Detecting Plant Diseases Using Image Recognition in Android Application

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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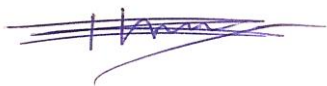**DAFFODIL INTERNATIONAL UNIVERSITY**

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APPROVAL

This Project titled "Detecting Plant Diseases Using Image Recognition in Android Application", submitted by Md. Kamrul Hasan (ID: 172-15-9709) and Kushal Das (ID: 172-15-9733) to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents.

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Md. Jueal Mia, Senior Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.
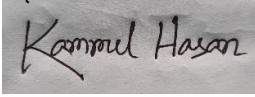
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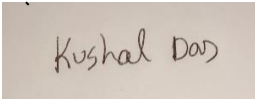Daffodil International University

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ABSTRACT

The method suggested aims to identify plant disease and offers a solution that can be used as a disease defense mechanism. The Internet data collection is carefully separated and the various plant species classified and renamed to form a proper database, which also provides the test database consisting of various plant diseases used to verify the consistency and trust of the programme. Then we practice our classifier with training data and then we forecast the results with optimal precision. We use CNN (Convolution Neural Network) that consists of numerous predictive layers. The activation mechanism is the cornerstone of the CNN model since the non-linearity has an authentic classification artificial intelligence scheme. ReLu is one of the better functions for active input, but it has a benefit that the function derivative for negative values is zero and contributes to neuronal necrosis. New mathematical activation function to increase the device accuracy and efficiency on a TensorFlow framework is evaluated in comparison to acquired learning rate.

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CHAPTER 1

Introduction

1.1 Introduction

Bangladesh is one of the most quickly growing developed countries in the world, where agricultural and rural households account for 58 percent of subsistence.

While production is enormous, India lags behind as there is no alternative methodology in the current literature to accurately identify crop disease. The common methods of crop contamination are caused by pathogenic species and the work currently being done does not increase the fertilizer consistency. This article uses Convolutionary Neural Networks (CNN) algorithms to apply an image processing approach. The CNN model knows about the filtering, while standard algorithms are able to practice and distinguish output using different activation functions. The key benefit of this program is the implementation of a new feature activation mechanism for apt optimizer. The project's goal is to predict crop disease earlier and to avoid further cultivation disruption. The infected area of disease is also observed to maximize the use of fertilizers. Farmers are growing a large variety of crops here in Bangladesh. The cultivation of crops affects multiple variables, including climatic conditions, soil conditions, different diseases, etc. The latest approach for the identification of plants is essentially naked eye inspection, which calls for more manpower, well-equipped labs and costly facilities. And the inaccurate identification of diseases may lead to inexperienced use of pesticides that can lead to the production and reduction of the ability of crops to combat diseases over a long period of time. The identification of plant diseases is possible by monitoring the location on the plant's leaves. The tool we use is the retrieval of photographs with CNN.

1.2 Motivation

Productivity in agriculture is something that relies strongly on economics. This is one of the reasons why disease identification in plants is of great significance in agriculture, because it is very common to have disease in plants. If careful attention in this field is not taken, it will have severe effects on plants and impact the consistency, quantity or productivity of the respective crop. For example, a disease called small leaf disease is a dangerous disease found in US pine trees. The detection of plant diseases by any automated technology is helpful as it cuts down a broad surveillance job in major crop farms and detects the signs of diseases very quickly, i.e. when they occur on leaves of plants. This article offers a technique of segmentation of the picture that is used to identify and classify plant leaf diseases automatically. It also contains surveys on various methods to identify diseases that can be used for the diagnosis of plant leaf diseases. Image segmentation is achieved using genetic algorithm and is a significant feature for the identification of diseases in plant leaf disease. There is a need for a large team of experts and ongoing plant surveillance which, with large farms, costs so much. Around the same time, farmers in certain countries have no acceptable facilities or notion of being able to reach experts. As a consequence, meetings with professionals cost as well as time. In these situations, the proposed methodology is useful for the monitoring of large crop areas. It is quicker and cheaper to automatically diagnose the conditions by only seeing the signs on plant leaves.

1.3 Objective

Crop diseases are a significant concern when both the quantities and the quality of agricultural goods are significantly reduced. An automated identification method for plant diseases offers a direct advantage in the surveillance of vast domains, since this is the only way to identify diseases at an early stage. There are some lackings that is our objective of our work.

- In certain circumstances, the output is also inaccurate. Further optimization is essential.
- For Image disease detection, prior knowledge is needed.
- To achieve greater precision, data base extension is needed.
- There have been very few infections covered. Research must also be expanded to include more diseases.
- There may be causes to misclassify: disease symptoms vary from plant to plant, optimization of the characteristics is required, more training is needed to cover more cases and predict the disease more precisely.
- A new technique was suggested to use automated identification and to identify leaf diseases of plants using photos.

To develop a method that can reliably identify crop diseases and pests. Build an insecticides database for the specific plagues and diseases.

1.4 Expected Outcome:

It could be too late to save a particular plant, but, to stop the issue in another plant, or to prevent it in future, a correct diagnosis may be very important. The diagnostic must have outstanding analytical ability and he/she must also be a good detective. It is important to remember before all details on the dilemma are gathered. It is important to remember. It must also be taken into account the possible various causal factors. Proper detection of disease and causal agents rely on control steps. Diagnosis is also one of the most significant facets of the formation of a plant pathologist. The disease prevention initiatives can be a waste of time and resources and could lead to more plants failure without a proper diagnosis of the disease and the disease-causing agent. Thus, it is important to correctly detect illness.

1.5 Report Layout:

In this section, we will discuss about the report layout. In the first chapter, we are talking about Introduction and a plan of how we will do the work, what is the motivation behind this research work, and what are the objectives and outcomes. In the second chapter we have to discuss the background studies and related works, and the challenges we have faced. In chapter 3 we have discussed the methodology how we have done the work, workflow, and CNN algorithm, and the equations of the algorithm. The model we have created and the test accuracy graphs, we have also give a screenshot of how our app is working and giving the result. Then we have discussed the use case diagrams and other diagrams we have used in the report. In chapter 4 we have discussed design and UX. And in chapter 5 we have discussed the implementation and testing. In Chapter 6 we have discussed the impact and sustainability. And in the last chapter, we have discussed the Conclusion and future scope.

CHAPTER 2

Background Studies

2.1 Introduction:

Plant disease poses a relentless risk, risking income and food safety, for farmers. The new mobile penetration and computer vision revolution has created a chance for agricultural picture classification. CNNs are called state-art image recognition and provide the potential to diagnose quickly and definitively. Convolutionary neural networks (CNNs) A sequential model is investigated in this paper to diagnose crop disease output of a pretrained model. The developed model is used as a smartphone application to diagnose plant diseases from healthy leaf tissue.

These mechanisms are linked to the resolution of issues in real life. Food is one of human beings' fundamental requirements. The population of the world is growing daily. Therefore, enough crops have become necessary for feeding such a large population. However, over time, the plants have numerous diseases that cause serious damage to the development of agricultural plants. In addition, the economics of many countries relies heavily on agricultural productivity and the need is therefore for the population of that specific country to achieve the agricultural productivity of the basic agricultural commodity. Detecting plant disease by any automated process is useful because it entails a substantial amount of surveillance work on large crop farms, and it identifies signs of diseases very early and implies where they occur on plant leaves. The standard system of human interpretation is no longer possible in the classification of crop diseases by visual observation. CNN models are designed to solve this matter easily, standardized and correctly.

