Paddy leaf disease detection using CNN

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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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APPROVAL

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Sharmin Akter, Sr. Lecturer, Department of CSE,** and 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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ABSTRACT

The identification of plant diseases is highly significant to avoid losses in quantity and productivity of agricultural production. Problems in the agriculture industry includes are minimized by using more deep learning and image processing techniques. This review mostly emphasizes on rice diseases detection of input pictures of sick rice plants captured by DL and other imaging methods. In addition, remarkable DL and image processing concepts in plant detection and classification mentioned disease. Different classification methods, such as traditional neural networks (CNNs) are applied in a variety of agricultural research applications. Various input data produces results of different quality and, therefore, the selection of a classification method is an important task. Conventional Neural Networks (CNN) different classification techniques used in various agricultural research applications. The choice of a classification technique is a crucial undertaking since various input data yield results of varying quality.

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CHAPTER 1

Introduction

1.1 Introduction

Paddy is a very important food crop in Asia. Rice is a common dish covering most of the surrounding 100 million hectares of the world, of which more than 90% is in Asia.[1]. Rice farmers must be supported as much as possible. Rice production still produces a high production and quality. Unfortunately, it is common for farmers to face a variety of challenges while harvesting rice at the ideal time to create a high-quality crop. Other Factors One of the determinants of rice yield. In fact, many farmers today need the assistance of experts to solve their farming problems, but the number of specialists and their limited allocation leave this problem unsolved. Additionally, because the information has not been kept in the computer system, it presents a challenge when people inquire about it and the agricultural extension staff is constrained and unable to recall agricultural knowledge. Must refer to extension files or documents. It is time consuming and ineffective in overcoming agricultural problems. [5]. Compact Neural Networks (CNNs) have been visual networks in the brain since the 1980s.Deep networks have enabled CNNs to perform highly complex visual tasks. In this study, we use CNN. Architecture in this investigation. Christian Sergei and others designed the Google Net architecture. a prize from Google Research. The failure rate of 5 increases to the first 7% of the SILVER Challenge 2014. This remarkable accomplishment has a lot to do with reality. The network is much deeper than previous CNNs. This is made possible thanks to a subnet called the starter module. This allows Google Net to use more parameters efficiently than the previous architecture: Google Net has only 1/10 of Talent`s parameters (approximately 61 million instead of 60 million). [6]. Results of integrating Google Net have been demonstrated in prior research [8, [9], [10]. analysis of rice cultivated for disease. However, field research revealed that fields with severe illness had the highest production losses, at 65.4%. The utilization of disease-free seeds from healthy plants, sensible crop rotations, and resistant or tolerant varieties are also recommended. Currently, there is an urgent need for a reliable and precise disease-risk forecasting

system based on real-time meteorological data, with a lead time of at least one week. The biggest source of crop loss each year and the opponent of all illnesses in agriculture.

1.2 Motivation

- To detect paddy leaf disease
- Provide Knowledge about detect leaf diseases through DL
- Provide Knowledge about primary medicines
- Provide Dermatologists and Veterinarian's information.

1.3 Objectives

We can reduce pest attacks by using the right medicines and insecticides. We can reduce the image size with good grinding techniques and make sure the quality is not affected too much. We can continue the above efforts authors because a panacea is also presented by the system. The purpose of image processing is to detect diseases in plants. It also suggests, after the disease is identified, the brand of the insecticide utilized. It also identifies insects and pests that cause epidemics. In addition to these parallel lenses, this drone saves a lot of time. The cost of the model is quite high for small-scale farming, but it will be effective for large-scale farming. It terminates each process sequentially and thus achieves each result. Therefore, the main goals are:

- Create a system that can reliably identify plants diseases.
- Create a database of pesticides for the respective plants.
- Provide a cure for the detected disease.

1.4 Rationale of the Study

- Collect the data from affected plant.
- Help people about primary symptoms about paddy leaf.
- Collect knowledge how prevent the spread of diseases.

1.5 Expected Outcome

- Disease detecting.
- Owner or any other people can get help about problem easily.
- Full package of Disease Alert, Detecting and Preventing.
- Primary medicines.
- Primary care tips.

1.6 Report Layout

In this report, we have proposed a CNN model for rice leaf disease recognition; it consists of six parts given below:

Chapter 1: Introduction

We explain the introduction to the study with its motives, goals, and expected outcomes in this chapter.

Chapter 2: Background Study

In this chapter, we **review** the **literature; summarize the research, the scope of the problem,** and **the** challenges.

Chapter 3: Research Methodology

We discuss this research process**,** data collection process, and performance requirements in this chapter.

Chapter 4: Experimental Results and Discussion

This chapter discusses the study methodology, data gathering techniques, and necessary conditions for its use.

Chapter 5: Impact on society, environment and sustainability

This chapter outlines the effects of our study on the environment and society.

Chapter 6: Conclusion

This chapter gives a summary of our investigations and makes suggestions for more research.

CHAPTER 2

Background Study

2.1 Introduction

The breadth of the issue, a description of the study, considering the challenges we had when writing this chapter are all included in this part. We will detail some of the research papers relevant to our study and explain the basic classifiers, algorithms, and accuracy of their studies in the literature review. In the study abstract, we will go through the shortcomings of earlier studies. In the following section, we'll discuss how our CNN models can address the issue. The challenges we encountered while performing the research are covered in the Challenges section.

2.2 Literature Review

The reviewed articles have been, not fast but about to least. Here we want to show how the DL work in the agriculture secures. This deceit Deep learning create its own position in agriculture sector and gain a good profit through image processing .There is lots of papers that have been already written and are related to our work. [1].Here we can see that the use of deep learning and machines in different types of agriculture but we will still focus on the use of deep learning in some areas. Using deep learning and image processing the paper gain a good result in crop management sector. Now we have to increase crop production and control costs by diagnosing any disease through the use of DL and image processing. [2]Here they used various types of algorithm to get the accuracy.

