Optimization Techniques for Detection and Recognition of Plant Leaf Diseases Using IOT and Image Segmentation

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Abstract

On the earlier days, considerable effort has been put into building a database of plant diseases that is sufficient to develop effective methods for the detection and recognition of plant diseases. Since then, nutrition become an important factor throughout Asia, where the poorest people live. At the moment, the main purpose of agriculture is to produce and nourish the nation. Diagnosis and identification on a very large scale area through automated procedures is very helpful as it reduces labor, time and cost of diagnosing and diagnosing disease symptoms. The project reports on the novel's method of diagnosing diseases in rice leaf by employing an advanced algorithm such as the modified SqueezeNet to enhance accuracy to a greater stage. Incorporating the loss reduction process as one of the categorical cross entropy to enhance accurate level. An improved application is being developed where we can capture the image of the affected crop and propose the type of chemical fertilizer that will be used by the farmer to reduce crop losses due to improper fertilizer use.

1. Introduction

Paddy planting is a water-intensive and labor intensive operation. The growth of rice crop can be in several types with different types of irrigation techniques and the aims of the agriculturers. In India scientific method of rice growth is being followed. Mostly the northern parts of the country will prefer wheat crops. When it comes to eastern parts as well as southern parts of the country, the major crop is paddy. So India and other kinds of Asian countries widely produces the paddy crop. In the world, next to India China is the major paddy crop producer. The research and statistics says, the most leading state in paddy crop production in India is West Bengal. Rice growth requires very efficient hard work and plenty of water. Hence, crop cultivation is being taken place in areas of heavy rainfall. The scientific name of the rice plant is known to be Oryza Sativa. This plant grows to an extension of about six metres with linear roots. The leaves are pointed in shape and long bounded on a round stem. Always edible seeds grow high in different stems and commercially called as 'Rice'. The paddy planes are also known to be rice fields. The rice plant grows from the sea to an extension of about three thousand feet. It is one of the types of the tropical crop. On humid conditions, the paddy growth can be progressed on both warmer and cooler conditions. The key factors for rice plant cultivation are humidity, high temperatures and adequate water for irrigation purposes. The temperature for their growth ranges from 20 to 42ºC. The rice is harvested in various regions of the Indian country because rice plant can adapt to several kinds of heights and climates. During the winter (low temperature) and rainy seasons (moisture), the paddy is cultivated only one time in a year. In both the south parts and east parts, the paddy is grown approximately three times per year. The winter, autumn and summer are the three main seasons for rice growth.

The kharif period in expansion called as winter rice it is the major rice advancement season in India in June and July the seeds are sowed and in November and December the crops are collected the caliph modify has an in common supply of 84 the summer rice is the rice that is made on Rabbin period since it were in this season 9 of the rice trim is made. Usually all types of soils are well – suited for paddy cultivation. The soil types include red and black soils. Initially the seed sowing process is performed using some tractors or it is performed using seed sowing machines. Before sowing the seeds, the soil that is going to be used for cultivation purpose is well ploughed. In earlier days, they used the animal cow to plough the land, But after the technological revolution, the farmers started to use tractors and large capacity machines to plough the cultivable land efficiently. So once after the seeds are sowed, watering to the seeds is done. As the area of cultivation is very large, the method called irrigation is used to spray the water to all the corners of the land. There are various

types of irrigation process exists. The land is monitored in a periodic way inorder to look for pesticide issues.

Fig. 1 - Rice Farming in Flooded Field using Bund System

Bund cultivating framework is taken after when planting rice where the areas are ceaselessly filled up to 7-10 days some time recently collect. To deliver a kilogram of rice the edit on normal requires 1500 litres of water. In another words, rice needs a huge sum of water for development. This continuous surge design is being taken after to guarantee weed control and satisfactory water accessibility.

2. Literature Survey

Many research scholars have performed various researches on this field to detect the diseases in the plant leaves by exploring various algorithms and methodologies. We carried out a study on different plant leaf diseases.

