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PLANT LEAF DISEASES DETECTION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK

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Abstract - The global rise in population has led to a shortage of raw materials and food supplies. The agricultural sector has become the primary and most vital source to overcome this particular constraint. However, the industry itself is facing the challenge of pests and various crop diseases. Battling this has been the significant focus of the sector for decades. due to the technology gap identifying the diseased crops on a massive scale is a big obstacle for the agricultural sector. The proposed system recognizes diseases using CNN, disease detection involves steps such as image acquisition, pre-processing, segmentation, feature extraction and classification, also we are deploying a web app with this trained model which can be used on computers and any android devices thus farmers can easy detect the disease and get the remedy by using the application, we are developing the web app using the python flask.

Key Words: CNN, Python flask, Web-app, Diseases detection.

1.INTRODUCTION

Identification of the plant illnesses is the important thing to stopping the losses with inside the yield and amount of the rural product. The research of the plant illnesses implies the research of visually observable styles visible at the plant. Health tracking and ailment detection on plant may be very vital for sustainable agriculture. It may be very tough to display the plant illnesses manually.

It calls for outstanding quantity of work, information with inside the plant illnesses, and additionally require the immoderate processing time. Hence, photo processing and Machine mastering strategies are used for the detection of plant illnesses. Disease detection entails the stairs like photo acquisition, photo pre-processing, photo segmentation, function extraction and classification.

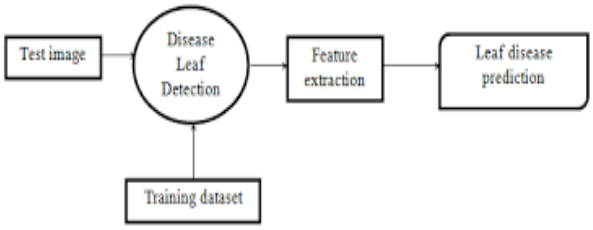

Figure 1: Overview of Leaf Diseases detection

2. RELATED WORKS

[1] The work done by the author, Namrata R.Bhimte, V. R.Thool, "Diseases Detection of Cotton Leaf Spot Using Image Processing and SVM Classifier" in the year 2020

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In India Cotton is considered as one of the most important cash crops, as most farmers cultivate cotton in large number. The diseases on cotton, over past few decades have to lead to tremendous loss of yield and productivity. Identification of cotton diseases at early stage diagnosis is important. The goal of our proposed work presents a system using simple image processing approach for automatic diagnosis of cotton leaf diseases. Classification based on selecting appropriate features such as color, texture of images done by using SVM classifier. The images are acquired from cotton fields using a digital camera. Various preprocessing techniques as filtering, background removal, enhancement are done. Color-based segmentation is done to obtain the diseased segmented part from the cotton leaf. Segmented image is used for feature extraction.

[2] The work done by the author, Nithish kannan E, Kaushik M, Prakash P, Ajay R, Veni S**,** "Tomato Leaf Disease Detection using Convolutional Neural Network with Data Augmentation" in the year 2020.

This project briefs the detection of diseases present in a tomato leaf using Convolutional Neural

Networks (CNNs) which is a class under a deep neural network. As an initial step, the dataset is segregated before the detection of tomato leaves. The concept of transfer learning is used where a pre-trained model (ResNet-50) is imported and adjusted according to our classification problem. To increase the quality of the ResNet model and to enhance the result as close to the actual prevailing disease, data augmentation has been implemented. Taking all these into consideration, a tomato leaf disease detection model has been developed using PyTorch that uses
deep - CNNs. Finally, the testing dataset is processed for validation based on the learned parameters from the ResNet 50 model. Six most prevailing diseases in tomato crops have been taken for classification. Data augmentation has been introduced to increase the data set to 4 times the actual data and the model has shown an
accuracy of 97%.

[3] The work done by the author, Index Terms—Paddy Leaf Disease, K-Means Clustering, Color, Texture, Shape, SVM, Remedy, "Content based Paddy Leaf Disease Recognition and Remedy Prediction using Support Vector Machine", in the year 2020.