They also analyzed 41 papers from 2017 to 2019 possibilities using AI and CNN algorithms. The research which is published based on “Deep learning performance over Agriculture “among them 57% use CNN algorithms to reduce food problem over the world[3].The main food source of our survival we get from agriculture so any kind of problem in agriculture can be considered as our own problem. Due to all the diseases, a lot of crops are lost in the field of agriculture. If these diseases are predicted in advance, then farmers will be able to protect their crops from these diseases. By applying various algorithms on coffee plant, they are gain only 99% accuracy but in many cases it depends on advanced camera and environmental recognition and networking. Which in many

cases has questioned the paper [4].This paper provides an overview of the agricultural system of the least developed countries and attempts to highlight what has improved and its natural use through the use of different algorithms and the use of WSN technology. This paper symbolizes what happens through smart learning through proper end management and financial management. The data setting here has been used as a numeric model by NSL-KDD and highlight the nature of the wireless network system for IOT based future agriculture. Here are some of the problems because the machines that can't do the job properly without the proper numeric method, which is still almost impossible. So we have to wait for some future in agriculture [5].

Diagnosis of rice through training system which has been programmed by DCNN with Attempts have been made to diagnose rice through image processing where segmentation clustering has been used and its nature has been highlighted. Diagnosis of rice plants has been shown since it first came from the database and segment and then judgment-analysis classification and lastly sought has been used to diagnose rice plant disease. Accurate segmentation through the use of image processing technology to accurately diagnose rice plant images [6]

2.3 Research Summary

The identification and classification of rice leaf diseases have previously been investigated using deep learning and data mining approaches. The application of deep learning and machine learning techniques for illness identification is growing daily. We have previously covered a number of papers where they have attempted to identify this sort of sickness in the literature review section. Both conventional methods and prediction algorithms were employed by certain researchers. They are unable to achieve enough accuracy, though. Because of this, their detecting technique is unable to yield findings that are adequate. We are aware of no detection method that can discriminate between a healthy class and the different classes of illnesses that affect leaf. After analyzing this kind of study report, we discovered that several experts have employed CNN to improve their detection of various paddy leaf infections.

2.4 Scope of the Problem

Following a review of multiple related studies, we found that their picture collections shared a common flaw. Deep learning methods offer more accuracy when you have a large data set of images. However, they utilize a smaller picture dataset for their model, which prevents them from achieving our suggested system cannot deliver satisfactory results when they employ fresh test images since they have improved precision. Today, a sizeable fraction of the research community uses deep learning to train their models on a big dataset to tackle recognizing problems. Their theory is compatible with contemporary technology, making their research pertinent to and helpful to the general public. As a result, we made the decision to create a model for identifying paddy illnesses using deep learning. It will function with current technology and be advantageous to the general public.

2.5 Challenges and Future Directions

There are several rice disease detection techniques for rice diseases, including edge detection, water separation, cluster detection, half-level, active-level and thresholdings. For all methods, the inspection procedure remains more or less the same. Four major procedures are used to process images: counting, segmenting, feature extraction, and classification. The essential economic goals can be achieved with pretreatment: (1) identification of leaf, seed and stem diseases in rice (2) detection of diseased areas in rice (3) determination of shape and color and infected areas in rice (4) A solution was found to prevent rice diseases. Segmentation method involves dividing an image into regions of special importance, which is the most important technique for extracting features from an image. The image's distinguishing qualities include its texture, form, color, and motion-related qualities. This categorization result is one that is based on recently chosen characteristics. Several research papers related to automatic leaf disease detection have been proposed and different feature extraction and segmentation methods have been discussed, such as vertical threshold, bottom edge, region, variable wavelet change, Gabor procedure. Filter and principal component analysis (PCA). Segmentation and background removal techniques will be proposed to remove the background.

They used a green pixel mask to split the colors, and then applied Otsu’s thresholding

techniques to the infected images. Another study briefly discussed the image-based method of plant division and discussed ten types of plant diseases, such as powdery mildew, bacterial spot, fungal spot, sunburn, soot and burn leaves in the morning and evening. The features are similarities, contradictions, energies, and clusters that CNNs use to identify shadows and their tributaries to identify disease forms. Due to the lack of available studies, we provide detailed information on rice diseases, including preparation, distribution, activity, characteristics, classification and problems, as well as advantages and disadvantages. Point of disease. In addition, differences in methods related to improved detection and accuracy are also included. Detailed comparisons were made with existing research. In several literature reviews, we found that data availability was still limited. The proposed solution not only significantly increases the size of the image dataset, but also increases the diversity of the data, since the natural variation of each image is indirectly taken into account when dividing into regions. Although this strategy has certain drawbacks as well, it will inevitably produce more trustworthy conclusions when there is less data available. To obtain high performance, pre-processing the picture before machine learning model training will show to be a useful strategy. Each of the enhanced approaches may be used to identify and classify rice illnesses more accurately while also minimizing misclassification. Expand the rice disorder records set and set up a complete device for the rice disorder analysis machine while the range of samples isn't enough, the usage of records development techniques to construct an amazing classifier. The accuracy of the category may also be increased by adding more photographs to the dataset and changing the parameters of the machine learning model. Finding the ideal settings for machine learning algorithms is still a difficult research problem. 0 2 4 6 8 10 12 14 16 Number of articles Journal issue ISSN STANDARD REVIEW- 2394-5125 vol. 7, NO. 11, 2020 4387 such as rice, wheat, maize, soybean and sugarcane, and due to insects, the harvest is reduced. There are a lot of plant diseases that can seriously harm various economies and populations. It can even cause significant ecological loss. Plant diseases and pests must be correctly categorized and identified, which is a challenging process.

CHAPTER 3

Research Methodology

3.1 Introduction

Preprocessing and training the model (CNN)

Pre-processing of the database includes resizing, reshaping, and conversion to raster format for images. The test image likewise goes through the same processing. Uploaded image of about 676 different plant species are gathered, and any image from them can be utilized as a system testing image. The model (CNN) is trained using the database train so that it can recognize the test image and the ailment it is suffering from. Convolution2D, MaxPooling2D, Dropout, Activation, Flatten, and Dense layers make up CNN's unique set of layers. If the plant species is represented in the database after the model has been effectively trained, the program may identify the illness. In order to predict illness, test photos and trained models are compared after effective training and preprocessing.