Manjarrez-Sanchez in [1], Definition is a fundamental process, when analyzing photos, uploading and editing content among other features, components, photos, the description must be high enough in order to distinguish similar changes for different images depending on the distance. Although many descriptions of the various images are proposed, the challenge is their suitability to solve these tasks effectively. One suggestion is a set of MPEG-7 visual effects. We look at their ability to accurately describe the diseases and plagues of corn plant images. In most cases 68% clarity is provided by the BrayCurtis which is the most efficient range.

L.V. Koenigkan in [2], a database called PDDB, contained 2326 images of 171 diseases and 21 other plant species. The size of the PDDB, while seemingly insignificant, is not enough to allow for the use of powerful techniques such as in-depth learning. To increase its size, each image is

categorized by specific terms, increasing the number of images to 46,513. Both pre-existing information (PDDB) and separate (XDB) data are now freely available for academic research purposes, thus supporting new studies and contributing to accelerating development in the area.

JGA Barbedo in [3], This paper aims to organize all published information on the subject over the past four decades by displaying a brief person depiction of each proposed program, and allowing all information to reflect on how the problem was treated in the past, how it changed, and what it is indicators that can be considered in the future.

Andrea Cossettini1 in [4], A learning approach is proposed to process the actual HFIS platform response to micro-organisms, and discuss the viral case study RHDV, CCMV and HAV. Compact experimental models have been detected, which appear to be useful in the investigation of electronic impedance detecting equipment. The strategy is exceptionally wide and can be adjusted to client assets, maybe utilizing using structural congestion(e.g. to divide the viral body into multiple fragments),particularly when high precision is required for low recurrence.

Fumiaki Mitsugi in [5], Ozone depletion treatment program was developed and used in a real agricultural environment to protect the soil from germs. The profundity of ozone movement within the soil was measured by measuring the sharpness of the soil with the nitrogenous nutrients. Thereafter, a portion of the camp that was filled with Streptomyces, which created crust, was treated with an ozone depletion program. It has been It has been found that radishes developed in an ozone-depleted zone appear moved forward development compared to control and are not tainted with scabies. It has been demonstrated that ozone dissemination treatment was compelling in killing soil microbes that live near to the soil and in expanding plant development.

S. Makhlouf in [6], This composition summarizes the stars and cons of all such considers to shed light on different angles of investigate. A discourse of the foremost commonly considered diseases and the nature of the research is displayed completely different stages of the symptomatic handle. The adequacy of state-of-the-art procedures is investigated to distinguish those that appear to work best in all categories of crops or plants.

Iraklis Giannakis in [7], We are outlining, a Sensor based Mobile App framework for accuracy agribusiness which furnishes agriculturists with valuable information about the paddy yield and its condition. Our framework intends to make development more productive as the agriculturist can settle on better educated choices and subsequently spare time and assets. The proposed methodology (Deep CNN & SVM classifier) compared to previous methods used by combining the k-means & fuzzy logic classifier with the KNN & SVM classifier.

A.E.H. Adane in [8], A data acquisition system with hot silicon sensors is used to control air intake on plant leaves. These sensors are built using MEMS technology and are used to naturally degree mugginess, temperature and wind speed close plants, inside a green house. The measurements obtained are found to be consistent with the data generated by the leaf border model.

Davoud Ashourloo in [9], The experiment was performed in a subtropical environment beneath controlled conditions to ponder the diverse impacts of infection indications on leaf signs. The combination of malady indications at each arrange of the malady has driven to a more complex spectra that has diminished the PRI and NBNDVI information. The comes about speak to that machine learning strategies not at all like SVIs are not delicate to the side effects of different infections and their comes about are solid.

