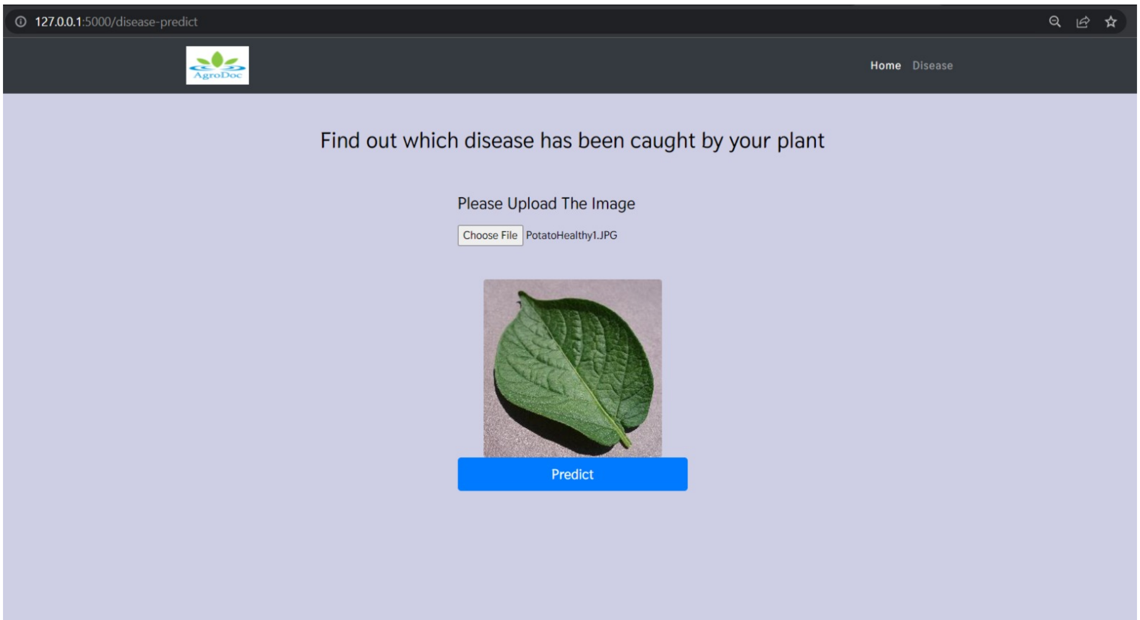

Figure 4.7: Predicting Healthy Leaf

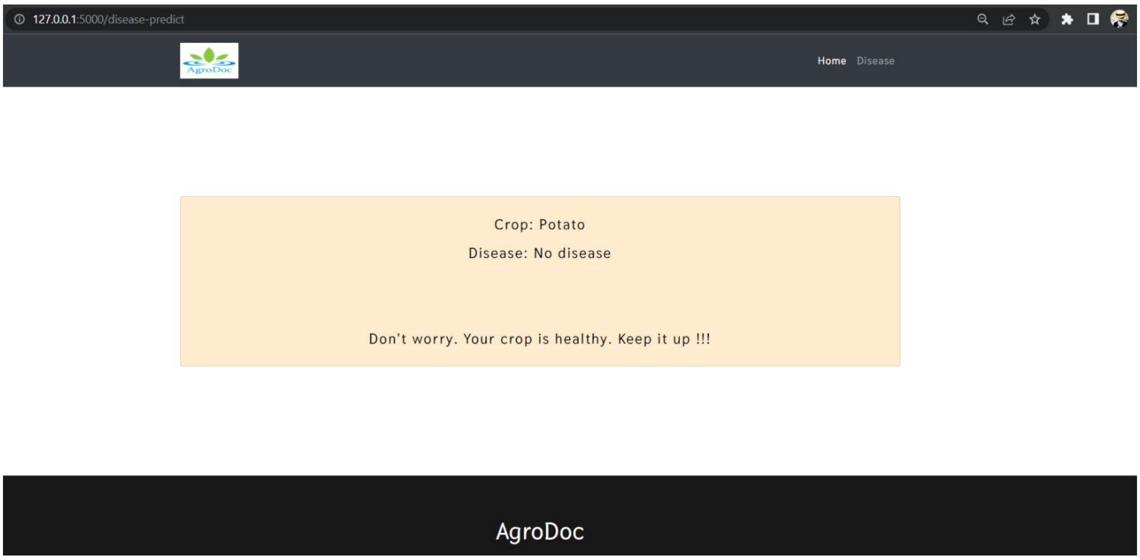

Figure 4.8: Predicted Result for Healthy Leaf

As you can see in Figure 4.8 Predicted Result for Healthy Leaf, Our system can even determine whether the leaf is healthy and free of obvious diseases.