Rice is one of the staple foods of the world. But the production of rice is hampered by various kind of paddy diseases. One of the main diseases of paddy is leaf disease. Generally, it is very time-consuming and laborious for farmers of remote areas to identify paddy leaf diseases due to unavailability of experts. Though experts are available in some areas, disease detection is performed by naked eye which causes inappropriate recognition sometimes. An automated system can minimize these problems. In this paper, an automated system is proposed for diagnosis three common paddy leaf diseases (Brown spot, Leaf blast, and Bacterial blight) and pesticides and/or fertilizers are advised according to the severity of the diseases. K-means clustering is used for separating affected part from paddy leaf image. Visual contents (colour, texture, and shape) are used as features for classification of these diseases. The type of paddy leaf diseases is recognized by Support Vector Machine (SVM) classifier. After recognition, the predictive remedy is suggested that can help agriculture related people and organizations to take appropriate actions against these diseases.

[4] The work done by the author, Namrata R.Bhimte,V. R.Thool, "Diseases Detection of Cotton Leaf Spot Using Image Processing and SVM Classifier", in the year 2020.

In India Cotton is considered as one of the most important cash crops, as most farmers cultivate cotton in large
number. The diseases on cotton, over past few decades have to lead to tremendous loss of yield and productivity. Identification of cotton diseases at early stage diagnosis is important [1]. The goal of our proposed work presents a system using simple image processing approach for automatic diagnosis of cotton leaf diseases [2]. Classification based on selecting appropriate features such as color, texture of images done by using SVM classifier. The images are acquired from cotton fields using a digital camera. Various preprocessing techniques as filtering, background removal, enhancement are done. Color-based segmentation is done to obtain the diseased segmented part from the cotton leaf. Segmented image is used for feature extraction.

3. PROPOSED SYSTEM

The primary cause of proposed gadget is to discover the illnesses of plant leaves via way of means of the use of function extraction strategies in which capabilities which includes shape, color, and texture are taken into consideration. Convolutional neural network (CNN), a gadget getting to know approach is utilized in classifying the plant leaves into wholesome or diseased and if it's far a diseased plant leaf, CNN will supply the call of that specific disorder. Suggesting treatments for specific disorder is made if you want to assist in developing wholesome flora and enhance the productivity.

3.1 MERITS OF PROPOSED SYSTEM

The major reason of proposed gadget is to stumble on the illnesses of plant leaves with the aid of using the use of function extraction strategies in which capabilities including shape, color, and texture are taken into consideration. Convolutional neural network (CNN), a device gaining knowledge of approach is utilized in classifying the plant

leaves into wholesome or diseased and if it's miles a diseased plant leaf, CNN will deliver the call of that specific disorder. Suggesting treatments for specific disorder is made that allows you to assist in developing wholesome plant life and enhance the productivity

3.2 MODULES DESCRIPTION

There are three modules used in the project. They are the training module, testing module & app module.

1) Training Module
2) Testing Module
3) App Module

3.2.1 TRAINING MODULE

In the training phase the data sets which are collected from the internet are being trained using CNN to create a trained model. The data set images are fetched from the Kaggle website for the training purpose.

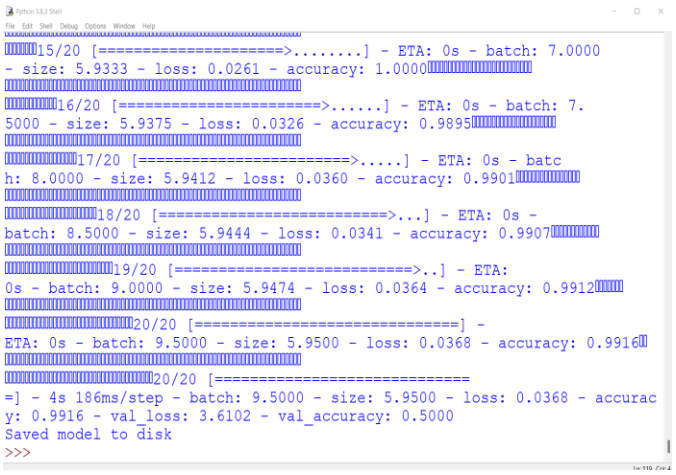

Figure 2: Training Module Screen

Some of the example data sets are provided below.