Wenjiang Huang in [10], Ghostly files (NSIs) that can be valuable in recognizing different plant infections. Recently arranged ghostly records were taken from a weighted combination of one band and the normal variety within the separate between the two bunches. All four NSIs were able to identify and distinguish certain plant illnesses. Utilizing these NSI, infections can be identified and classified, which isn't the case when existing pointers are delicate to abiotic push conditions.
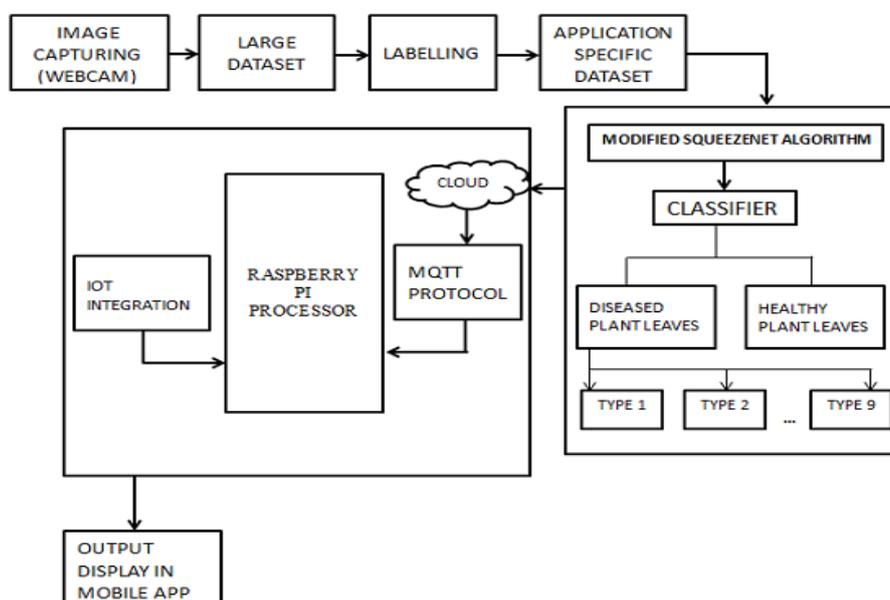
Al Suwaidi [11], This paper is concerned with the investigation of hyperspectral information for the determination of plant maladies and stretch conditions and the separation of plant species by progressed mechanical learning strategies. The comes about of the tests appeared noteworthy advancements in supremacist execution compared to the utilize of solid plant markers and existing strategies of classification. The discoveries recommend the convenience of the proposed state-of-the-art observing and location system when as it were solid tests are accessible, thus the information status is immense.

Benson Kipkemboi Kenduiywo in [12], This paper introduces a systematic sequence of plants in which the expert information and phenological details of the Terra SAR-X base are obtained. The merger method was tested and compared with the standard procedure for inserting a variety of images such as integrated split bands using partition (MLC) and multiple CRFs. It has surpassed MLC and CRFs based on the back-end probability measured by both the original orders DCRF and HDCRF. chandra et.al [13] discussed other IoT applications for false detection of sensor-based accelerometer activity. Many research scholars have performed various researches on this field to detect the diseases in the plant leaves by exploring various algorithms and methodologies. We carried out a study on different plant leaf diseases.
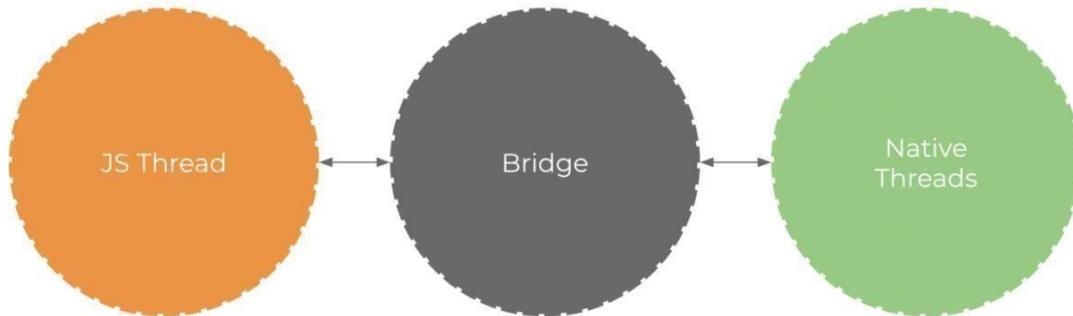
3. Proposed Model