2.2 Related Work:

Test findings in qualified databases indicate that the activation mechanism produced has improved the precision and efficiency of the CNN models, that is, 95%. When applied in the ARM processor using the suggested optimizer, the training speed of the CNN model is 83% better. Further disease region is determined through the use of K - means clustering of algorithms in order to optimize the use of fertilizer.[1] This paper offers plant leaf disease prediction and farm prevention steps using image processing as well as two well-known neural convolution (CNN) models like AlexNet and ResNet-50. To solve these problems. The research findings generate the efficiency of the suggested method in which it achieves ResNet-50 accuracy of a total of 97% and 96,1%, and the total accuracy of AlexNet 96,5% and 95,3% respectively in classifying healthy-unhealthy diseases in the leaves and leaves.[2] This branch also enables the early sensing of plant diseases using CNNs, which is familiar to many famous architectures, including the "ResNet" architecture, with an enlarged dataset containing images of good health and diseases in a leaf (both manually cut off and placed in a uniform background) with an access to a computer system using Deep Learning System based on artificial neural networkings. For multiple object detection challenges, this deep learning approach demonstrated a very good efficiency. The model performs its function by dividing pictures into two categories (free from disease) and (diseased). The result achieved enhances the measurement accuracy of the developed system compared to the modern state-of-the art system. [4] This paper introduces a CNN model and LVQ algorithm based approach for the identification and classification of tomato-leaf diseases (LVQ). The dataset includes 500 photographs from tomato leaves with four disease symptoms. For automated function removal and classification, we have modeled a CNN. For plant leaf disease analysis, color knowledge is actively used. The three channel filters based on RGB components are implemented in our model.[5]

2.3 Comparative Studies:

Every year the accessibility and affordability of smartphones is continued. In 2020, the number of mobile users around the world is around 5 billion. There are one billion users in India and an additional one billion in Africa. These numbers have been gradually growing over the past decade per year, according to Statista. Given these facts, AI apps are expected to play an important role in shaping the future of agriculture. CNNs have obtained outstanding results in recent years in the classification of plant diseases.

The multifaceted supervised network has become favorable to researchers due to the constant appearance of superior findings. For the output of a model, data pre-processing is of critical importance. It can be difficult to differentiate between virus, bacterial and fungal infections and sometimes duplication in symptoms. These symptoms may be any detectable color, form, or functional variation, resulting in the response of the plant to the pathogen.

The durability of a model may be affected by smaller databases or unvaried data. This can be managed in many ways by strategies like improvement or transition. Increased photographs of training can only mitigate overfitting but can also increase overall efficiency of a model. This can be done by incorporating features like zooming, rotating, adding color variations, or changes in contrast. However, the converted images are perceptions.

2.4 Challenges

The first challenge is to understand the dataset and after pre-processing the data we have to define what layer should be used for our research work. After completing the model we have to work on how we can use this on an android app. Because our goal is to use images in an android app and find the plant disease. We have to use tflite to convert the model to create a usable form in android app.

2.5 Scope of the Problem:

The mother of all civilizations is agriculture. The focus is on improving efficiency without taking into account environmental effects. As plant disease is unavoidable, disease detection plays an important role in agriculture. Fungi, organisms, bacteria, viruses, phytoplasm, viriods etc. are plant pathogens. In order that diseases exist in all plant systems and that can infect any kind of plant tissue, leaves, shootings, stirs, crowns, roots, tuber, fruit, seeds, and vascular tissues, three elements are completely required. Therefore, it is necessary and urgent to identify and classify diseases. The specialists' necked-eye observation is the primary practice method for plant disease diagnosis and identification. This needs ongoing surveillance by consultants that may be prohibitively costly in vast farms. By using digital image processing techniques, we can interpret disease leaves and can extract disease spot attributes from a quantitative view on the basis of colour, shape, and other properties.

CHAPTER 3

Requirement Specification

3.1 Methodology

For crop safety, the automatic detection of plant diseases is very necessary. Most automatic approaches are intended to construct leaf or fruit picture classification models. These methods typically involve compilation and annotation of several photographs, which in particular in the case of new or unusual conditions are a complex and expensive process. Thus, several methodologies for detecting low data plant diseases were created and evaluated in this report. The superior ability to pass learning means that revolutionary neuronetworks (CNNs) are used. These methods have been learned from a broad source domain dataset to distinguish new conditions from a few photos per illness. In order to recognize disease and plant species together, the methods suggested were either tested or only if the disease was detected irrespective of the infected plant. The findings of the assessment have found that a model with a wide range of source field images can be optimized for the classification of new diseases from a few pictures. The existence of a greater number of photographs may also be taken advantage of. In addition, we find that the base model has a much greater transferability if the source domain pictures vary substantially from the goal domain or are taken under different conditions by contrasting this with metric learning methods.

3.2 Requirement and workflow

The requirements for this research work can be understand from the workflow given below and it will be explained.
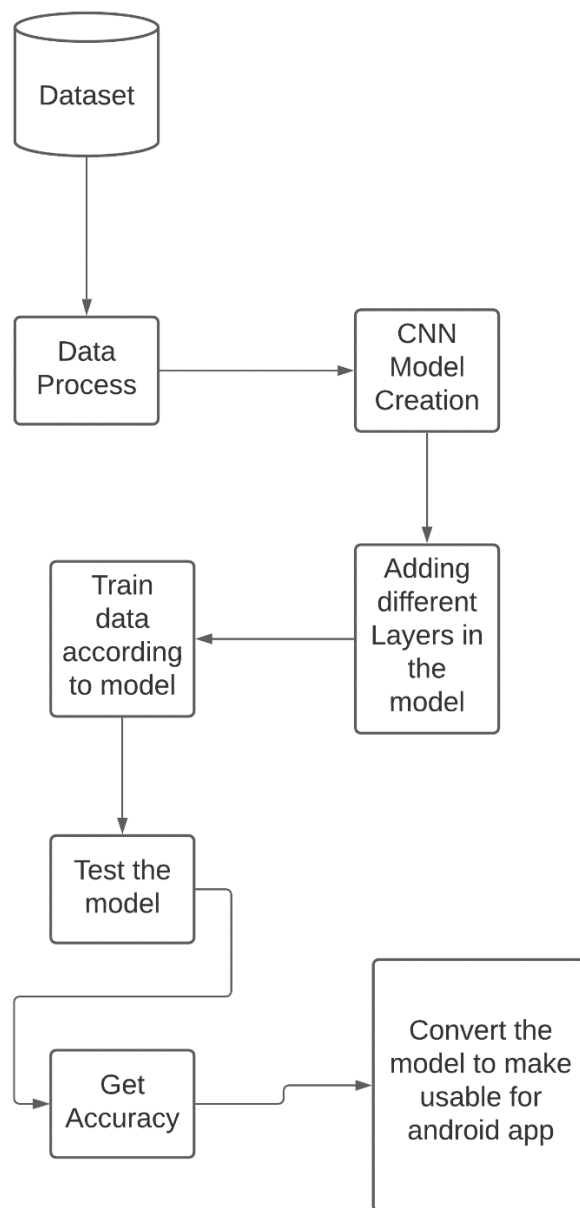

Figure 3.2.1: Workflow

- **Dataset:** We have collected our dataset from internet. In this pandemic situation it is quite impossible collect data and create our own dataset. So we are working on an existing dataset. And implement it using machine learning

- **Data preprocessing:** Before using the data we need to pre-process it. The reason is in our dataset there maybe some null values or some unnecessary columns those should be dropped.

