A

PROJECT REPORT

ON

Potato Disease Detection

Submitted by

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For Partial Fulfillment of the Requirements for Bachelor of Technology in Information Technology

Guided by

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AY: 2022-23, Semester I

CERTIFICATE

This is to certify that the project work entitled **Potato Disease Detection** has been successfully carried out by **Suchi Shathavara (19IT402) and Dhruvika Gajera (19IT414)** for the subject **Project I (4IT31)** during the academic year 2022-23, Semester-I for partial fulfilment of Bachelor of Technology in Information Technology. The work carried out during the semester is satisfactory.

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We would be failing in duty if we do not acknowledge with gratefulness to the authors of the references and other literatures referred to in this project. Last but not the least; we are very much thankful to our parents who guided us in every step which we took.

Thanking You,
Suchi Sathavara,
Dhruvika Gajera.

Abstract

Using machine vision and image processing methods has an important role in the identification of defects of agricultural products, especially potatoes. The applications of image processing and artificial intelligence in agriculture in identifying and classifying diseases of plants and fruits have increased and research in this field is ongoing.

In this mobile application we use the convolution neural network (CNN) methods, also, we examined 3 classes of potato diseases with the names: Healthy, Blight, Black. We used a database of around 5000 potato images. After building and evaluating model we get 97.8 % accuracy to detect disease in our android application.

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List of Abbreviation

Abbreviation	Definition
DFD	Data Flow Diagram
UML	Unified Modeling Language
CNN	Convolution Neural Network
SQL	Structured Query Language
PIL	Python Imaging Library

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Chapter 1: Introduction

1.1 Brief overview of the work

In our country farmers are not very educated so sometimes they cannot recognize the disease in their crop. Agriculture doctors cannot visit every farm so we have made a solution application for the problem. Convolution neural network has been trained on that dataset which can classify the leaf image into 3 classes.

This is android application for the farmers through which they can capture and upload the image of their plant to our server. Every farmer must register themselves to use the application. This application used SQLite database to store their data. After that they have to login to the application by entering their mail-id and password. Then they can capture the image through application or upload an already present image .Application's model has stored on the server which can predict the class of the image which has been uploaded by the user. This application used flask at the server side and OKHttp module to send the request from an android application

1.2 Objective

The goal of this application is to obtain an image from the farmer of the diseased crop preferably the stem or the leaves through the Android Application installed on farmers phone. The image will then process using image-processing technique (CNN) and the disease type will detect. The diseases affected to the crop and the amount of fertilizer or the pesticide/insecticide to be used will update to the Android Application that was previously used by the farmer to upload image.

1.3 Scope

This application provides farmers with detection of disease in potatoes. Every logged in user will have access to the system. The system will go through the image that user provides, then according to classification it will detect disease and user can view it. The project's main aim is to provide accurate detection of potato disease.

1.4 Project Modules

1.4.1 Pre-processing

1.4.2 Model building

1.4.3 Mobile application

1.4.3.1 Login/Sign Up

1.4.3.2 Image capture

1.4.3.3 Disease detection

1.5 Project Hardware/Software Requirements

1.5.1 **Hardware**

Processor: 2.5 GHz frequency or above

Hard-disk: Minimum of 20 GB of available space

RAM: A minimum of 4 GB of RAM

Input Device: High resolution camera

1.5.2 **Software**

Operating System: Windows 10 and above.

Programming Language: Python 3 and above, Java.

Platform: Annaconda Jupyter Notebook, VS code, SQL.

Supporting Libraries: Tensorflow, OpenCV, PIL, tkinter, os, Sklearn etc.

Chapter 2: Literature Review

Since diseases in Plants are such a hot topic in agricultural field. Many articles have been published in the field of disease detection in plants. Finally, genuine articles related to our project were presented by many researchers.” 2014

Some of the previous studies that have conducted trail in potato leaf disease detection include the following:

Table 2.1: Literature Review

Title	Type	Year	Author	Advantage	Disadvantage
Severity Identification of Potato Late Blight Disease In Plant [1]	Research Paper	2014	Sandika Biaswas, Bhushan Jagyasi, Bir Pal Singh, Mehi Lal	Doesn’t need special training to farmers as dataset has images in different angles.	The images captured by untrained farmers were not oriented and contain cluster of leaves with background visible in several segments
A model for Early Detection of potato Late Blight Disease [2]	Research Paper	2017	Patrick Limo, Josen Orero, Ruth Kritika	System detects disease and also offers real time status of farmer's farms.	System can only detect Late Blight Disease.
Evaluating Late blight severity in Potato Crops using ML algorithms [3]	Article	2018	Julio M. Duarte, Diego F. Alzate, Andres A. Ramirez	Hypersective Camera	Can only detect Late Blight Disease.
Krishi Mitra: using ML to indentify Diseases in plants. [4]	Research Paper	2022	Anushka Bangal, Dhiraj Pagar, Hemant Patil, Neha Pande	Only leaf area was calculated and fungi caused diseases in sugarcane can recognized.	High Computational Complexity was required to implement.