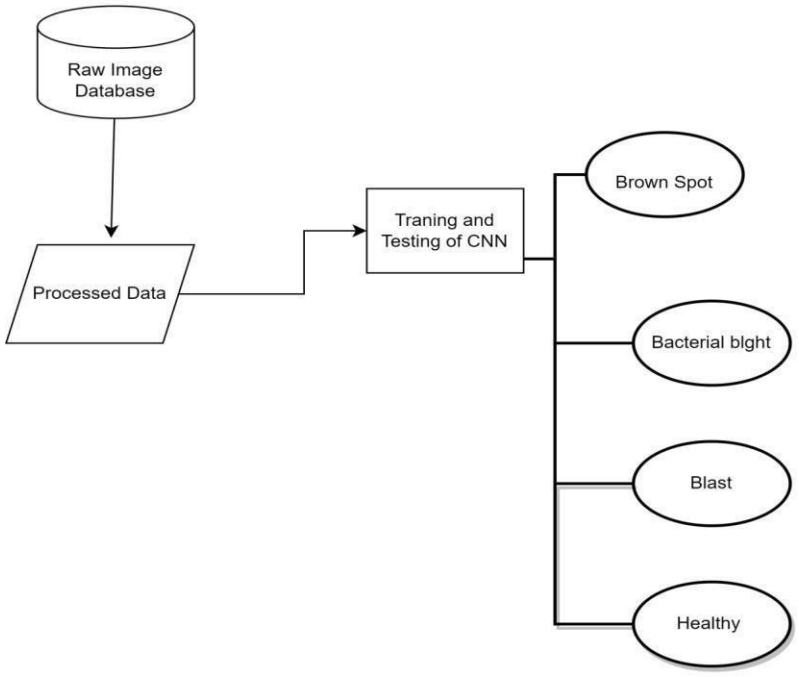

Fig.3.1.1: Block diagram of this research methodology

Database Collection

The first step in any image processing based project is to obtain a valid and proper database. In most cases, the common database is preferred, but in some cases we don't have the right database. Under these conditions, we collect images through the kaggle dataset and build our own database. Database accessible to all It is difficult to classify plant diseases. The information provided here is not labeled. So the first task is to clean and label the data warehouse. There is a vast selection of photographs that may be chosen from with greater quality and perspectives. After selecting the pictures, we should have a thorough knowledge of the various types of leaves and the diseases they suffer from. The main research was carried out from the archives of the green village organization. Various botanical picture kinds are researched and blended. After a comprehensive analysis, the pictures are separated and labeled with various diseases.

Deep learning Method:

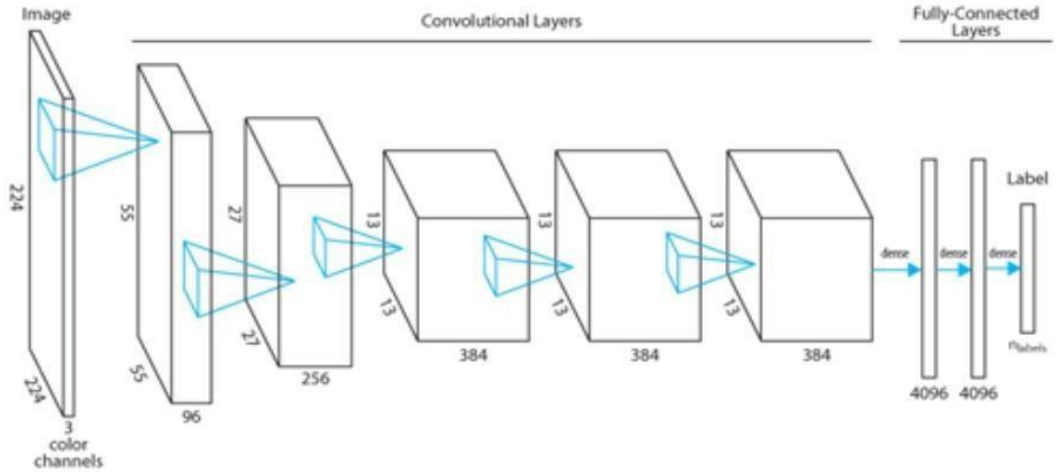

Fig 3.1.2: Traditional Process of CNN

Data Mining Method:

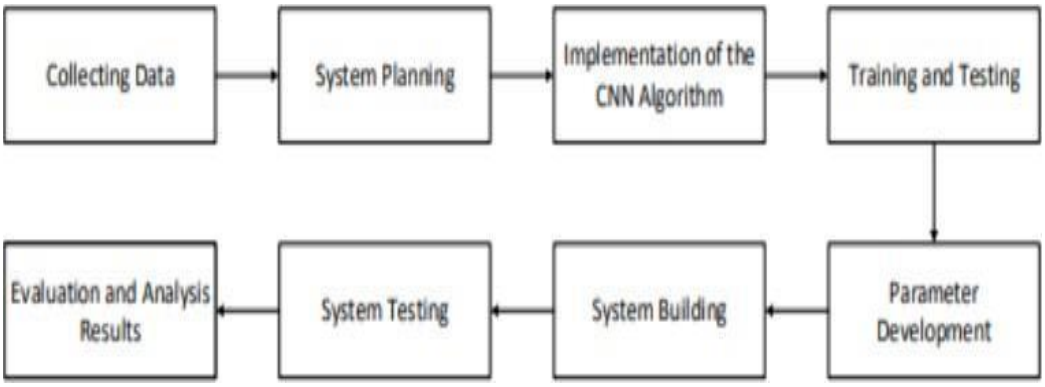

Fig 3.1.3: Data Mining Method

3.2 Disease description

An essential component of our research is disease of paddy leaf. It makes it straightforward to understand the effects of several paddy leaf diseases. After conducting an disease investigation, we identified four common paddy leaf diseases in Bangladesh: Diseases including Mastitis, Brown Spot, and Bacterial Blight.

3.2.1 Bacterial blight

Bacterial blight resulting from Xanthomonas oryzae pv. It reasons seedling wilting and yellowing and drying of leaves. This generally takes place while robust winds and non-stop heavy rain facilitate the unfold of disease-inflicting micro organism via droplets at the wound of an inflamed plant. In rice types that are sensitive to high nitrogen levels, leaf blight can be severe. As the disease progresses, the leaves turn straw yellow and wilt, causing the entire seedling to wilt and die. Because when vulnerable types are cultivated in a blight-friendly climate, blight rates can reach up to 70%.