India's economic, political and social stability is directly or indirectly dependent on annual rice production. The income of hundreds of millions of people depends, not only on rice production, and not on anything else. But according to a report previously published by the International Rice Research Institute (IRRI), only 37% of the crop is lost to disease. In this case, the farmer is able to take care of the crops under different depending is different. Of the cash crop, rice is the most nutritious in the world, with more food than any other crop. Currently, the main goal of agricultural production and providing the people with food. Therefore, leafy during the disease of rice cultivation, and fast-fast will lead to a decrease in the quality, efficiency and financial inheritance, respectively. Diagnosis and identification of a large area is carried out using an automated process, which is very good, because it reduces labor, time and expenses for troubleshooting and diagnosing diseases and symptoms. The project reports that new methods for identifying and diagnosing diseases, rice, leaves, using advanced algorithms such as modified squeezenet, in order to improve accuracy and reach the next level. Self-harm in the reduction process, which uses categorical cross-entropy to improve accuracy. This improves the accuracy of using hybrid algorithms on the account in fine adjustments. Plant image scanning is a mobile app based on the reactor. It is also an indication of the nature of chemical fertilizers that will be used to diagnose any disease. The hardware module has been successfully developed to spray pesticides in plant diseases. It is also an indication of the nature of chemical fertilizers that will be used to diagnose any disease.

Fig. 2 - Proposed Block Diagram

Fig. 3 - Architecture Diagram

Mobile App Development

In this project, react native is used for mobile app development.

The conventional local application is built as a layout employing a conventional JavaScript reaction system. The versatile app empowers the client to see accessible stopping spaces at their favoured area. It too empowers the client to book a nearby stopping part. Respond Local (too known as RN) could be a JavaScript-based versatile application system that permits you to construct conventional versatile apps for iOS and Android. The system permits you to construct an application for diverse stages utilizing the same codebase. Respond Local was to begin with propelled by Facebook as an open venture in 2015. In fair a couple of a long time, it got to be one of the best arrangements for cell phone improvement. Respond local improvement is utilized to empower a few of the world's driving portable apps, counting Instagram, Facebook and Skype. We talk about these and other illustrations of apps that have been empowered by Innate individuals encourage in this post.

There are a few reasons behind the worldwide victory of Respond Local.

To begin with, by utilizing Respond Local, companies can make code once and utilize it to empower both their iOS and Android applications. This spares a parcel of time and assets. Moment, Respond Local was built based on Respond - a JavaScript library, which got to be exceptionally prevalent with the discharge of the portable system. We talk about the contrasts between Respond and Respond Local in detail in this area.

Third, the system engages previous designers, who were able to work only with web-based advances, to make useful applications for optimizing versatile stages. Respond Local is composed

with a combination of JavaScript and JXL, uncommon stamping code comparable to XML. The system has the capacity to communicate in both regions - JavaScript-based strings and nearness, conventional application strings.

Fig. 4 - React Native Bridge

The react platform employs the framework so-called bridge whereas the js and inborn strings are composed in totally diverse dialects it may be a highlight of the bridge that produces the communication of both parties conceivable.