A novel framework for potato leaf disease detection using deep learning model [5]	Article	2022	Rabbia Mahum, Haris Munir, Muhammad Awais	Require less processing time and highest accuracy is 97%.	Have limited dataset.

Chapter 3: System Analysis & Design

3.1 Comparison of Existing Applications with your Project with merits and demerits

1. "Evaluating Late blight severity in Potato Crops using ML algorithms [3]" and "A model for Early Detection of potato Late Blight Disease [2]", both systems can only detect late blight disease. By covering a huge dataset and using more feature of other disease of potato plant like early blight, our system has added the positive qualities of existing systems while overcoming the shortcomings of existing systems. Hence, this application will detect late blight and early blight disease by adding features of both type of disease through dataset.
2. "A novel framework for potato leaf disease detection using deep learning model [5]" had a restricted dataset. Also we used huge dataset for training our model so it's perform better than existing system, in which not enough data for their model.
3. For using this application, we don't need to give special training to farmers as we solved issue if captured images in different angles by data augmentation process.

3.2 Project Feasibility Study

During system analysis the feasibility study of the proposed system is to be carried out. For feasibility analysis, some understanding of the major requirements for the system is essential.

3.2.1 Technical Feasibility:

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

3.2.2 Economical Feasibility:

This system is going to be economically feasible because there is no need of new hardware or software.

3.2.3 Operational Feasibility:

This system will process smoothly thus, it is sure that system developed is operationally feasible.

3.3 Project Timeline chart

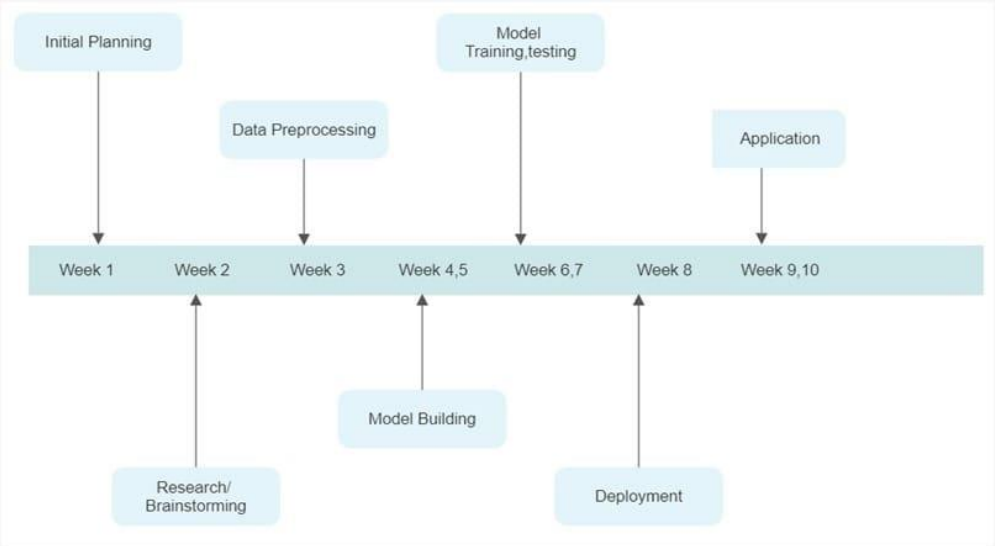

Figure 3.1: Timeline Diagram

3.4 Detailed Modules Description

3.4.1 Pre-processing: In this stage, 2152 images are used to divide into 3 classes. Each data from each class used are divided into training dataset and testing dataset with ratio of 80:20.

3.4.2 Model Building: Model is build using Convolution Neural Network. Model is build by feature extraction, image augmentation, rescale, resize.

3.4.3 Mobile Application: This mobile application can detect disease in potato leaf.

3.4.3.1 Login/Sign Up: User can login into application after sign up. Where user have to add their information like username, email, password.

3.4.3.2 Image Capture: In this page, user can either upload image from gallery or capture image using camera application.

3.4.3.3 Display Detection: After uploading an image user have to submit image which can access by model and detect the disease in the leaf. It will display the disease name.

3.5 Project SRS

3.5.1 Use Case Diagrams

Use case diagrams are a common way to communicate the major functions of a software system. A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.

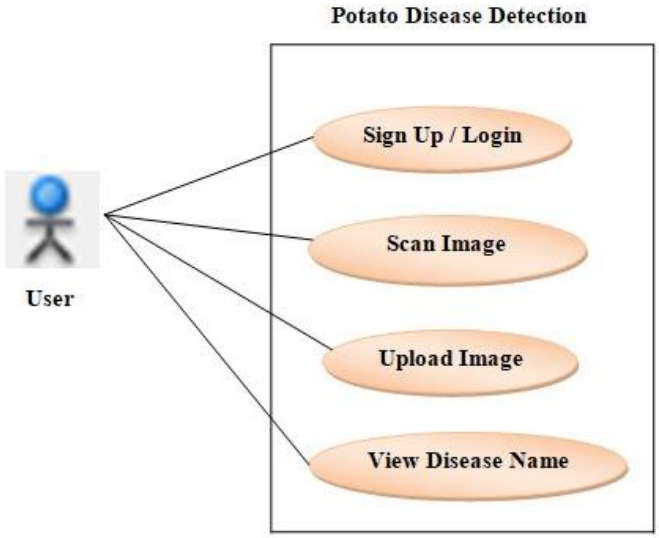

Figure 3.2: Use Case Diagram

3.5.2 Data Flow Diagrams

DFD provides the functional overview of a system. The graphical representation easily overcomes any gap between 'user and system analyst' and 'analyst and system designer' in understanding a system. Starting from an overview of the system it explores detailed design of a system through a hierarchy.