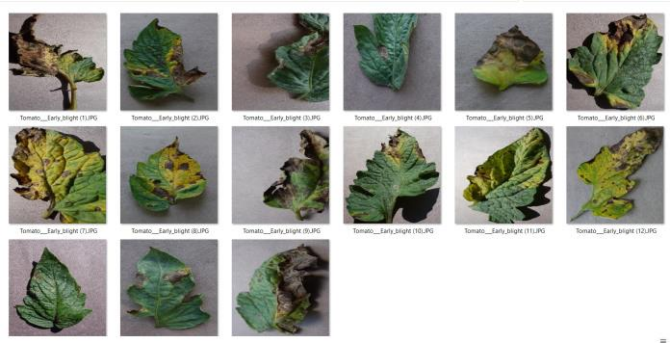

Figure 3: Datasets Example of Leafs

3.2.2 TESTING MODULE

Using the trained model, we can test the CNN module offline before using it in the web app first we need to specify the location of the test leaf image and then run the module and test our module.

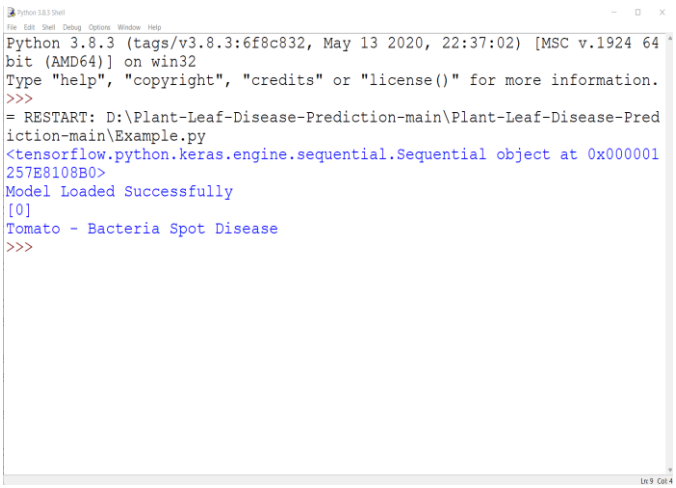

Figure 4: Testing Module Screen

3.2.3 APP MODULE

Web applications have many different uses, and with those uses, comes many potential benefits. Some common benefits of Web apps include, allowing multiple users access to the same version of an application, Web apps don't need to be installed. Web apps can be accessed through various

platforms such as a desktop, laptop, or mobile, can be accessed through multiple browsers.

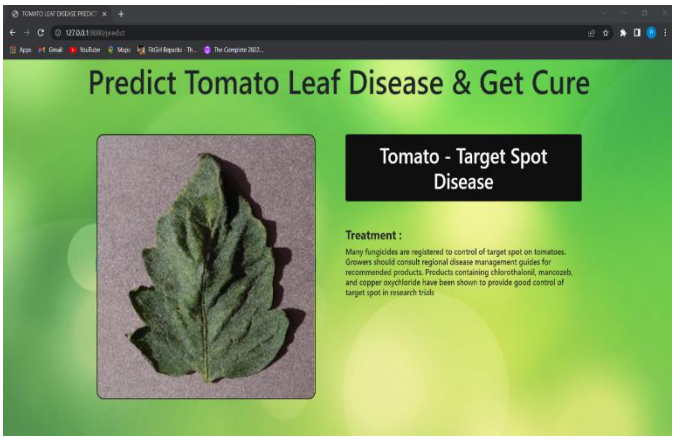

Figure 5: App Module Screen

4. ARCHITECTURAL AND DATA FLOW DIAGRAM

4.1 SYSTEM ARCHITECTURE

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

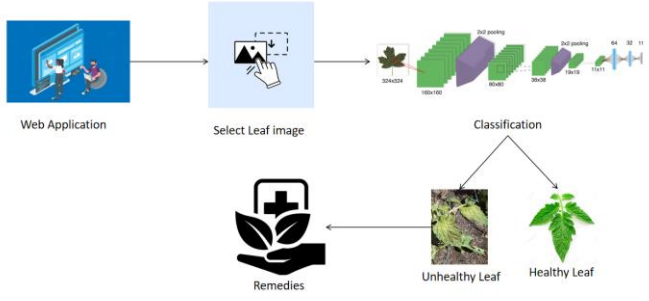

Figure 6: System Architecture

4.2 DATAFLOW DIAGRAM

A data flow Diagram is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail, which can later be elaborated.