- **CNN:** In this section we will discuss about how CNN works. Neural networks revolutionary. It sounds like a strange mix of biology and mathematics with a little CS input, but the networks are some of the most important developments in computer vision and image processing. The CNNs are regularized multi-layer models of the sensor (MLP). The neurons of the animal visual cortex were formed based on the function of them. Let us assume that we have a JPG-sized color picture of 960 x 960. The array of representatives is 960 x 960 x 3. A value of 0 to 255 describing the strength of pixels is assigned to each one of these numbers. The machine visualizes RGB strength values for the image processing.

  The idea is to give this array of numbers to your machine and to produce numbers which define the likelihood of a certain class of the image. It functions like the functioning of our brain. When you look at an object image, you will identify it as such if it has recognizable characteristics. Similarly, the machine will carry out image recognition by searching for low-level features such as curved and edges and then create up a sequence of convolutionary layers to produce more complex definitions. In order to create high-level characteristics, such as paw or eyes, the computer uses low level featured at the initial levels to identify the item.

Contents of the classical Classic Network Convolutionary: -

1. Convolutionary layer.

2. Every convolutionary layer activates.

3. Pooling layer especially Max pooling layer and other requirement-based layers.

4. Completely integrated layer, finally.

5.Extended layer data: the image is resized to an optimum size and is fed to a convolutionary layer as an input.

6. A kernel or neuron filter has been installed which sets the input image over certain pixels, depending on the size of the kernel.

7. The kernel simply moves over the input image, so that the values are multiplied by the initial image pixel values throughout the filter.

The small and big meaning. Or the value difference.

1. A much smaller value! This is because nothing reacted to the curve detector filter in the picture segment. Remember that the activation map is the contribution of this turmoil sheet. Thus the activation chart shows the regions where the filter is more likely to be bent in the image while a single filter is convoluted, and whether the filter is a curve detector.

2. The top-left value of our activation map is given in the previous example. This high value suggests that there is probably some kind of curve in the volume of the input that activated the filter. The right top of the activation map is 0 because in the input volume there was nothing to activate the filter. This just applies to one filter.

3. It is just a filter that can sense outward and correct curving patterns. For lines that curve left or straight edges we may provide other filters. The further filters, the more depth and details on the amount of input are given in the activation diagram.

The key point, however, remains unchanged. When the special function you are looking for is in the input volume the filters are converged around the image and "enabled" (or calculated with high values).

After the first one, sequential conv layers.

1. The result of the first conv layer is a 2nd conv layer input as we pass through another conv layer.

2. The input is, therefore, the activation map(s) resulting from the first layer for the second conv layer. Each input layer essentially describes the places at which those low-level characteristics occur in the original picture.

3. The display is now an activation representing higher level functions when you use a series of filters. Types could be semicircles or squares with these features. You can get activation maps that show more and more dynamic characteristics by going across the network and through more conv. layers.

4. You could have some filters activating at the end of the network when you have the picture handwriting, when you have the pink artifacts, filters which unlock, etc.

This is why the preparation is a necessary move. The preparation phase is often referred to as backbreaking, and is further divided into 4 different divisions or procedures.

•Forward Pass

•Loss Function

•Backward Pass

•Weight Update

The Forward Pass: The initial kernels of the first conv are initialized with random values for the first stage or iteration of the training. There is therefore something like [.1.1.1.1.1.1.1.1.1.1.1] after the first iteration output which doesn't give any class choice as kernel weights are unknown.

Lost Function: the testing includes images with marks, which means we can quantify loss (MSE — Mean Squared Error) on digits 3 [0 0 0 1 0 0 0 0 0 0 0], while the result after a first period is very different.

$$E_{total} = \sum \frac{1}{2}(target - output)^2$$

The aim is to mitigate the loss, which is a challenge in calculus optimisation. In order to minimize the failure it means having to change the weights.

The Backward pass: it entails deciding which weights is the greatest contribution to failure and how they should be adjusted to reduce losses. It is calculated using dL/dW, where L is the loss and W is the kernel weight.

The modified weight: The following equation is used to update the weights of the kernel.

$$w = w_i - \eta \frac{dL}{dw}$$

The programmer selects the learning rate here. Greater value of the learning rate means even bigger steps to refine steps and greater time to optimize weight.

Finally, we have separate pictures and marks (not double dip between preparation and tests!) and push the photographs into the CNN, to see if our CNN works or not. We equate the results with the reality on the ground to see if our network is working!

- **Adding different layers:** In our work we have added some layers in our model. They are Conv2D layer with relu activation function. MaxPooling2D layer. Flatten, Dense layer. As there are 5 classes of images in our dataset so we have added a Dense(5) layer.
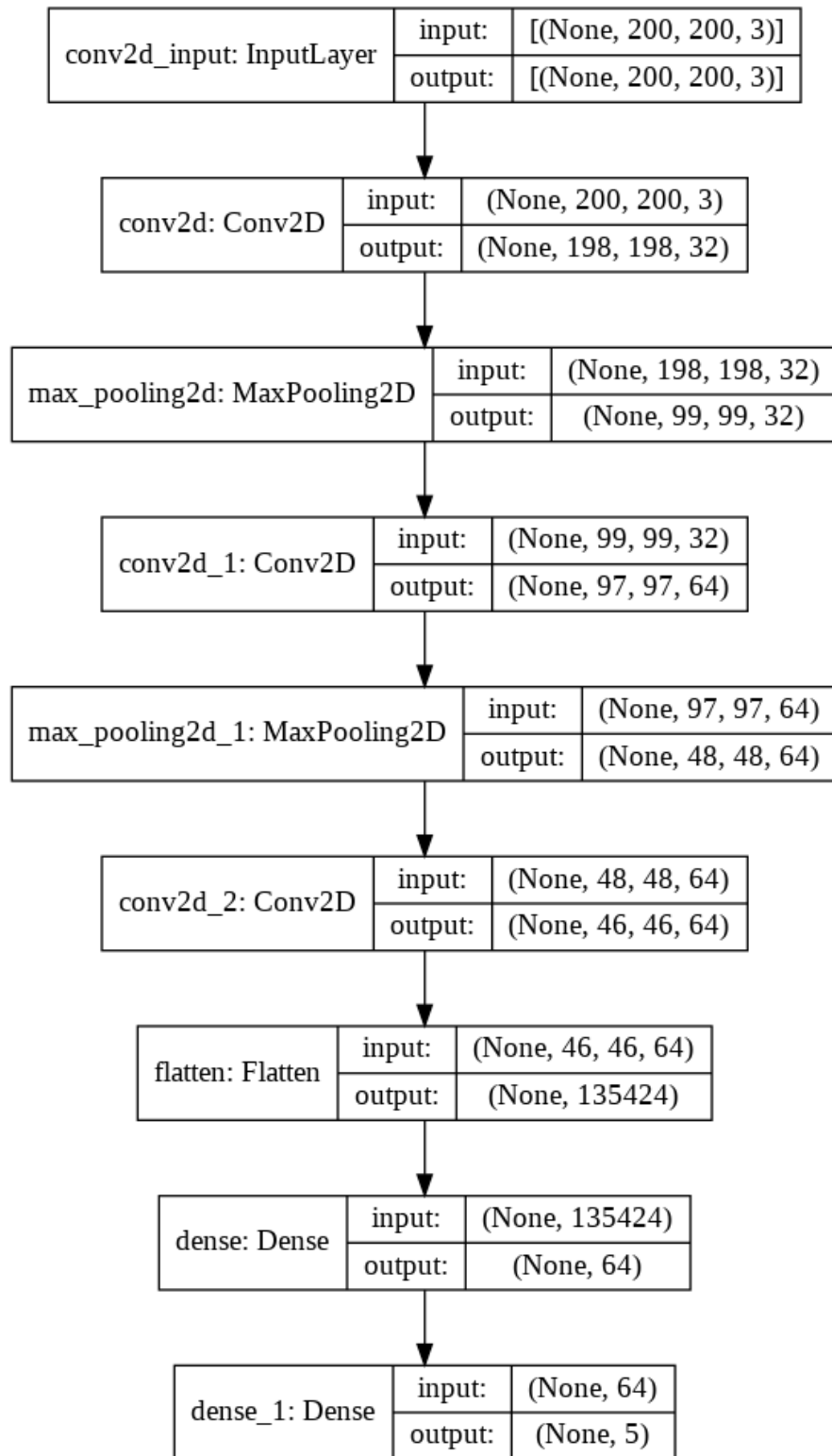
Figure 3.2.2: Model summary