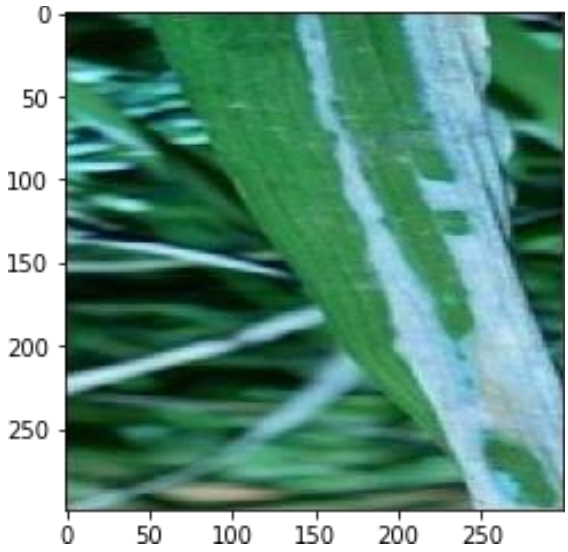

Fig: 3.2.1: Bacterial blight

3.2.2 Blast (leaf and collar)

It can impact the rice plant's entire aerial structure: Leaves, necklaces, buttons, necks, blocks and sometimes sheaths. Blast disease can occur anywhere blast spores are present. The significant temperature difference between day and night in upland rice results in dew on the leaves, and generally lower conditions encourage the growth of disease. Check leaves and collars for diseases: Initially, symptoms appear as white to bluish-gray patches or patches or with a dark green border. Lesions on older leaves are elliptic or rhomboid and have yellowish color to gray in color, with red to brown or necrotic edges. Some have broad middles and ends that resemble diamonds.

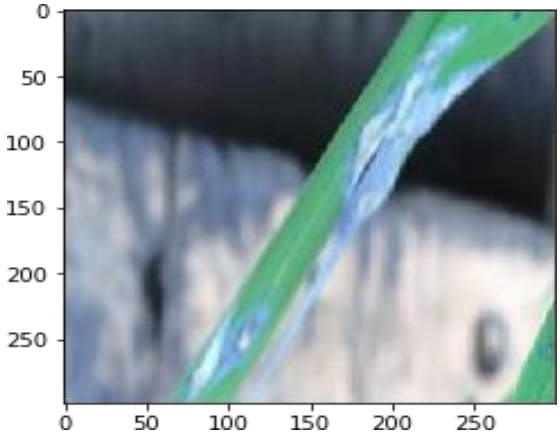

Fig 3.2.2: Blast (leaf and collar)

3.2.3 Brown spot

Brown spot is always considered by many to be among the most prevalent and dangerous rice illnesses.. When infection occurs in seeds, seeds are not filled or form seeds that are mottled or discolored. Temperatures between 16 and 36 °C and high relative humidity (86–100%) are conducive to the development of the illness. The main sources of blackheads on the ground include: infected seeds, giving rise to intentionally infected rice Brown spot disease can occur at any stage of the growing season, but infection is most severe from tailoring to maturity stick. Infected seedlings have small, round, yellow-brown or brownish lesions that may surround the cotyledons and deform the primary and secondary leaves. From filleting, lesions can be observed on leaves. Fully developed lesions are round to oval with a light brown to gray center surrounded by a reddish brown border produced by mycotoxins. On infected varieties, the lesions are 5 to 14 mm long, which can cause leaf wilt.

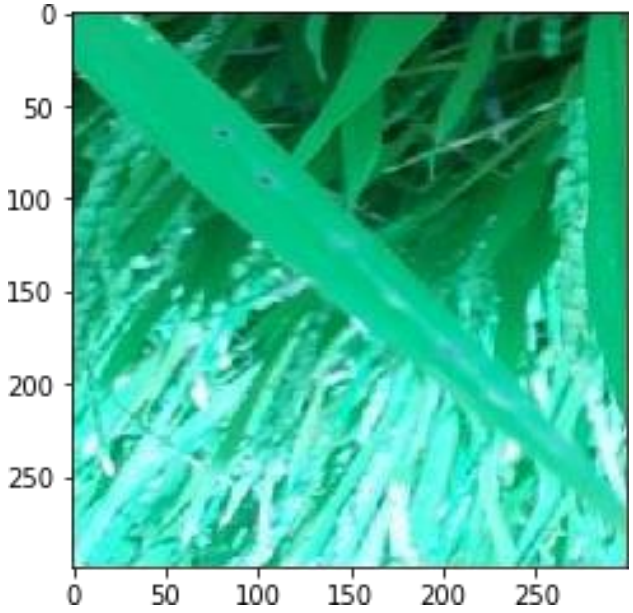

Fig 3.2.3: Brown spot.

3.3 Data-Collection

This same hardest assignment for us to do is acquiring data. To make our report effective, it is needed to collect the real data through random people. So, by making a Google form and upload it on our social media site. We receive 200 responses from it. We could not make physical survey because of the COVID 19. So, we had to survey it on online. Declarations Model availability [10]

3.3.1 Data pre-processing

Otsu's method / thresholding:

It is a common task in image processing to convert grayscale pictures to monochrome. Otsu's method, which bears the term NO, consists of numerous binary algorithms. Our method rationally implements pixels that either belongs to the historical past or the foreground by iterating over all possible threshold values. Finding a lower limit price where the sum of the historical lead as well as previous deviations is limited is the desired outcome.

Pixel Intensity Adjustment:

To distinguish pixels from plant life, a linear composite of RGB planes has a factor:

r->-0.884, g->1.262, b->0.311 a performed. Using set of genetic optimization rules these coefficients are detected. Resizing a picture allows for the acquisition of several objects before the rice in the image disappears. The editing procedure is pretty vital, due to the fact if cropping isn't finished, all items inside the photograph could be analyzed by a computer, despite the fact that the item to be examined is inside the shape of paddy leaves. Preliminary length of photograph this belongs to may be more diverse, so editing is finished to get awareness of the photograph placed on the scale of 224 of same [15]. Following image enhancement figuring out the scale of the entered photograph, the augmentation records procedure is then performed. Deep learning, as is well known, requires a vast number of records in order to operate at its optimum. Proposed technique is a method of altering records without losing their essential qualities. Rotation, resizing, flipping, applying tensor transformations, and image conversion are used for augmentation [16]. CNN implementation The CNN set of rules aims to first instruct to discover identifiable functions inside the image and prompt neural classification systems

before it was used to detect diseases in rice. Version education and version checking out are the two models that make up the education step of picture processing. After the model has been trained, CNN structure may be developed and called during the testing phase.