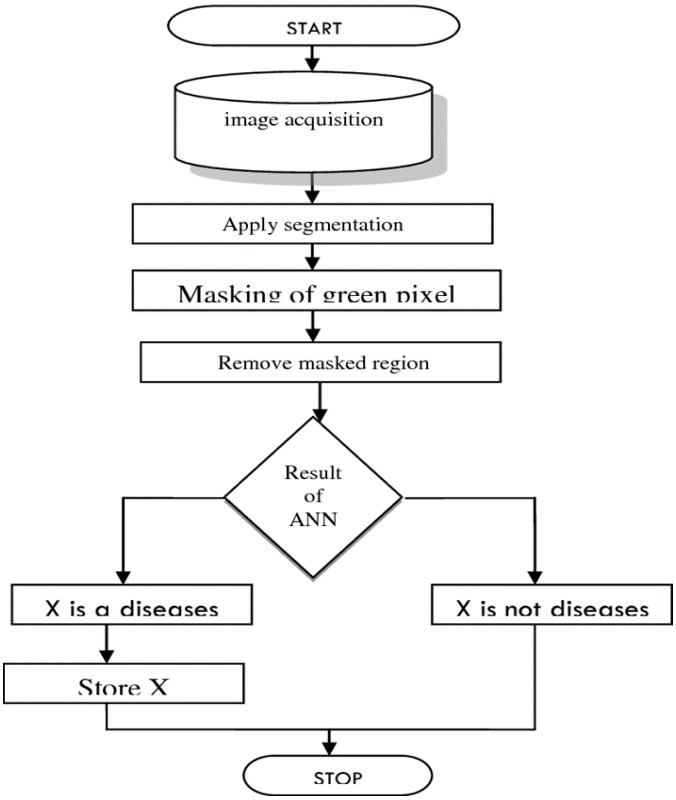

Figure 7: Dataflow Diagram

4.3 OTHER DIAGRAM

4.3.1 USE CASE DIAGRAM

Use case diagram is a graphic depiction of the interactions among the elements of a system. Use cases will specify the expected behavior, and the exact method of making It happened. Use cases once specified can be denoted both textual and visual representation.

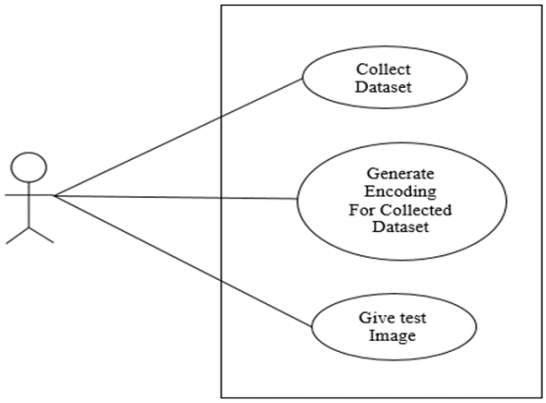

Figure 8: Use Case Diagram

5. RESULTS AND OBSERVATIONS

The system worked well efficient in different scenarios.