Level 0:

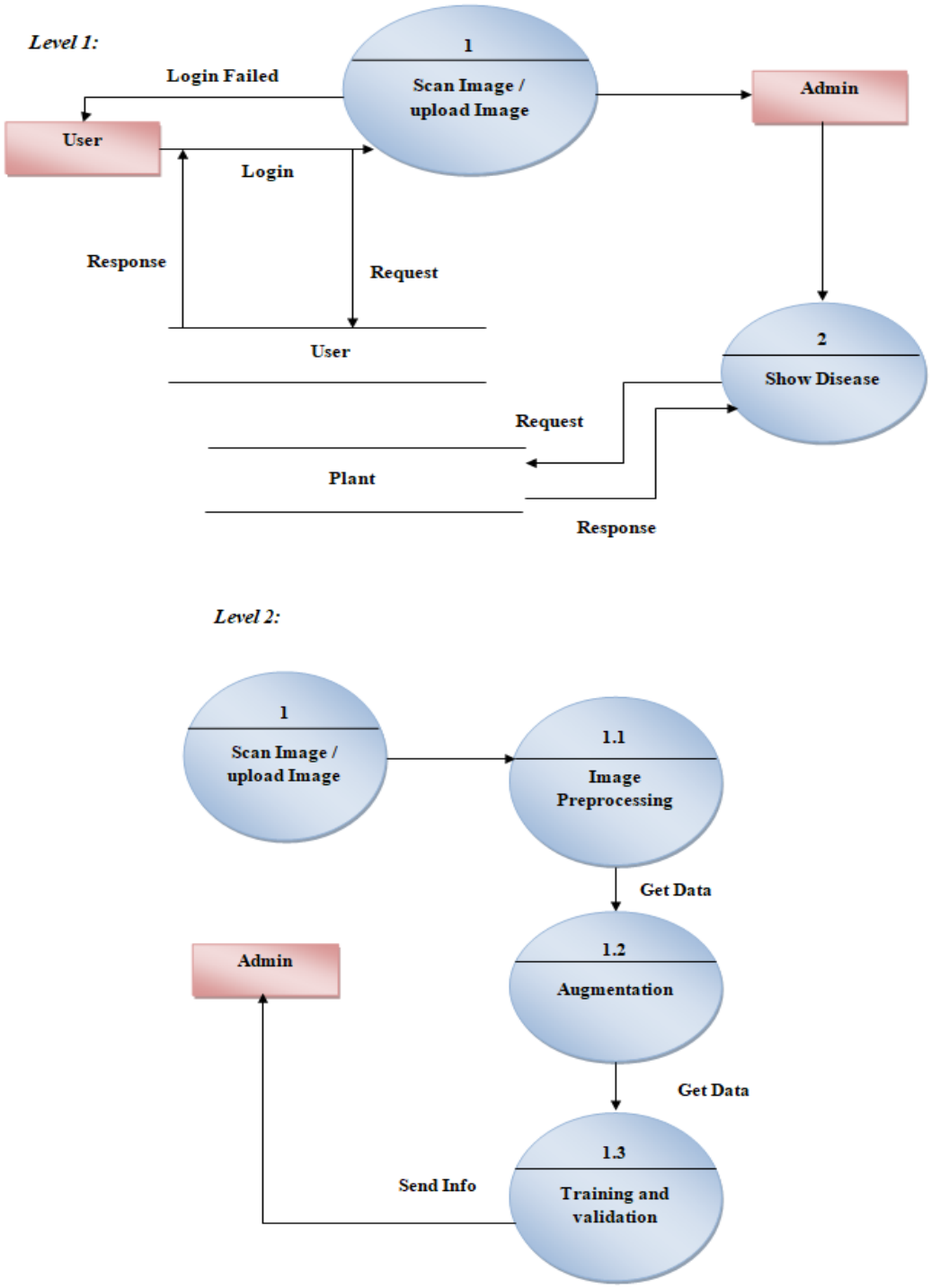

Figure 3.3: Data Flow Diagram

3.5.3 Class diagram

The class diagram is the main building block of object-oriented modeling. It is used both for general conceptual modeling of the systematic of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