Before processing, the training procedure the use of CNN set of rules, the desired schooling records need to be recalled first. Prior to that, it's very important to initialize a few to gain knowledge of parameters. Once the desired parameters have been initialized, CNN set of rules is applied to carry out characteristic gaining knowledge of and photo classification. In characteristic gaining knowledge of, its miles normally carried out via way of means of making use of a convolution layer. In addition to the convolution layer, there are layers for batch normalization, activation, and pooling. with inside the Google Net structure [6]. Batch-normalization is implemented the activation layer follows the convolution layer makes use of the Rely activation process.

The first layers separate the photo's peak and width with the aid of using 4 to lessen the computational load.

- Then the neighborhood reaction normalizing layer makes sure that the earlier levels assess a wide range of capabilities.
- Again, a neighborhood reaction normalization layer guarantees that the preceding layers follow an extensive sort of patterns. A maximum pooling layer follows the photo peak as well as width with the aid of using 2, once more to hurry up computations.
- Next, the common pooling layer makes use of a kernel the scale of the characteristic mappings that produce valid padding 1 × 1 characteristic maps:
- It efficaciously forces the preceding layers to provide characteristic maps which are definitely self-belief maps for every goal elegance (seeing that different styles of capabilities could be destroyed with the aid of using the averaging step)
- Testing Procedure Following CNN version is going through the educational manner, the version can be examined to check how nicely the formerly skilled version is performing.
- This checking out manner is executed with the aid of checking out new snap shots which have by no means been skilled earlier than with the aid of using the version. The subsequent manner is to deliver up the forecast consequences from the photo

being examined. To deliver up the prediction consequences, the device will examine the load among the anticipated photo as well as the output weight of the version that has been referred to as. After the load of the photo is validated, the photo can be labeled using the closest weight as the output. The consequences of the check are within side the shape of class consequences and possible values of the two outputs is based on nearest to the photo being examined.

Deployment at Currently, the developed model or engine is integrated into a web-based application developed using python workflow.

The application's categorization procedure is created to be standalone when the categorization process relies on certain services or operates just on the user's device but needs an internet connection. Applications can classify images using a tool or model generated from the training process. The classifier function loads CNN model that was created earlier in the training phase and sends an image that is the initial CNN node required to begin the categorization procedure, the result of the classification process

3.4 Dataset Description

We focused on the dataset because it is the most important element of a good model. Some photographs were lost owing to noise while capturing them, while others were captured unexpectedly. For more precision, we had to filter it. We'll need a few days to compile a more thorough dataset. In our study, we used 797 paddy leaf photographs that were divided into five categories. All of our procedures have made use of color photos. We chose images with resolutions of 224 x 224 and 227 x 227 pixels for our investigation. The distribution of the gathered dataset by class is shown in Table 3.1.

Table 3.1: The Collected Photographs Distribution Table

Class	Frequency
Healthy	315
Bacterial blight Diseases	244
Blast (leaf and collar) Diseases	98
Brown spot disease	140
Total	**797**

3.5 Statistical Analysis

We take a total of 797 pictures of paddy leaf from many different locations. We took 482 pictures ofthe sick paddy leaf and 315 pictures of healthy paddy leaf. In Fig. 3.7, total number of afflicted and healthy paddy leaf pictures is presented. There are 244 Bacterial blight Diseases, 98 Blast (leaf and collar) Diseases, 140 Brown spot diseases among the 797 pictures that are affected.

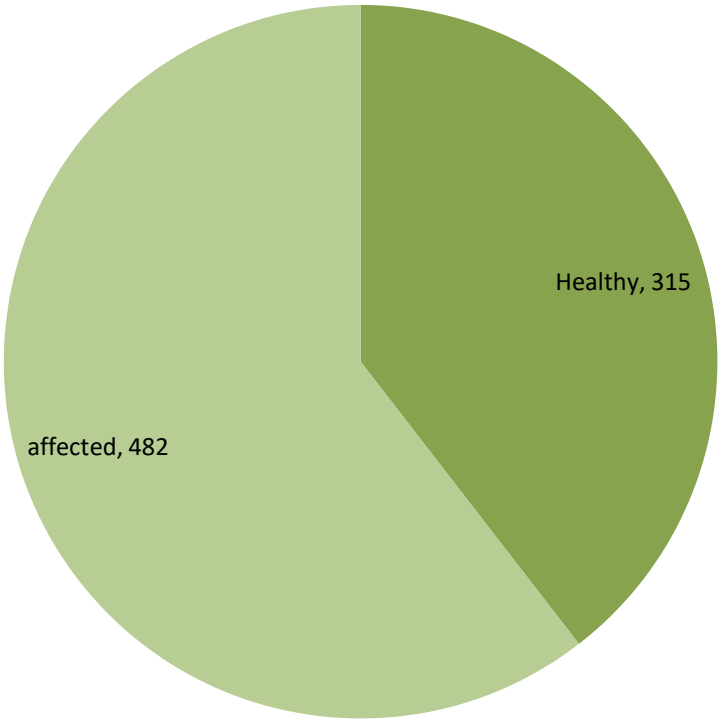

Fig 3.5: The proportion of afflicted and healthy photos.

Fig. 3.5.1 Displays the prevalence of illnesses caused by bacteria diseases of the collar and leaves photos of health and brown spot illness. We choose 57% as the greatest proportion of healthy paddy leaves, and 22%, 12%, and 9%, respectively, for bacterial blight, blast (leaf and collar), and brown spot diseases.