5.1 DATASET FROM KAGGLE

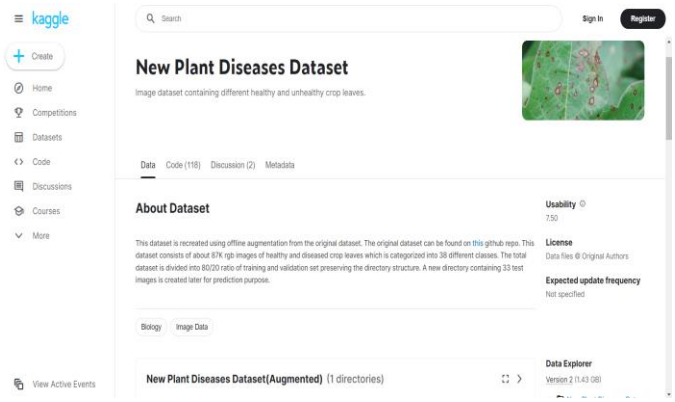

Figure 9: Plant Diseases Datasets

5.2 DATASET COLLECTION

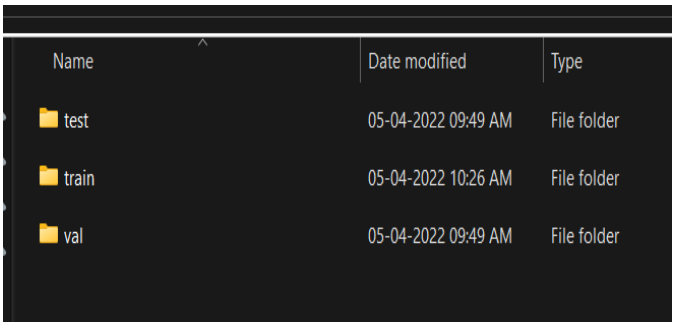

Figure 10: Datasets screen

5.3 DISEASED LEAF & HEALTHY LEAF DATASETS

Figure 11: Number of Leaf Sample

5.4 TRAINING MODULE

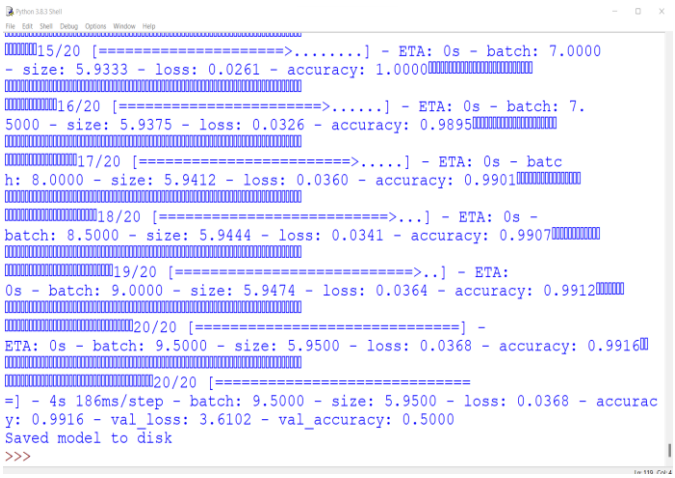

Figure 12: Training Module Screen

5.5 TRAINED MODULE

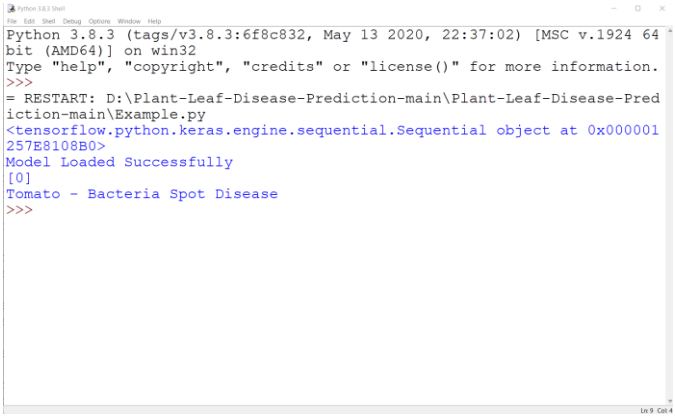

Figure 13: After Training the System

5.6 WEB APP GUI

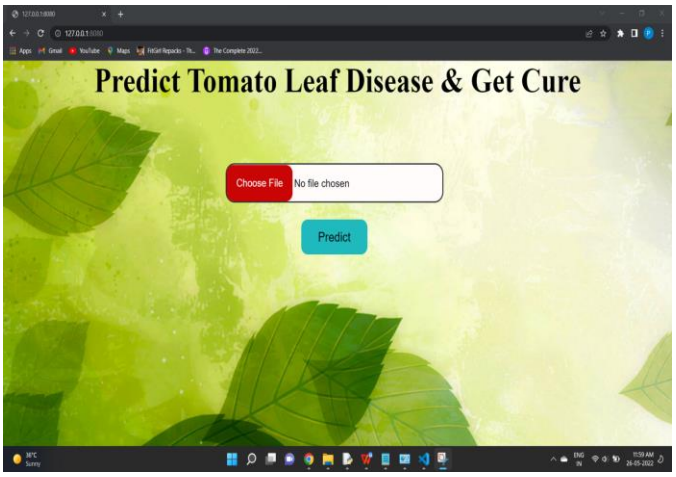

Figure 14: Web Interface Screen

5.7 SELECT LEAF IMAGE

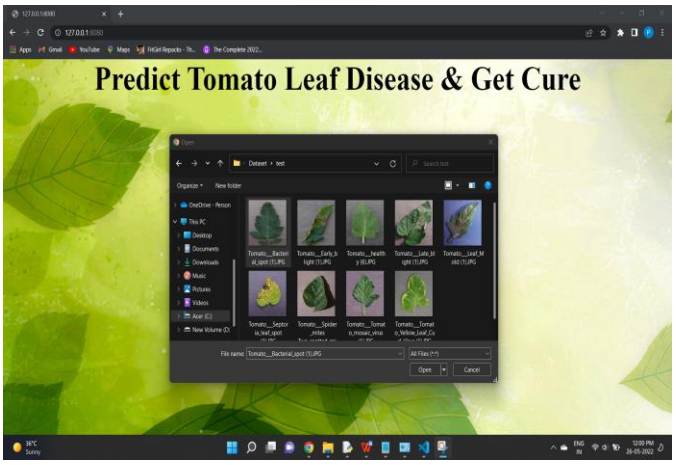

Figure 15: Selection of Leaf image

5.8 AFTER CHOOSING IMAGE

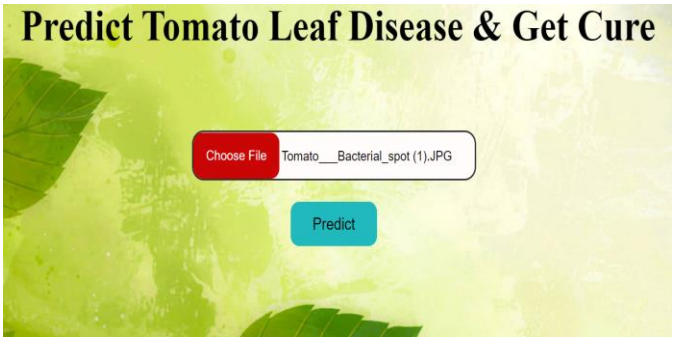

Figure 16: Disease Predications

5.9 HEALTHY LEAF DETECTED

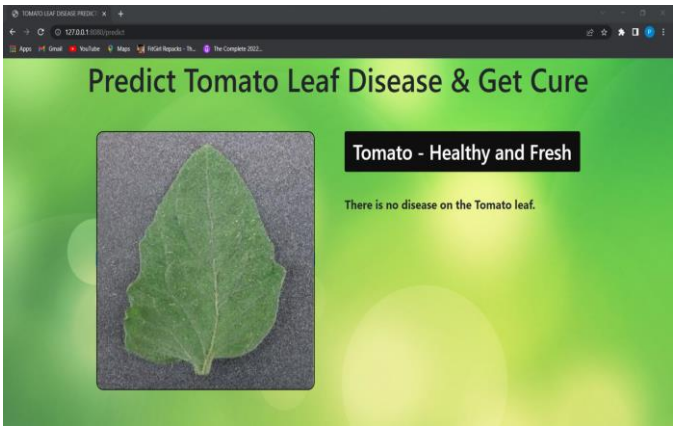

Figure 17: Healthy Leaf Detection

5.10 UNHEALTHY LEAF DETECTED