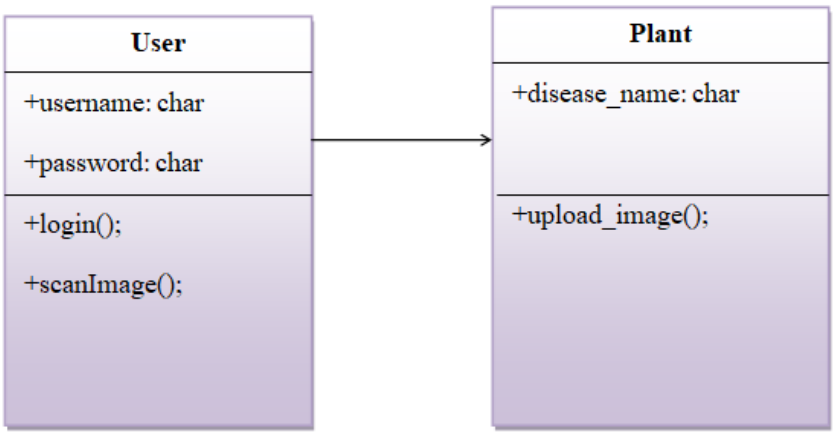

Figure 3.4: Class Diagram

3.5.4 Sequence Diagrams

A Sequence Diagram simply depicts interaction between objects in a sequential order. The purpose of a sequence diagram in UML is to visualize the sequence of a message flow in the system. The sequence diagram shows the interaction between two lifelines as a time-orderedsequence.

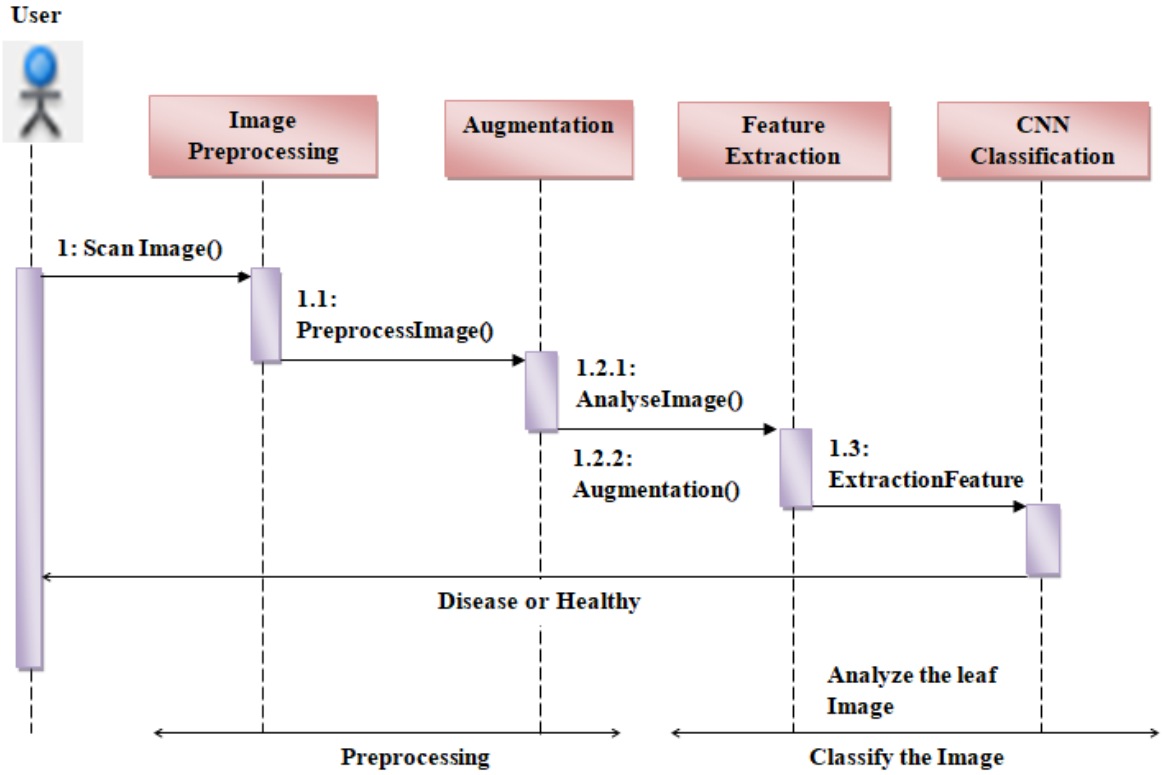

Figure 3.5: Sequence Diagram

3.5.5 State Diagram

State diagrams mainly depict states and transitions. States are represented with rectangles with rounded corners that are labelled with the name of the state. Transitions are marked with arrows that flow from one state to another, showing how the states change.