- **Train and test:** After adding different layers in our model we have compile the model and train the model. After training the model it is ready for testing purpose.
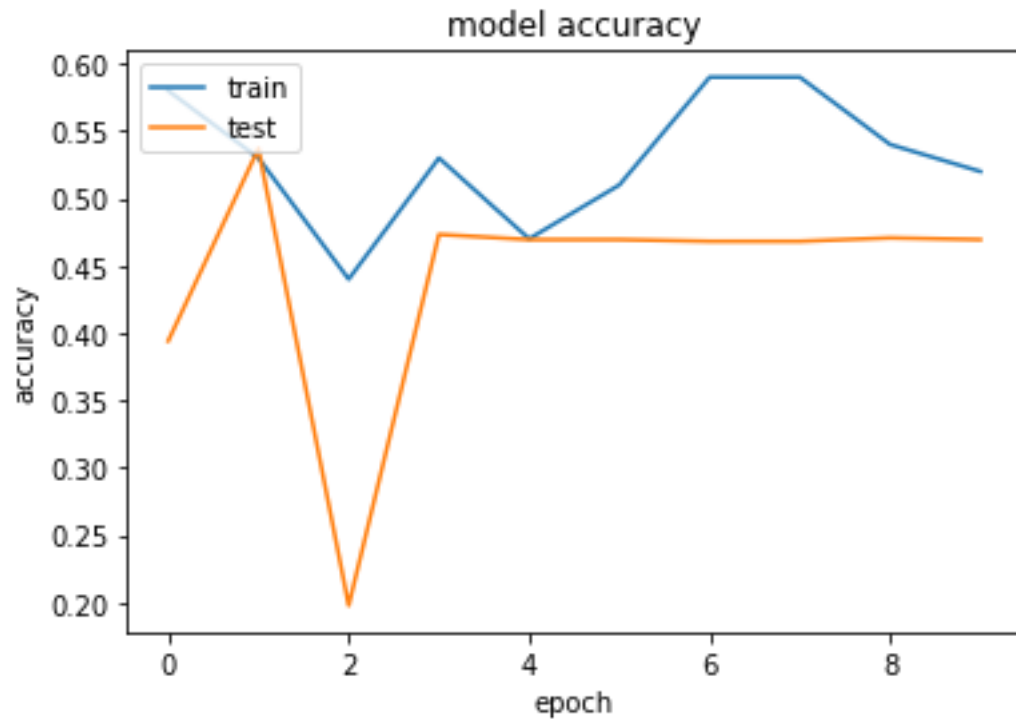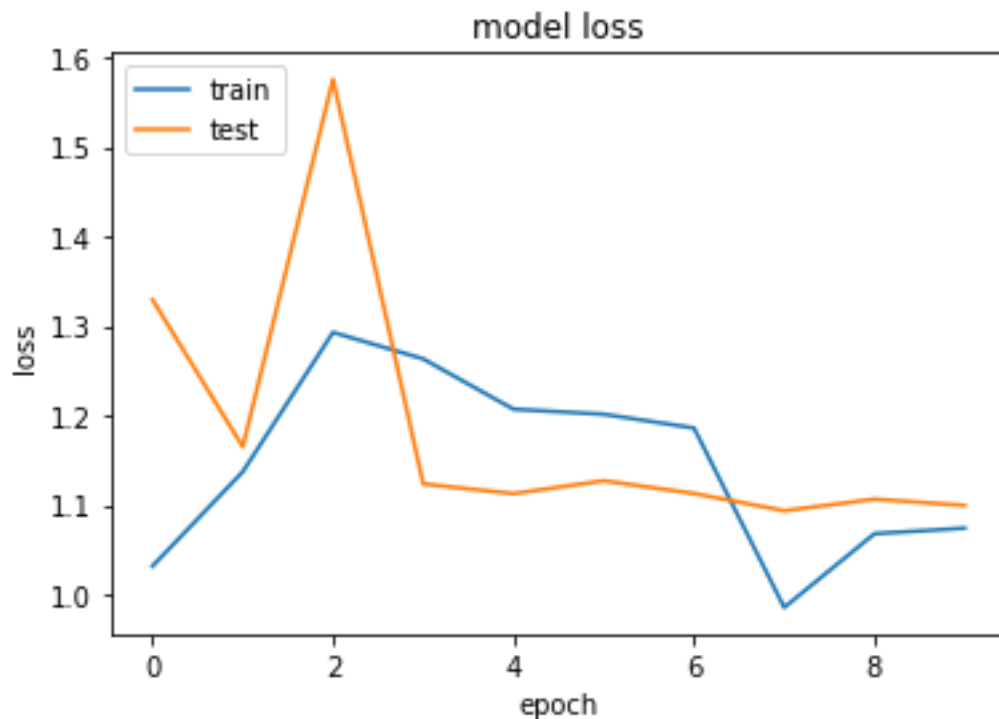