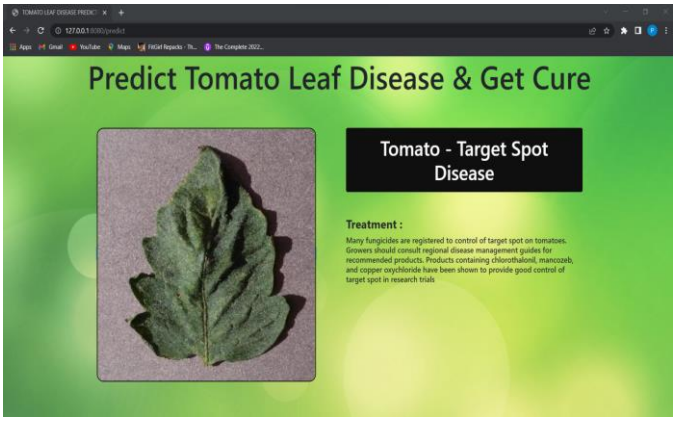

Figure 18: Diseases Leaf detection

6. CONCLUSION

The Convolutional neural network (CNN) is an important department of deep learning. Because of its robust feature extraction capability, CNN fashions had been added to discover plant diseases. In this research, we used pre-skilled weights as a starting factor to keep away from a completely lengthy treatment. Subsequently, we in comparison the proposed method with numerous artisanal shallow shape methods primarily based totally on device learning. The proposed machine achieves promising precision consequences on our set of facts on plant leaves, demonstrating the effectiveness of this proposed method for detection of diseases.

ACKNOWLEDGEMENT

The authors would like to thank Mrs. M. Pavithra for his suggestions and excellent guidance throughout the project period.

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