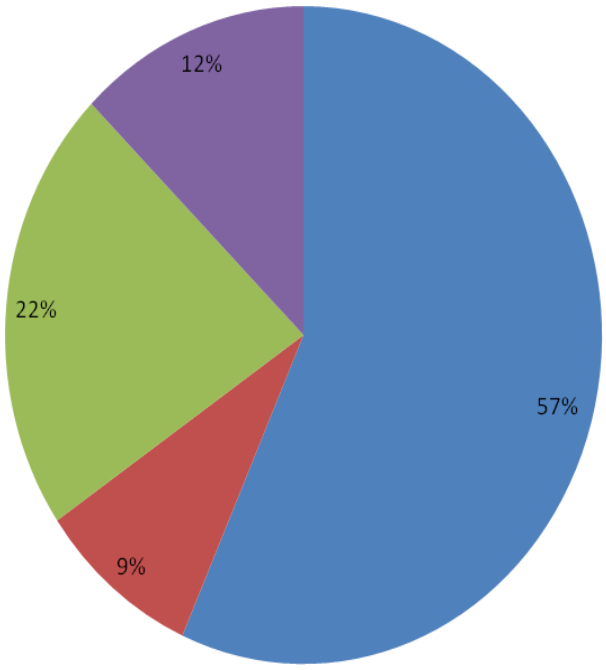

Fig 3.5.1 *:* Percentage of Bacterial blight Diseases Blast Diseases Brown spot disease and healthy images.

3.6 CNN Model for Disease Recognition

CNN is most likely the most well-known. Deep learning architecture in recent years. The popularity of CNN is increasing daily as a result of its effectiveness and enormous success. Since its inception, CNN's popularity began to rise after 2012. Today, CNN is commonly used for image segmentation, classification and identification. The basic way to use CNN is to analyze several different sorts of data, such as 1D signal and time series data, 2D images, or 3D audio and video signals. CNN is currently commonly employed .CNN was utilized in our survey because it is more efficient and outperforms all other methods. CNNs are increasingly being employed by academics to handle a wide range of problems.. On the other hand, CNN models can work on any device. It also shares parameters and particular convolution and aggregation methods are used, making them globally appealing. When extracting features, CNN can shrink an image without losing its details CNN relies heavily on image retrieval and categorization. When classifying images, a series of convolution, compositing, and fully connected layers are used. In order to extract features, the input images are routed through the convolution layer In CNN; there are three sorts of layers: input layer, hidden layer, and output layer.

CHAPTER 4

Experimental Results and Discussion

4.1 Introduction

We capture a large number of photos from the start of the process to ensure excellent quality. We wandered about and grabbed as many photographs as we could enhance our data collection. To save our dataset and model, we used cloud-based storage. We used CNN in our study to be able to train a model that can recognize disease in paddy leaf. We have proposed as the model used in this study, after utilizing it, we got good precision.. Since our primary worry was accuracy, we continued to focus on the dataset throughout the study. In this section, we'll provide a brief summary of the results from our experiments.

4.2 Experimental Results & Analysis

The analysis was conducted on a dataset of 676 images divided into five classes. Using Google Co-lab, we trained our models. In this work, the model was built using 30 convolution filters. This model has been briefly discussed in the category below, along with more pertinent data.

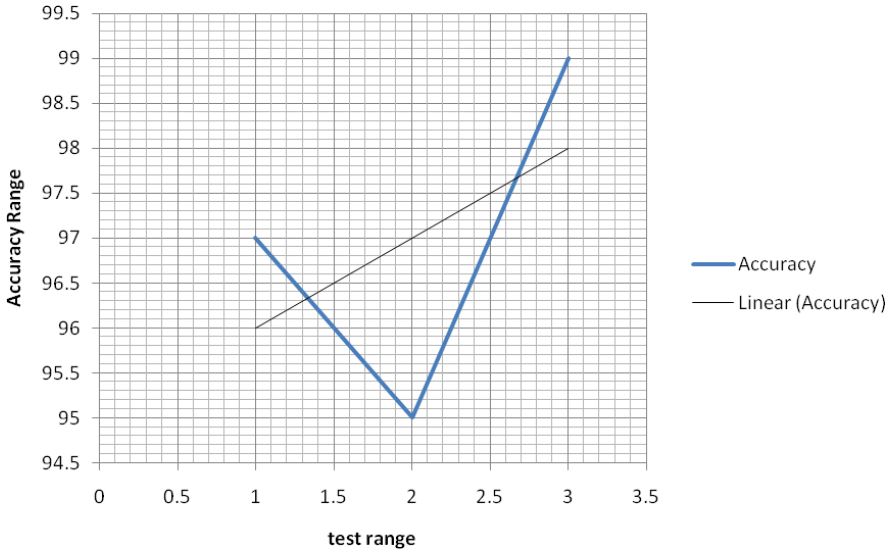

Fig 4.2 : Accuracy Range Test

Here we take our accuracy of CNN model applying on the paddy leaf and test it with the linear accuracy line. The fig 4 clearly shows how the accuracy relates with the linear accuracy.

4.2.1 CNN

Introduction

This image and video-specific deep learning method called the convolution neural network. It receives input in the form of photos, extracts and learns characteristics from them, and then categorizes the images using the learnt features.

Components of CNN

The CNN model has two steps to it: categorization and extraction of features. Feature extraction is a phase when several filters are used and layers are applied to Analyze pictures to extract details and characteristics and once finished, they are moved to the next stage, i.e. categorization in which they are categorized in accordance with the problem's goal variable.

Implementation of CNN

A multi-layer perception specifically created for two-dimensional picture it will is the convolution neural network algorithm. Furthermore as part of a deep network design, the convolution layer and the sample layer can have more than one. CNN is not limited in the same way as the Boltzmann machine, must be before and after the neural layer in the adjacent layer for all connections, convolution neural network algorithm. Just the local portion of the image has to be perceived by each neuron, not the entire image. Furthermore, pooling layer, a parameter that is changed equally for each neuron, ensures that each neuron uses the very same convolution layer during background subtraction. The CNN algorithm has two main processes: convolution and sampling. Convolution process: using a Fix rationale filter, decode the input image (the input image for the first stage is the Feature Map; the input for the subsequent convolution is the feature image for each layer.), we may obtain the convolution layer Cx by adding a bias bx. n pixels from each neighborhood are sampled by grouping steps, becoming pixels, and then by scalar weight. The combination of Wx+1, an offset of +1, and an activation function results in a narrow feature map of times Sx + 1.