Figure 3.2.3: Model accuracy

Figure 3.2.4: Model loss

- **Convert it for android app and get result:** we have used tflite to convert our model from machine learning to android app so that we can use the model in our app to check the result. A qualified TensorFlow model can be compressed and implemented in a smartphone or embedded application by TensorFlow Lite. The program will then use the inference ability of the pre-trained model for its own use by interfacing with TensorFlow Lite Interpreter. This is how TensorFlow Lite functions as a TensorFlow supplement. TensorFlow will also carry out the computationally costly training phase in its most suitable environment (personal server, cloud, overclocked computer, etc.). TensorFlow Lite takes as an input, box, deploy and then interprets the resulting model (frozen graph, SavedModel, etc) in the client framework and handles resource-preserving optimization along the way. But TensorFlow Lite has lower latency, better throughput and a light weight approach that the TensorFlow team can work on. Functionally, TensorFlow Lite differs from TensorFlow Mobile in the degree to which the

mechanism of transformation, implementation and analysis has been streamlined. In order to improve the feasibility of system deductibility while preserving software integrity, TensorFlow Lite has been used at each step from model translation to hardware. A trained TensorFlow Model as an input to the TensorFlow Lite Converter (TOCO) will output a file of TFLite (.tflite), the flatbuffer-based file which includes the original model with a reduced binary representation. FlatBuffers are important to serialize model data effectively and provide easy access while keeping a limited binary format. This applies in particular to files with large numerical weight data which can cause a lot of latency for reading operations by virtue of their size.
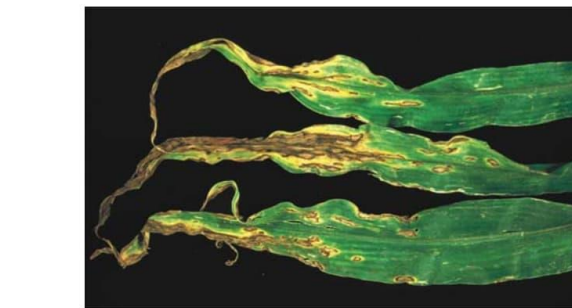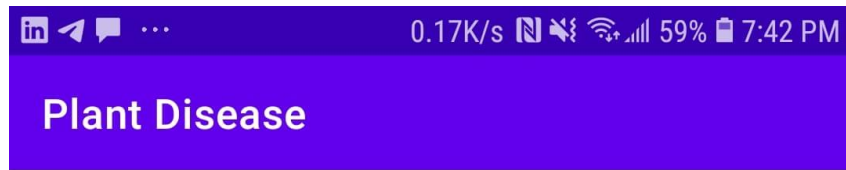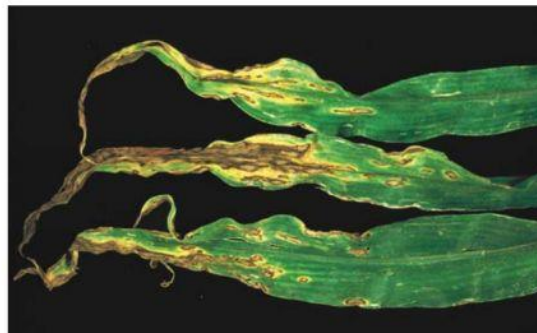
Figure 3.2.5: Checking result in app

Figure 3.2.6 : Final Result

3.3 Use Case Modeling and Description:

The case diagram represents the interaction between system users and the Software. The application is browsed by the user, with the login option available. You must first register as a new user and then log in or access the system. Only the primary functionality of the system is displayed in the use case. The users are involved or involved. The use cases displaying the features:

- User Registration.
- Login respectively.
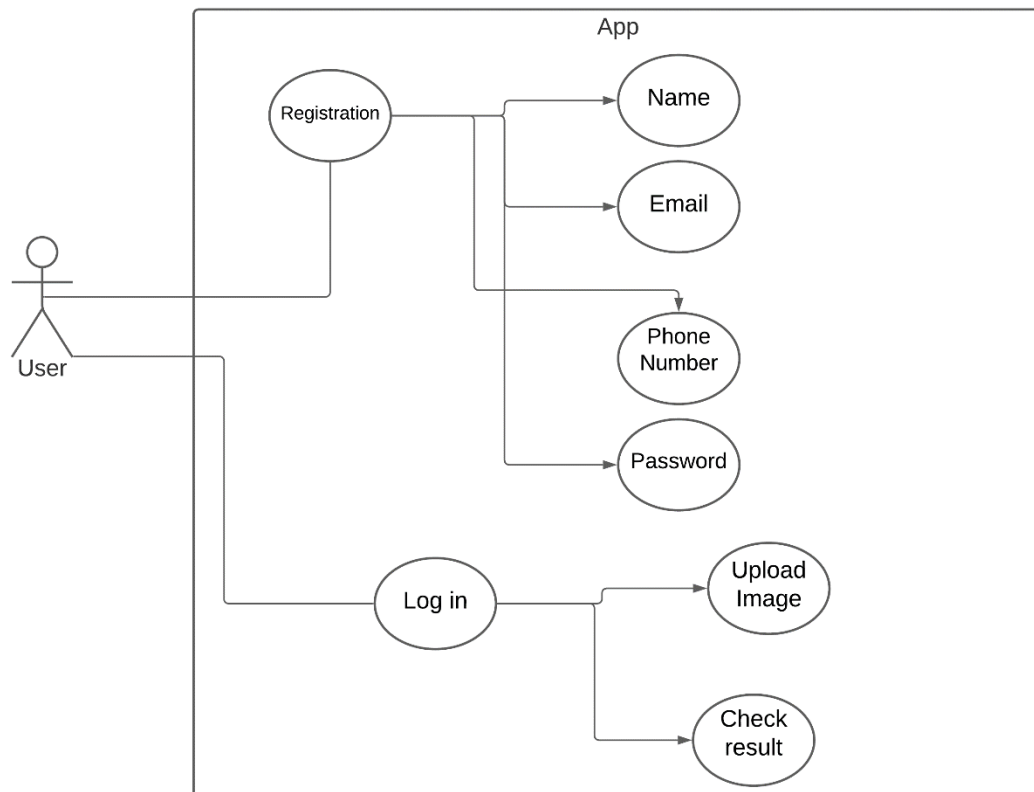- Upload an image
- Check the result

Figure 3.3.1: Use Case Diagram

In figure 3.3.1, A user can access the application by login only if he/she is registered before. User can upload their image on the app and they can check the plant disease result.

3.4 Logical Data Model:

This section explores the qualities and the connection between dataset objects and a database dictionary and tables that transcend uncertainty. This data objects are considered. The first is to store user records, the second is the complaint data module, and the third is the user data registration module. Logically, in a relational data model, a system represents data contained in a database.

3.5 Design Requirements:

Design is the phase after request and construction requirements. The software architecture involves three technical tasks – design, coding, implementation and testing which, as soon as software requirements have been analyzed and identified, are required for software construction and verification. At this point, design activities are of major significance because decisions influence the success and easiness of the execution of the program. In the end, these choices lead to stability and management of the system. Design is the best way to correctly turn consumer specifications into finished program or device. Design is the place for quality-fostering growth.