4. Result and Discussion

Fig. 5 - Screenshot of the Running Code

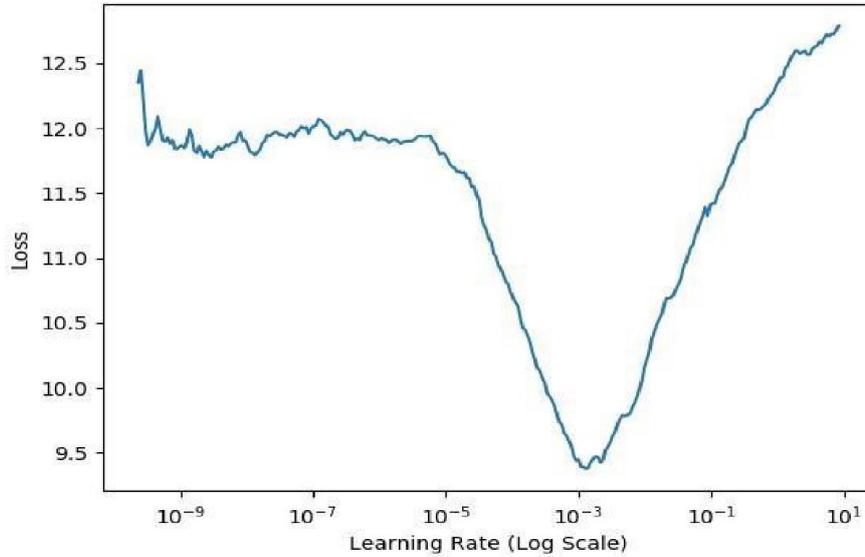Finding the learning rate finder to train the model with maximum accuracy.

Fig. 6 - Learning Rate

Table 1 - Output Obtained after the Model is Trained

DISEASES	PRECISION	RECALL	F1 SCORE	SUPPORT
False smut	1.00	0.90	0.95	40
Bacterial blight	0.90	0.84	0.87	76
Blast	0.63	0.76	0.69	45
Brown spot	0.80	0.71	0.75	56
Grain discolouration	0.93	1.00	0.97	28
Leaf streak	0.83	1.00	0.91	43
Sheath blight	0.93	0.84	0.88	31
Sheath rot	1.00	0.92	0.96	24
Tungro	1.00	1.00	1.00	55

Table 2 – Micro, Macro and Weighted Average Values

AVERAGES	PRECISION	RECALL	F1 SCORE	SUPPORT
Micro avg	0.87	0.87	0.87	398
Macro avg	0.89	0.89	0.89	398
Weighted avg	0.88	0.87	0.88	398

The above mentioned details tells us that the model is been trained and we have got the weighted average of the model as 88% which is the maximum accuracy of the model.

After performing loss minimization, we gotten the plot which can be seen within the chart underneath.