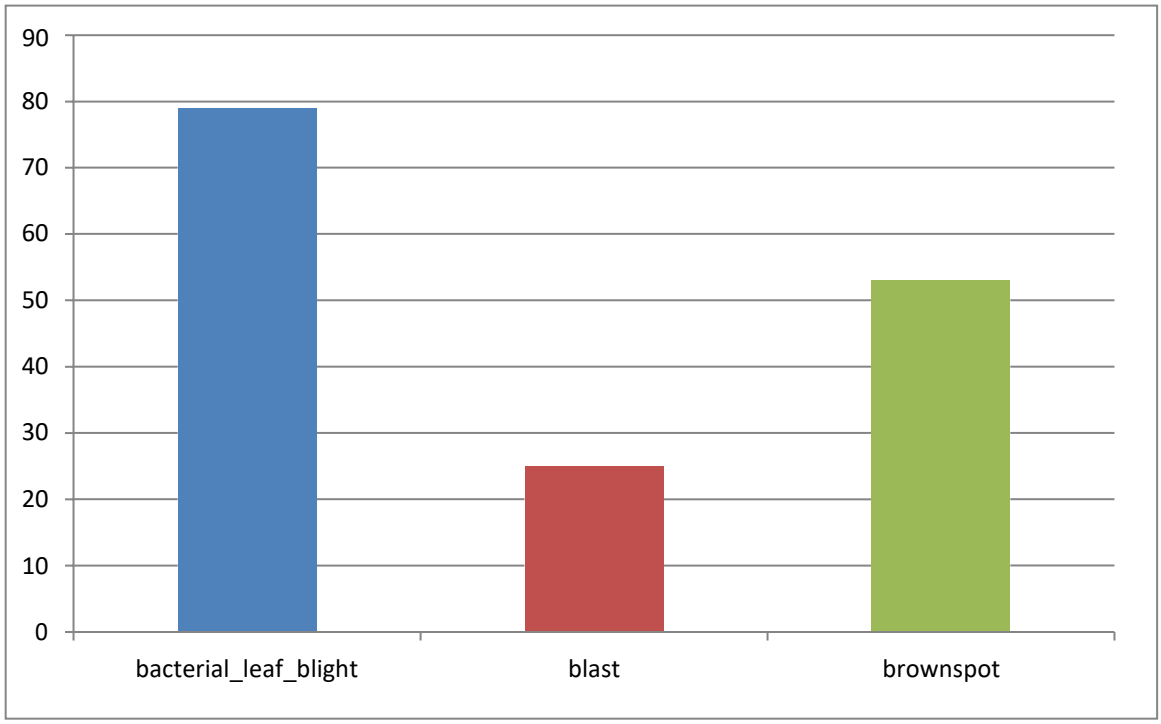

Fig 4.2.1: Train Data rates

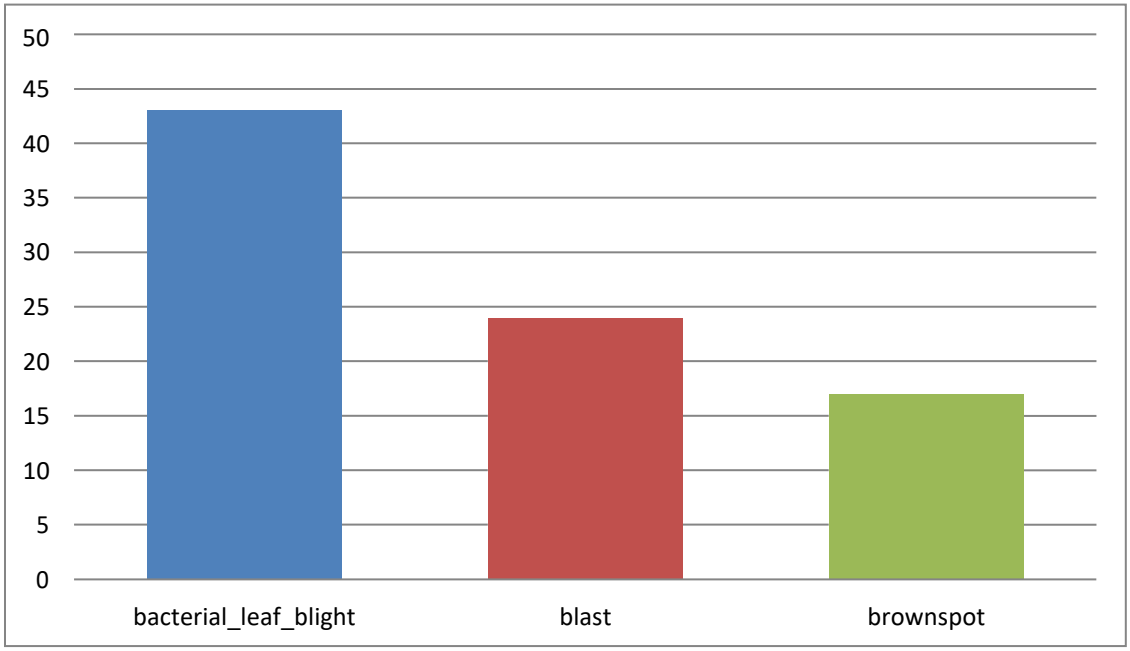

Fig 4.2.2: Verification rates

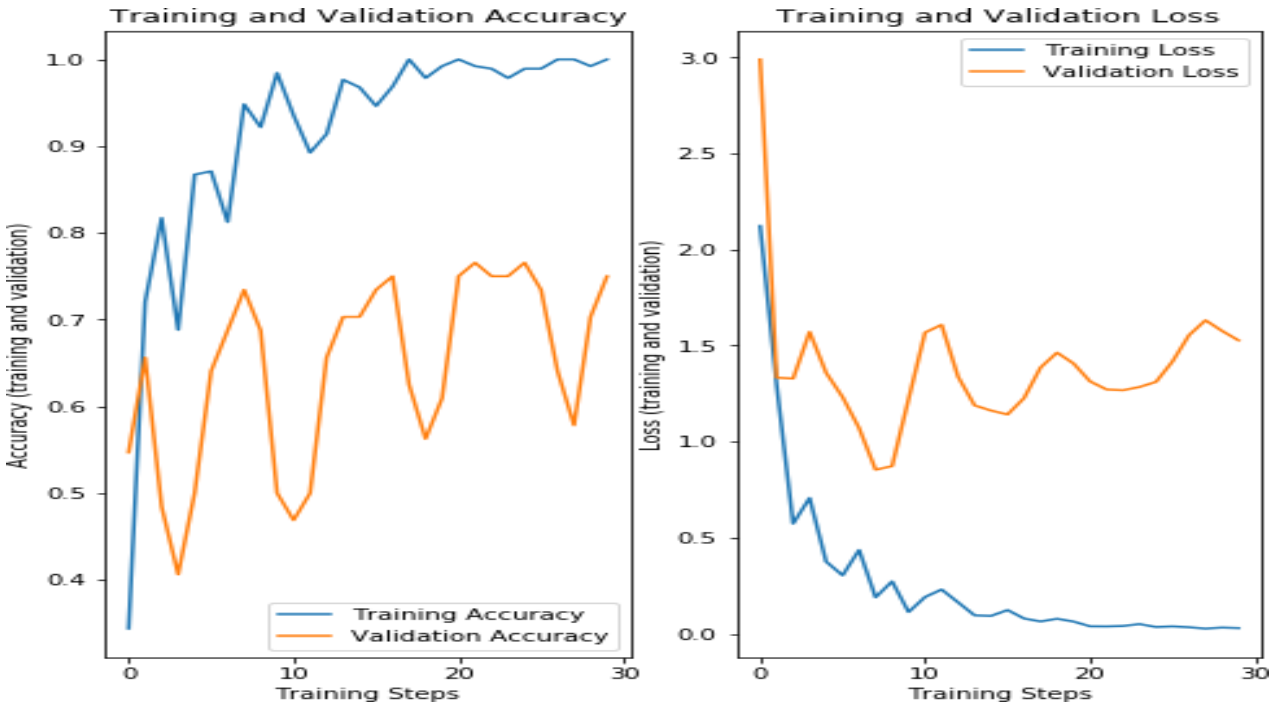

Fig 4.2.3: Percentage of loss and accuracy

CHAPTER 5

Impact on Society, Environment, and Sustainability

5.1 Impact on Society

Improving the financial status of rice farmers is one of the key objectives of this research .As farmers in other South Asian nations, Bangladeshi farmers are not accustomed with contemporary farming techniques. They frequently experience financial losses as a result. Paddy fields are always vulnerable to various diseases, making agriculture difficult proposition. For farmers to turn a profit, they must rely on chance. Our results will help farmers to detect rice leaf diseases early. You can then take steps to limit sick leave and secure your benefits In this, our technology has given farmers a monetary benefit. Other plant diseases can benefit from the usage of this disease detection method. We achieved outstanding accuracy by training the CNN model on a wider image dataset. CNNs are simple to utilize on any platform and up to date with technology. Farmers and the general public who are unfamiliar with plant diseases can benefit from our study. This research thus has a significant social impact.

5.2 Impact on Environment

Paddy is the most important asset of the agricultural industry. This is why rice leaf disease is such a big deal. Plant diseases can also cause environmental problems. Studies on plant diseases have shown that most diseases are contagious. It's not completely safe. Some diseases cause plant death. As a result, they rot and spread stench and pathogens everywhere. The ecology is seriously at risk because of this. Our study assists farmers in swiftly identifying illnesses and taking immediate action to solve this issue. The proposed CNN model performs well in the detection of plant diseases. These CNN models may be used to any intelligent software application. Intelligent software offers early sickness diagnosis based on this concept. It can really reduce the frequency of plant diseases, halt the spread of diseases, and increase profits. As the incidence of disease declines, the risk of contamination reduces. Our research will consequently have a considerable influence on the environment's safety.

5.3 Sustainability Plan

Our research aims to assist farmers with early crop disease detection. This format can assist the Department of Agriculture and other agricultural institutions in working more quickly. Due to the increasing demand for rice on both local and international markets, farmers will profit financially from our study, which will also have an effect on the national economy.