Chapter 5

Conclusion and Further Work

In this Project, deep learning methods are widely studied. According to the task Residual Network Model (ResNet34), we accurately detect and classify diseases in plant images. This model is trained on images from New Plant. Disease data set containing images belonging to 38 another class. 96.51 percent weighted average accuracy and accuracy 99.40 percent was achieved by our model. These two Performance metrics for ResNet models are also compared. In future studies, the network model can be trained using the dataset containing various diseases and crops. This can augment the data by adding more images as data points, so the network can further identify and classify diseases and plant species. As the use of cameras increases and their performance improves, it is only a matter of time before the use of mobile phones for accurate diagnosis becomes more widespread. Also, the model can train data such as panoramas. land area, aerial photographs and images of different diseases and stages. In addition, image rotation results can be detected on the network.

References

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[2] A. Panchal, S. Patel, K. Bagyalakshmi, E. Khan, and M. Soni, "Image-based plant diseases detection using deep learning," 07 2021.

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[4] J. Liu and X. Wang, "Plant diseases and pests detection based on deep learning: a review," *Plant Methods*, vol. 17, no. 1, p. 22, 2021.

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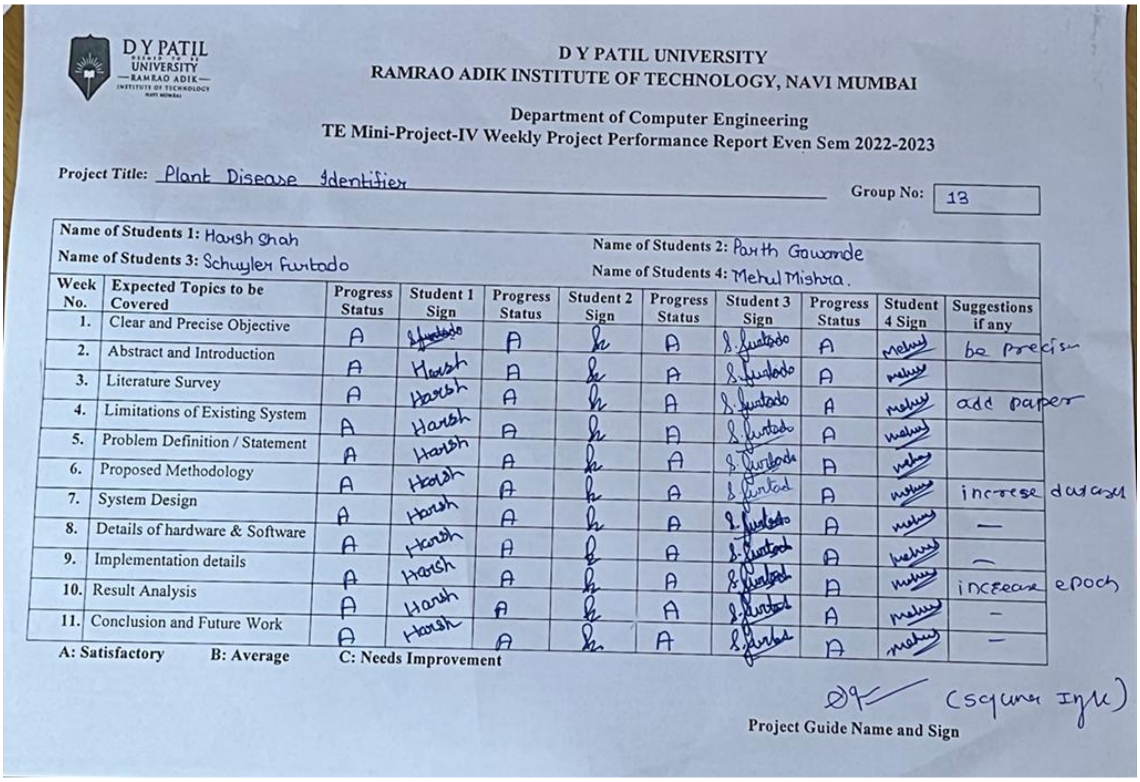
[6] V. Singh and A. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques," *Information Processing in Agriculture*, vol. 4, no. 1, pp. 41–49, 2017.