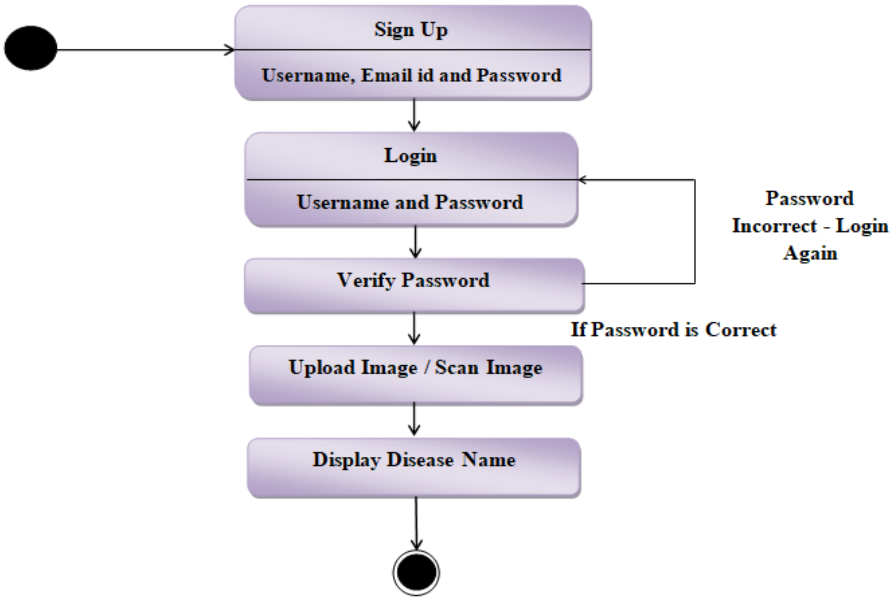

Figure 3.6: State Diagram

3.5.6 Activity Diagram

Activities diagrams are graphical representations of work processes of stepwise exercises and actions with backing for decision, emphasis and simultaneousness. In the Unified Modeling Language, movement outlines are planned to display both computational and authoritative procedures (i.e., workflows). Activity charts demonstrate the general stream of control.

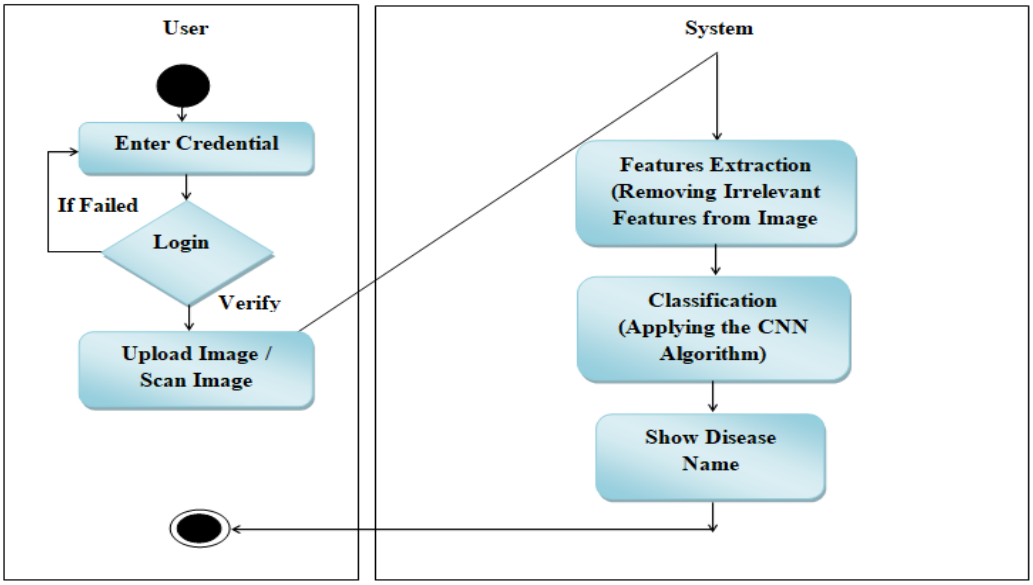

Figure 3.7: Activity Diagram

3.5 Data Dictionary

3.5.1 **Table Name:** Sign up User info

Description: To store the details of User who had Sign up

Primary key: Email

Table 3.1: Sign up User info

Sr. No	Name	Data type	Constraint	Description
1	User name	nvarchar(max)	Not null	To store the user's credentials
2	Email	nvarchar(max)	Primary key	To uniquely identify each user
3	Password	nvarchar(max)	Not null	To store user's password
4	Confirm Password	nvarchar(max)	Not null	To store user's password for match with previous one.

3.5.2 **Table Name:** Login User info

Description: To store the details of User who had Login

Primary key: Email

Table 3.2: Login User info

Sr. No	Name	Data type	Constraint	Description
1	Email	nvarchar(max)	Primary key	To uniquely identify each user
2	Password	nvarchar(max)	Not null	To store user's password