☐ Use case Diagram

☐ Sequence Diagram

☐ The ER Diagram

☐ The State Diagram

3.5.1 The ER Diagram:

The E-R graph depicts forms in which a space is interconnected. It consists of entities and establishes connections between these entities' instances. This is an E-R diagram for such a device.
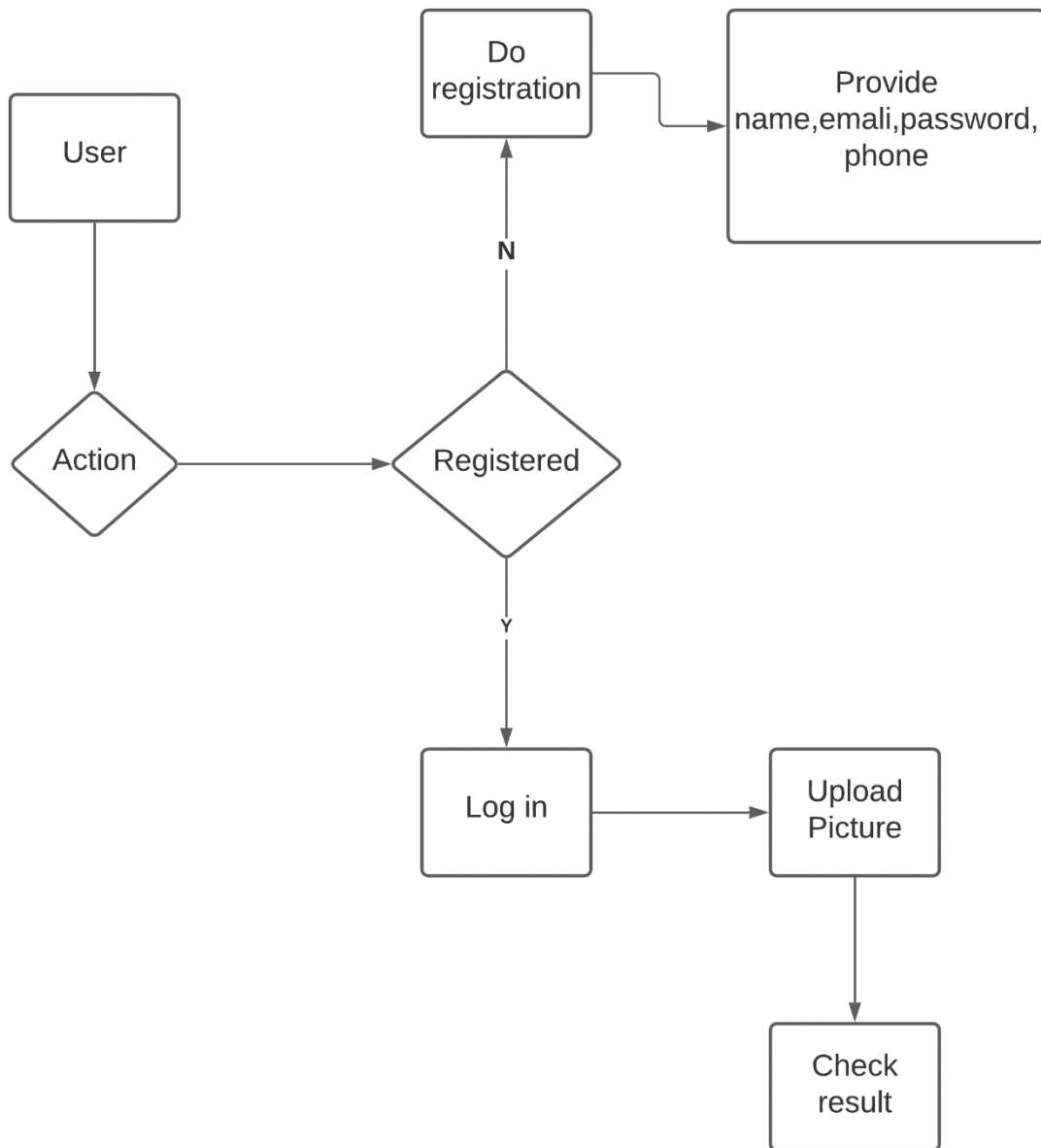

Figure 3.5.1: ER Diagram

3.5.2 Sequence Diagram:

Diagram of the sequence is the user-system relation. The express order is gradually being maintained. That's the sequence map as well. Often named sequence diagrams are event or event diagrams.
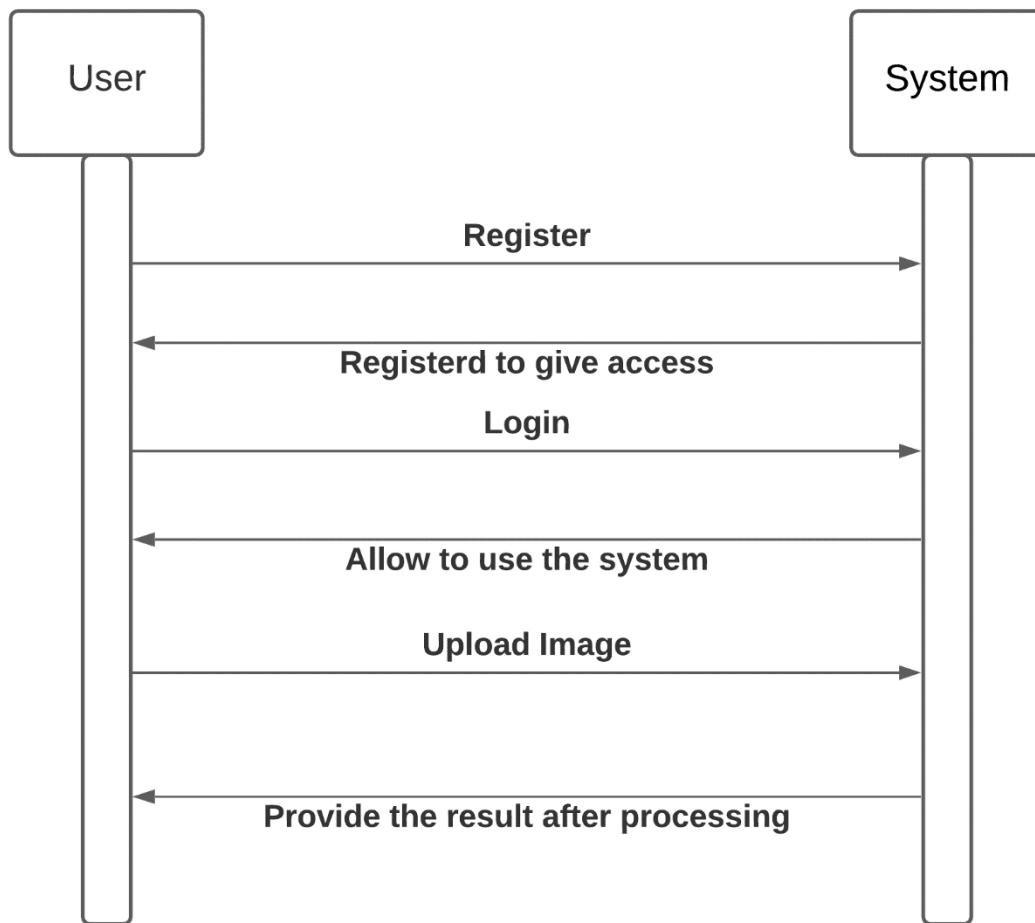