CHAPTER 6

Summary, Conclusion, Recommendation, And Implication for Future Research

6.1 Summary of the Study

There are ten main rice illnesses in Bangladesh that are costing farmers' fields' money. The goal of this paper is to investigate all available technological options. Manage rice disease to keep infection levels low and reduce economic losses by doing so. In the epidemic situation, Research results estimate yield losses of up to 98% at the highest levels of infection of the breath. It is vital to take preventative steps to combat the pandemic and reduce economic loss, such as planting tolerant or resistant kinds, using disease-free types of healthy plants, using balanced fertilizers appropriately, and adhering to practical crop rotations. In response to annual productivity losses, interventions such as provide grassroots training and demonstrate in farmers' fields, inspect fields regularly, digitize disease control, revive any indigenous technology, and enhance rice production methods. This document suggests a novel course of action for the three decades leading up to 2050 under the heading "Location, Type, and Disease Specific Intelligence Management" of research, development, and growth in order to advance the area of managing rice disease.

6.2 Limitations and Conclusions

In this study, we proposed a Deep Learning architecture that is evaluated on 200 distinct photos after being trained on 676 photographs of rice leaves. 91.21% of the test photos were properly categorized using this. The model's performance was greatly enhanced by transfer learning with specified Google Net fine-tuning, but other findings on such a tiny data set were unsatisfactory. In order to further increase the accuracy, we would like to gather photographs from additional farms and agricultural research facilities in the future. We also want to use better deep learning models and other state-of-the-art research to compare with the results obtained. One day, the developed model may be utilized to detect leaf diseases in other plants that are important crops in Bangladesh.

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APPENDICE

Appendix: Studies and Reflections

Before I started, I had very little knowledge of detection methods, deep learning, or machine learning. My supervisor is a lovely individual who is always willing to assist. She was really helpful and provided me wise counsel right away. She gained a lot of knowledge while conducting the research, including how to build CNN models and better datasets. Finally, my research has taught me several machine learning and deep learning algorithms and inspired me to perform more effectively in the future.

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