Chapter 4: Implementation and Testing

4.1 User Interface and Snapshot

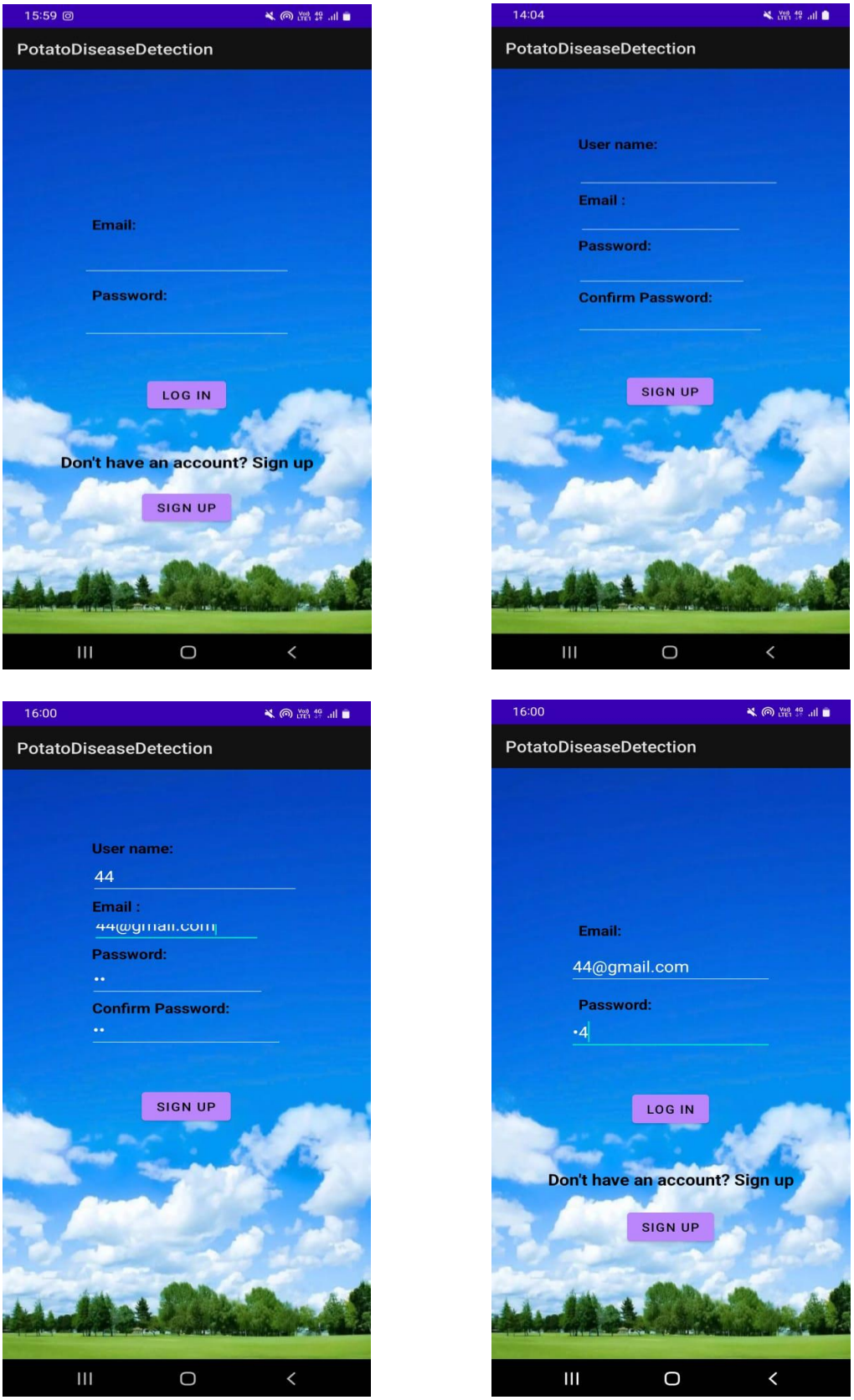

Figure 4.1: Login/Sign Up

The first page user will able to see is log in page. If the user doesn't have an account they have to sign up first. For sign up there's button called sign up which leads us to sign up page. In sign up user have to enter details like username, password, email and confirm password. After clicking sign up button our page will redirect to log in page. In login page we have to enter details like email and password.