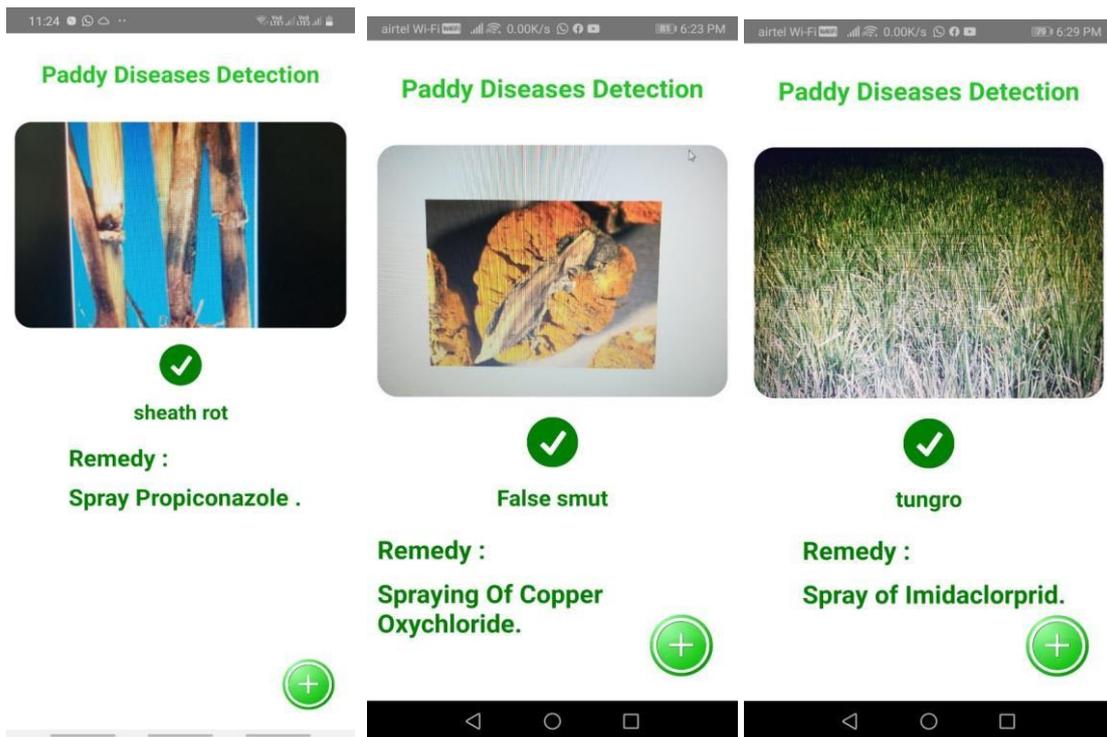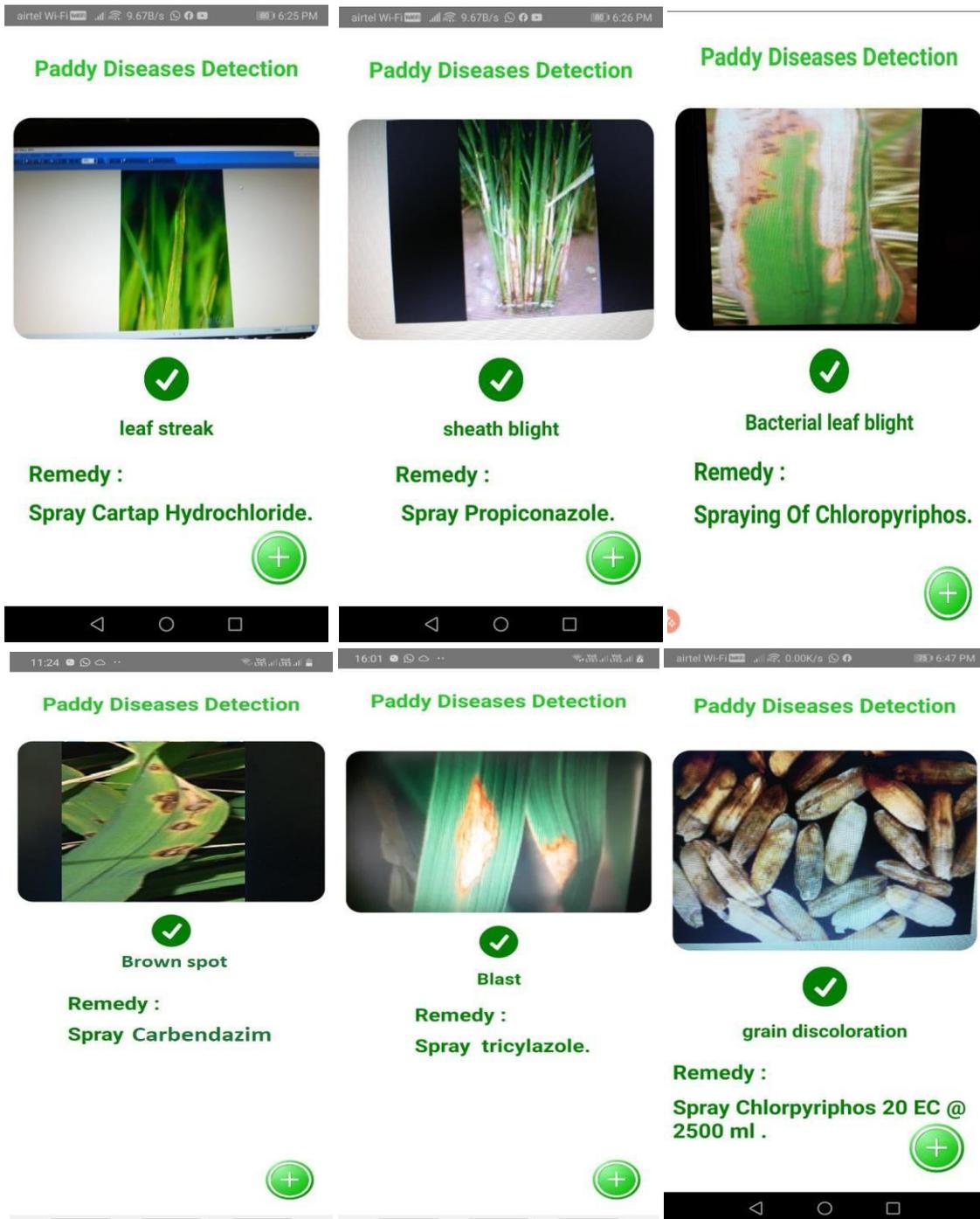Fig.7. Loss Minimization and Output Graph
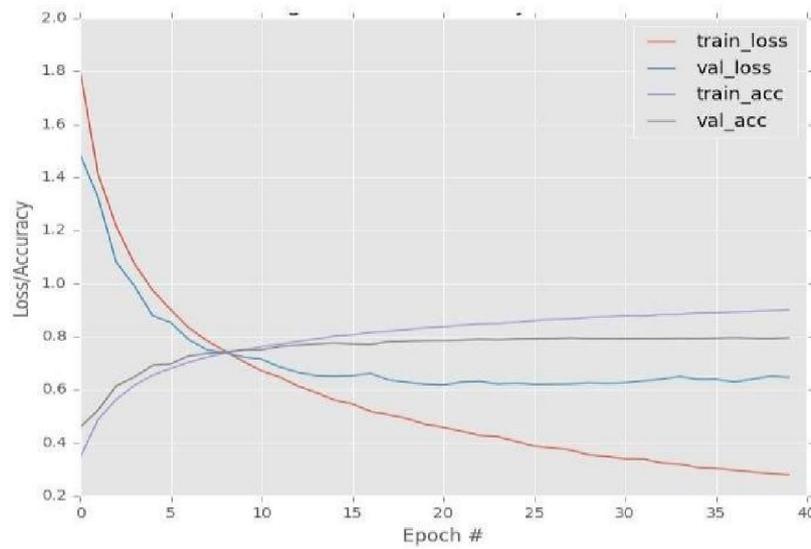
A mobile application using a javascript framework react native is developed to scan the images of the plant to test for any diseases in the paddy.

The results obtained for nine diseases on the mobile application is displayed below.

Fig. 8 - Output Images

Paddy Diseases Detection

leaf streak

Remedy :

Spray Cartap Hydrochloride.

Paddy Diseases Detection

sheath blight

Remedy :

Spray Propiconazole.

Paddy Diseases Detection

Bacterial leaf blight

Remedy :

Spraying Of Chloropyriphos.

Paddy Diseases Detection

Brown spot

Remedy :

Spray Carbendazim

Paddy Diseases Detection

Blast

Remedy :

Spray tricylazole.

Paddy Diseases Detection

grain discoloration

Remedy :

Spray Chlorpyriphos 20 EC @ 2500 ml .

5. Conclusion

From the point of view of propulsion, the proposed method was tested and validated for different sorts of rice leaf maladies such as bacterial damage, brown spot, leaf scald and leaf blight successfully. In addition it has been shown that, with less pain of the method, a very good result can be obtained discreetly to ensure the production of planned methods. Another idea of utilizing this

strategy is that, plant illness can be recorded as early as possible. Therefore, our project provides a solution to differentiate and predict the presence of disease in paddy successfully.

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