Figure 3.5.2: Sequence Diagram

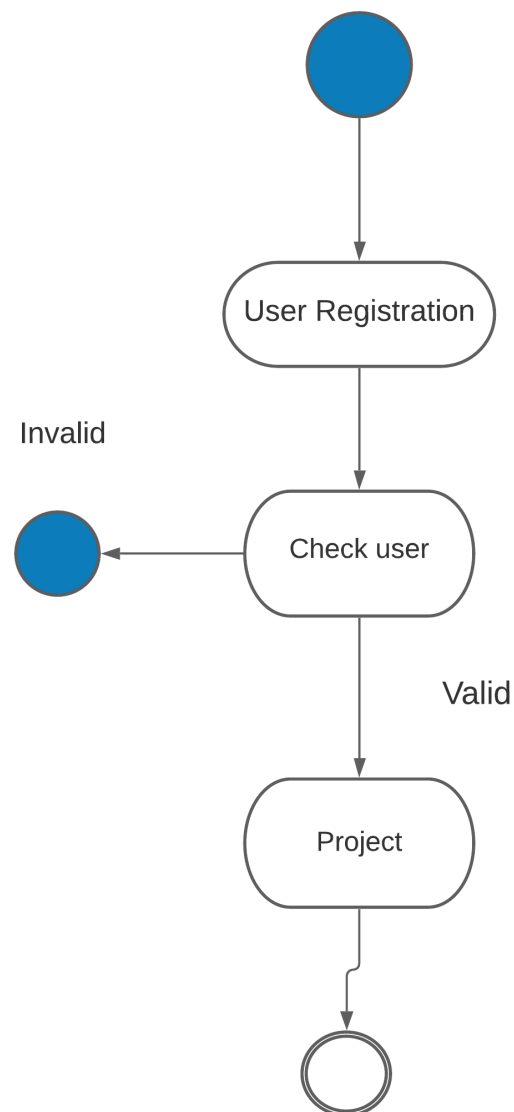**3.5.3 State Diagram:** The state diagram of our system is kind of like this one

Invalid

User Registration

Check user

Valid

Project

Figure 3.5.3: State Diagram

CHAPTER 4

Design Specification

4.1 Front-end Design:

All in the front end is used, Android XML. Java is used for creating android apps for customer behaviour. The coding must not be touched. Mobile Android is used in Application. Android is a worldwide popular technology. Android is one of the most common platforms in the world in the present scenario.

4.2 Back-end Design:

The back-end location is also the side of the website. With a multitude of today's server-side technology, developers have to decide the kind of back-end that best suits their application. Firebase offers developers a variety of resources and services for the creation of high-quality applications, building their customer databases and gaining more benefit. The Firebase Realtime Database is a NoSQL databases hosted in the cloud that can be stored and synced in real time between users. The Realtime Database is only one huge JSON entity the developing companies will handle in real time. With just one API, the application will include the actual meaning of the data and information on the data in the Firebase database. Real-time syncing makes access to your data from any browser on the web or smartphone convenient for your customers. The Realtime Database also allows your customers to cooperate.

Another wonderful advantage of the Realtime Database is that it comes with smartphone and web SDKs to create applications without the need for servers.

The Realtime Database SDKs are used to serve and store changes using local cache on the unit while your users get offline. The local data are automatically synchronized while the system is on-line. Firebase authentication also allows the Realtime Database to have an easy and intuitive authentication mechanism.

4.3 Interaction Design and UX:

Interaction architecture is extremely important for user interface. It's a useful pattern. Interaction Architecture involves mainly a user interface design for Android applications. This gui is user-friendly and thus UX is user friendly for the Android application. UX is used to carry out the front end. He defined how an app/site is used and made improvements through developer testing. It offers better usability and functionality that guarantees customer loyalty.

4.4 Implementation Requirements:

- Google Colab
- Android Studio
- Windows 10 operating system

CHAPTER 5
Implementation and Testing

5.1 Implementation of Database:

In our work for registering users and login system er have to implement these operation using FireBase. We need an integrated development environment, known as IDE, to use Firebase for our Android project. There are several IDEs for developing Android apps like Xamarin, Visual Studio, and Eclipse, but as Google recommends, we'll use "Android Studio." Firebase is a tool-kit and framework designed to enable the development and growth of better applications. This technology is now innovating and dominating the market for BaaS. Along with the time, it has evolved to be a core part of Google's mobile strategy. It was purchased by Google and is now continually updated to make the user interface even more comfortable and efficient.

The SDK app supported by this toolkit interacts directly with backend resources according to the Firebase console. So no relationship between the app and the service has to be established. Then you normally write code to ask for the data base in the app if you run one of the Firebase database choices. This is different from the conventional creation of apps. In the standard application development process both frontend and backend codes have to be written. Just the API endpoints exposed by the backend are implemented in the front code and the backend code really does the job. However, standard backend implementation of Firebase goods is circumvented, which places the job on the customer. There is too much room in the Firebase database to replace custom CMS implementation quickly, depending on the product development level, depending on the final objective (whether the product is built to engage active users). Firebase is a good option if you need to get a proof of concept for a minimum of money since it is free for a number of users and preferable for starting. When adapting to the market, you can control the device and change it, which later can quickly be

translated to CMS. It offers authentication, firebase analysis, app indexing, hosting, cloud messaging, as well as many more modules.
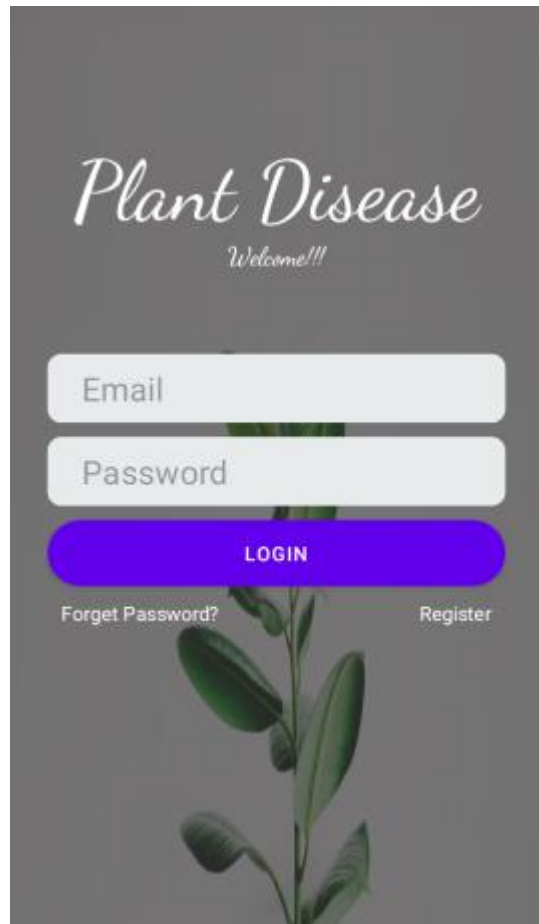