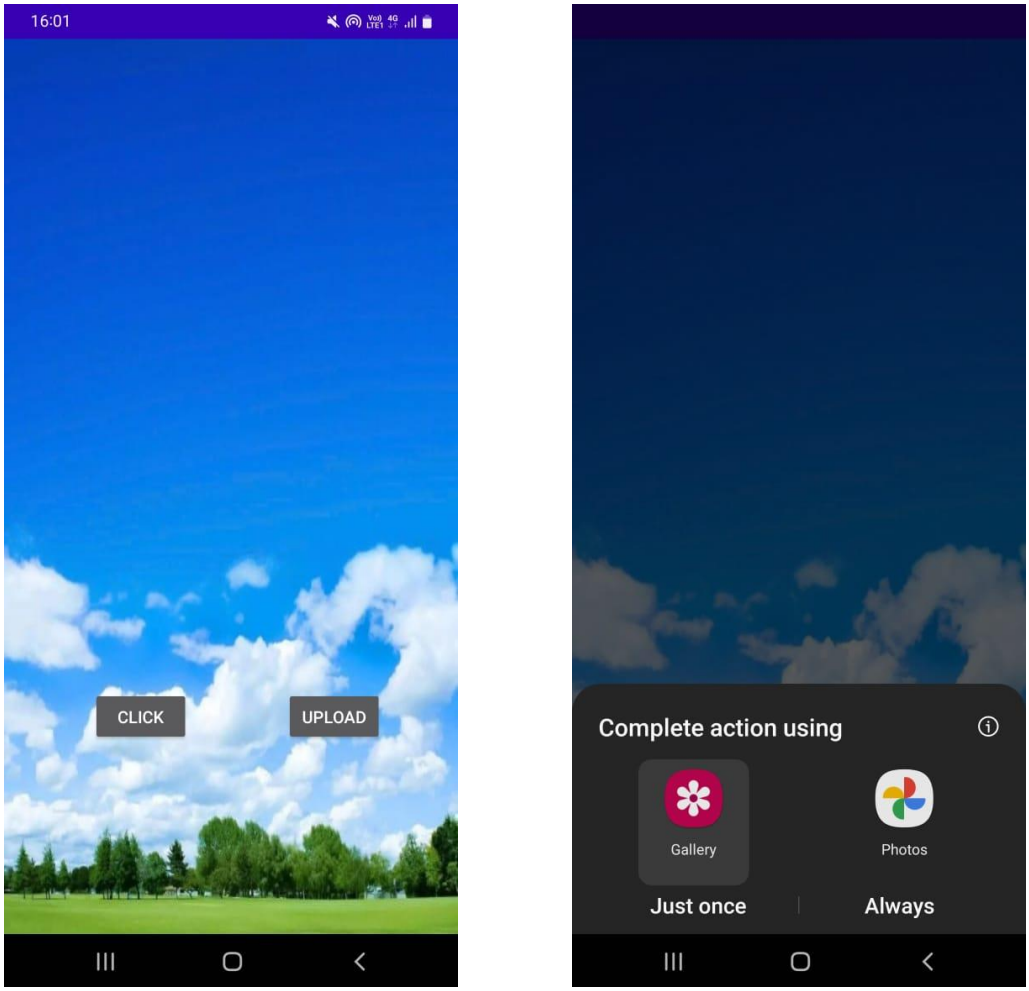

Figure 4.2: Capture / Upload Image

After logging in successfully app will show main page. In this there will be two options one to click image and second upload image from gallery. User can choose any one of these, where image of potato leaf is residing.

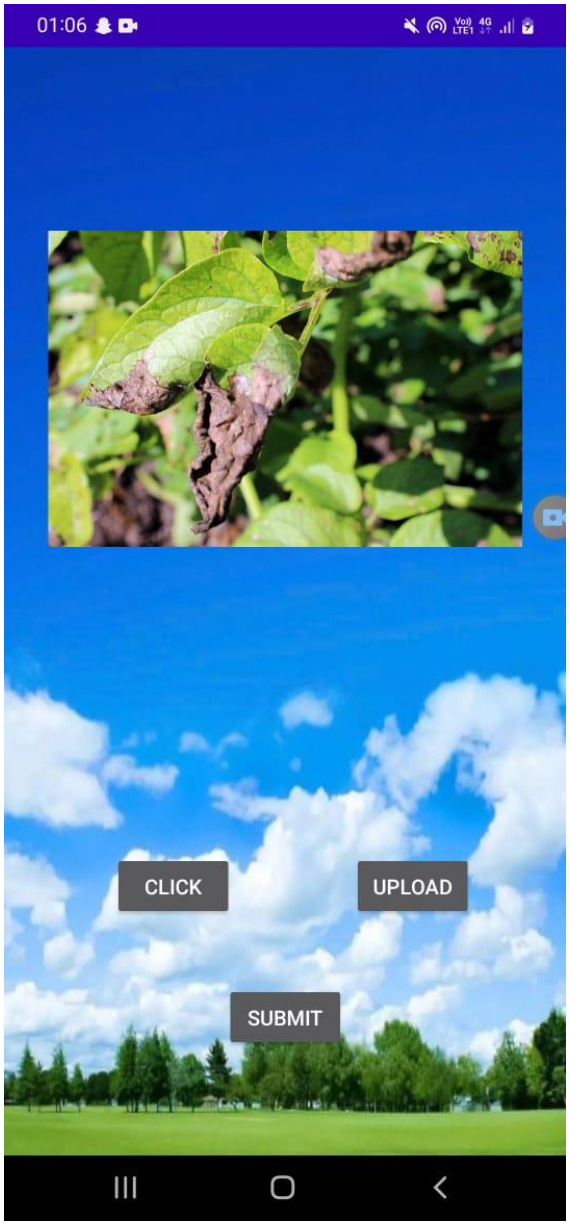

Figure 4.3: Submit Image

After chooses image from any one option, there will be submit button. On clicking the submit button user is submitting image to system for getting output.