[7] S. M. Hassan and A. K. Maji, "Plant disease identification using a novel convolutional neural network," *IEEE Access*, vol. 10, pp. 5390–5401, 2022.

Appendices

Appendix A

Weekly Progress Report



D Y PATIL UNIVERSITY
RAMRAO ADIK INSTITUTE OF TECHNOLOGY, NAVI MUMBAI

Department of Computer Engineering
TE Mini-Project-IV Weekly Project Performance Report Even Sem 2022-2023

Project Title: Plant Disease Identifier

Group No: 13

Name of Students 1: Harsh Shah

Name of Students 2: Parth Gawande

Name of Students 3: Schuyler Furtado

Name of Students 4: Mehul Mishra.

Week No.	Expected Topics to be Covered	Progress Status	Student 1 Sign	Progress Status	Student 2 Sign	Progress Status	Student 3 Sign	Progress Status	Student 4 Sign	Suggestions if any
1.	Clear and Precise Objective	A	S. Furtado	A	[illegible]	A	S. Furtado	A	Mehul	
2.	Abstract and Introduction	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	be precise
3.	Literature Survey	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	
4.	Limitations of Existing System	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	add paper
5.	Problem Definition / Statement	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	
6.	Proposed Methodology	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	
7.	System Design	A	Harsh	A	[illegible]	A	S. Furtad	A	Mehul	increse dataset
8.	Details of hardware & Software	A	Harsh	A	[illegible]	A	S. Furtado	A	Mehul	—
9.	Implementation details	A	Harsh	A	[illegible]	A	S. Furtad	A	Mehul	—
10.	Result Analysis	A	Harsh	A	[illegible]	A	S. Furtad	A	Mehul	increase epoch
11.	Conclusion and Future Work	A	Harsh	A	[illegible]	A	S. Furtad	A	Mehul	—

A: Satisfactory B: Average C: Needs Improvement

([illegible])

Project Guide Name and Sign

Appendix B

Plagiarism Report

plant

ORIGINALITY REPORT

21%

SIMILARITY INDEX

PRIMARY SOURCES

1	Vinod Kumar, Hritik Arora, Harsh, Jatin Sisodia. "ResNet-based approach for Detection and Classification of Plant Leaf Diseases", 2020 International Conference on Electronics and Sustainable Communication Systems (ICESC), 2020 Crossref	93 words — 5%
2	www.coursehero.com Internet	82 words — 4%
3	www.annauniv.edu Internet	51 words — 3%
4	www.researchgate.net Internet	41 words — 2%
5	Adesh V. Panchal, Subhash Chandra Patel, K. Bagyalakshmi, Pankaj Kumar, Ihtiram Raza Khan, Mukesh Soni. "Image-based Plant Diseases Detection using Deep Learning", Materials Today: Proceedings, 2021 Crossref	40 words — 2%
6	Jalal Rasulzade, Samir Rustamov, Bakytzhan Akhmetov, Yelaman Maksum, Makpal Nogaibayeva. "Computational Acceleration of Topology Optimization Using Deep Learning", Applied Sciences, 2022 Crossref	18 words — 1%

Appendix C

Publication Details / Copyright / Project Competitions

Acknowledgments

We would like to take this opportunity to extend our heartfelt thanks and appreciation to our guide, Mrs. Saguna K. Ingle, for her exceptional leadership, monitoring, and consistent support throughout the completion of this report. We sincerely appreciate her efforts to deepen our comprehension of numerous topics and the technical abilities needed for our project. Her blessings, assistance, and direction will carry us a long way in the life journey we are about to embark on. We would like to use this opportunity to offer our heartfelt gratitude to Dr. Mukesh D. Patil, Principal of RAIT, for providing the much-needed facilities. We are also grateful to Dr. Amarsinh V. Vidhate, Head of the Department of Computer Engineering at RAIT, Nerul Navi Mumbai, for their kind assistance. Last but not the least we would also like to thank all those who have directly or indirectly helped us in completion of this thesis.

Date: ____________________