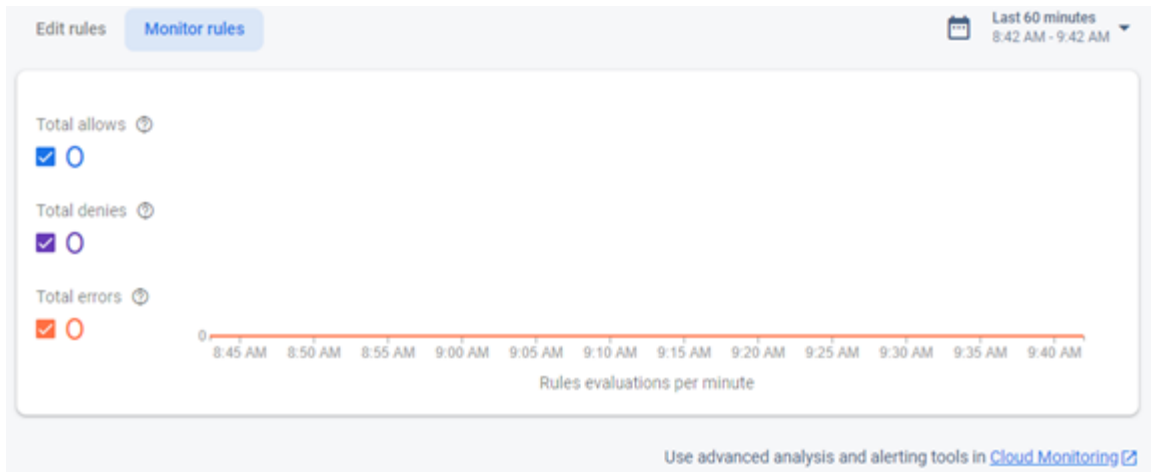Figure 5.1.1: Realtime Database example

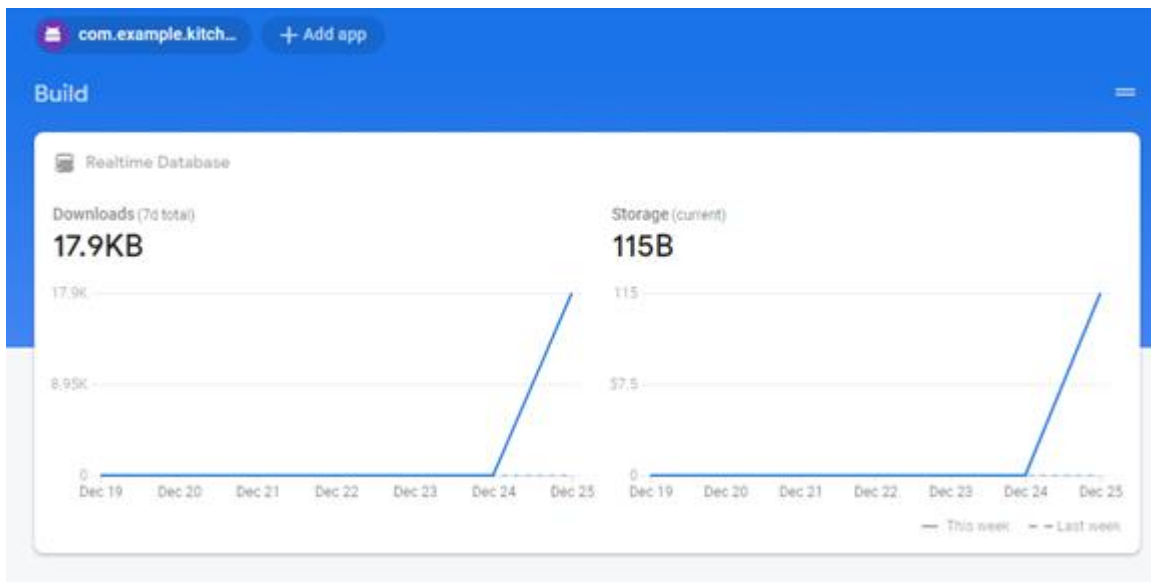Figure 5.1.2: Cloud monitoring example

Figure 5.1.3: Real-time database download and storage graph

5.2 Implementation of Front-end Design

As we can see in our first layout in the next class, Android templates are also written in the XML, eXtensible markup language. XML is also a markup language, similar to HTML (or Hypertext Markup Language). It was developed to encrypt data in internet applications as a standard way. Unlike HTML, however, XML is case-sensitive; each tag should be closed correctly and whitespace should be preserved.

Much as we did in previous classes, we will build XML templates in Android and then change it by using Java logic. We also create an HTML layout and modify this layout with jQuery. Another major component of Android-related files and modules called the tools is the Android XML layouts. Additional files and static contents, including animations, color schemes, templates or templates, are the resources required for the application.

5.3 Testing Implementation:

These operations are carried out once the processes of other management methodologies are finished or reviewed. Tests and evaluations can be carried out at the same time but are significantly different. Both are done in various ways. Prototyping is one of the techniques employed most often and some of the ones in this particular project were invented and adopted. For the way it initially operated, failures were highlighted and rectified in certain places in the final version and also in addition to the instruments were reconsidered. Other tests, such as the usability test, may be achieved by prototyping. The prototype allows all experiments to be run and people randomly to test the product, including usability testing. The emphasis of this evaluation is on four main aspects: how exact positions are, the material importance, the formatting and the outcome of the presentation, and the task rate, or how simplistic users were to perform their main tasks in an error free fashion with a correct password and the primary task of this project.

5.4 Test Case:

In test cases, it is tested whether features in the GUI type are working accordingly whether that. This is a way to ensure a form is effective. A test case involves a series of conditions or factors in which a test tester decides the correct functioning or meeting of a test device. The test case procedure may also help to detect problems with the parameters or architecture of a program.

5.5 Unit Test:

A unit test is necessary to check if each device module operates without or without a bug. This would also help decide whether the module has a logical error. Each module in the device is tested independently during the development process, so that the test is protected.

5.6 Integration Test:

Integration checks are usually accepted to check that several components fit together properly. There are several ways that accompany the resource distribution operation. It has 5 different forms and functions in parallel with each one. The condition in both operations is the same as before.

5.7 Test Results and Reports:

In order to easily predict test outcomes, the test report must reflect officially the test results. Data from corporate evaluation tests are recorded to classify the atmosphere or operating conditions and comparing the findings with the objectives. the research results are recorded. We would therefore ultimately obtain the findings as benefit of usability testing The problem is how to design the collection of instances so that they are open to the development of the user interface, as we have defined the general interaction object architecture. In the physical world, interaction is almost everywhere. The trick to a complex and user-friendly interface is to interact. The development of an immersive system is very necessary and we are working on this. As mentioned above, we have certain characteristics in our communications system.

CHAPTER 6

Impact on Society, Environment and Sustainability

6.1 Impact on Environment:

As we are developing a software, which will predict the plant disease from image. We are trying to get more accurate results and predict the disease accurately. if we can accurately predict the plant disease we can take the necessary steps to prevent it from destroying the crops. If our project works properly it will create a positive impact on the environment. As we are saving the crops it will increase the productivity and the environment will not be harmed and also be safe from critical insects which can cause damage to our environment. impact on the environment for our project.

6.2 Sustainability:

We are trying to improve the machine learning model to get more accurate results so that people who are are connected with agriculture they can use our application properly and also understand what kind of results we are generating. You have to improve our machine learning model and add more layers and changed some activation functions so that it will generally result in higher accuracy. Where are also trying to improve the UI so that each and every people can understand how to use our application.

CHAPTER 7
Conclusion and Future Scope

We mention our decision and conclusion in this section. Here we are discussing the future scope and how best it would have been.

7.1 Conclusion and Future Scope:

Finally, Research work we are having an average accuracy from the model we have created which is 45% of accuracy. We are working on our model to get higher accuracy and detect the plant disease accurately. We have planned to make your own dataset with images that will help us to get more accurate results. In this present situation, we are uploading images by the user and detecting the time disease. In our future work, we have a plan that by using the mobile camera we will try to detect the plant disease in real-time. We have also plan to use other machine learning algorithms and see which one will give us the more accurate result with higher accuracy.

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