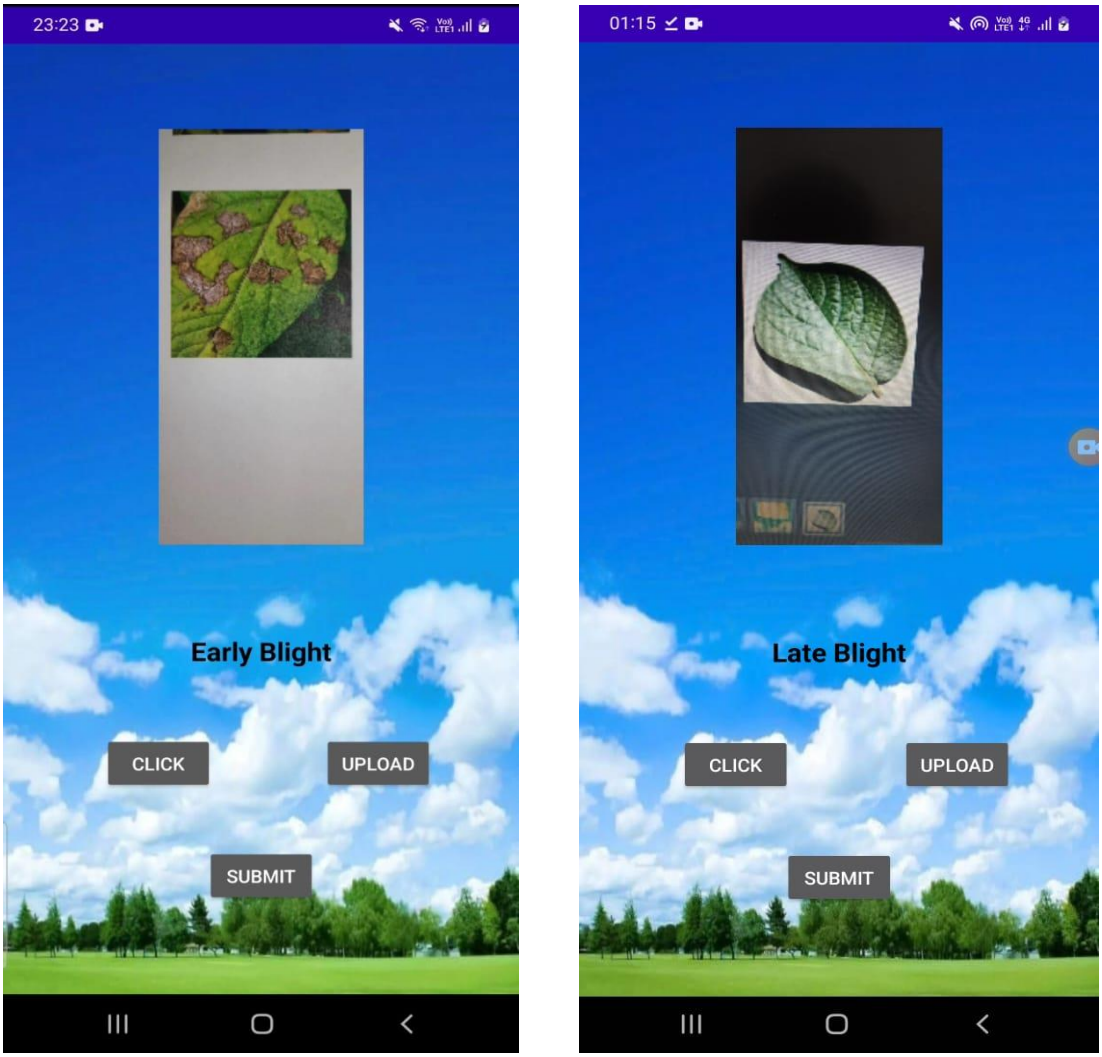

Figure 4.4: Display Result

After clicking on submit system will process image and do the detection. The detection result will be shown below.

4.2 Testing using Use Cases

Table 4.1: Test Case-01

Test Case ID	TC-01
Module to be tested	Sign up
Assumptions	---
Test Data	Check if the user is able to sign up to the system if he enters the new user's name
Test Steps	1. Choose the sign-up option 2. Enter the details 3. Click on the sign-up button
Expected results	If the user-name is not taken login page should be display on the screen.
Result	Pass
Comments	After the successful sign-up, user will go to the login page

Table 4.2: Test Case-02

Test Case ID	TC-02
Module to be tested	Sign-up page
Assumptions	---
Test Data	Check if user-name entered for the registration is already taken
Test Steps	1. Choose the sign-up option 2. Enter the username which has been taken and password 3. Click on the sign-up button
Expected results	The user should not be able to register for the system and displayed the error message to choose the different username
Result	Pass
Comments	If the username is already taken it will show the error message and system asked user to enter another username

Table 4.3: Test Case-03

Test Case ID	TC-03
Module to be tested	Login Page
Assumptions	---
Test Data	Check When passing a correct username and invalid password
Test Steps	1. Enter valid username 2. Enter incorrect password 3. Check on the login box
Expected results	User can’t login and show error message
Result	Pass
Comments	Upon entering wrong password user should not be able to logged in

Table 4.4: Test Case-04

Test Case ID	TC-04
Module to be tested	Detection page
Assumptions	User is already logged in
Test Data	Check that when user clicked or uploaded the image and clicked on submit button, user gets the detected disease name.
Test Steps	1. Upload or click leaf picture 2. Click the submit button
Expected results	User should get the detected disease name.
Result	Pass
Comments	On click the submit button user is getting the result based upon the image user uploaded.

Chapter 5: Conclusion &Future work

Conclusion

In this work, we have used the concept of Convolution neural network and have developed model to diagnose and classify diseases in the potato leaves like early blight, late blight and healthy with a novel solution achieving classification accuracy of 97.8% over the test dataset. Our mobile application can help farmers in detecting diseases in their early stages and in enhancing their crop yields.

Future Work

In future, our aim is to create application that can detect the disease of every type of crops and can provide proper solution. And also, by increasing our database, we will able to getter better accuracy. And we will create a system where farmers can easily get instance service and advice on their problem by detecting the disease.

Chapter 6: References

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