A MINI PROJECT REPORT

ON

RICE CROP DISEASE DETECTION USING DEEP LEARNING

SUBMITTED IN PARTIALLY FULFILLMENT FOR THE AWARD OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

BY

MOTURU KAVYA (17RH1A05E7)

M.SAHITHI(17RH1A05C1)

MARUTHI SOWMYA(17RH1A05D3)

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1.Introduction

1.1 overview

Rice is the major food crop in India and across the globe. It is the primary staple food in many countries. It is affected by wide variety of diseases. Diseases on plants placed a major constraint on the production and major threat to food security. Hence, early and accurate identification of plant diseases are essential to ensure high quantity and best quality.

In recent years, number of diseases on rice plant and degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods and inadequate plant protection techniques. It is observed that the loss of rice crop due to pathogen varies from 26% to 52%.

There are several leaf diseases having various symptoms. It is difficult to identify the type and intensity of diseases by experienced farmers.

With the expertise and knowledge of experts, it is possible to identify the plant diseases to certain extend in small farms. This traditional method requires availability of specialists and should possess good knowledge. In several places, there is an issue of finding the experts. Secondly, the judgement can be of low accuracy.

Thirdly, it is a time consuming process. Hence, there is a need for an automated system to identify rice diseases.

In this project, a visual recognition model is built in order to identify Rice Crop disease.

1.2 purpose

In order to support the farmers with timely and quick remedy, and to improve the accuracy of plant disease identification, researches have been done on automatic plant disease classification using various machine learning algorithms including Support Vector Machine (SVM)(1-3) , Artificial Neural Networks (ANN) on variety of crops like wheat (4), maize (5), cotton (6). In plant disease identification using machine learning algorithms, the accuracy depends on feature segmentation, feature extraction

and classification algorithm used.

Deep learning techniques have shown a great promise in image classification. In recent years, they have been used to analyse diseases of mango, apple, tomato, rice, wheat. In most of the cases, they have used leaves or fruits to detect the diseases from the images. In many of these cases, they have used images from homogeneous backgrounds.

Moreover, in most cases, the datasets have been crawled from different internet sources. There are some fundamental differences regarding the pattern of diseases between rice plants and the above mentioned plants. First of all rice leaves are narrow in width and diseases can occur in any part of the leaves.

Second, in addition to leaves, the diseases and pests of rice plant can affect both stem and grain. Third, the healthy area and the affected area of the rice plants do not have any significant contrast in color.

All these factors make it extremely difficult to collect and label the affected rice plants and finally to recognize the correct disease or pest.

In this study, an automated rice disease identification system has been proposed.

2.Literature Survey

2.1 Existing problem

Leaf Brown Spot

Brown spot, shown in figure is most common and cause most damage to the quality and quantity of productivity. It is a fungal infection that affects leaf, leaf sheath. The foliar lesions may appear as dark brown or black spots measuring

0.5 – 2.0mm in size. It may be in circular or oval in shape and looks like sesame seed. This infection affects the plant at all stages from seedling stage to maturity stage.

Bacterial leaf

Bacterial leaf streak occurs in areas with high temperature and high humidity. It is transmitted through seeds and infected stubbles to the next planting season. It can

occur in fields where X. Oryzae pv. Oryzicola bacteria is present on leaves, in the water, or in the debris left after harvest.

False smut

False smut causes chalkiness of grains which leads to reduction in grain weight. It also reduces seed germination. The disease can occur in areas with high relative humidity (>90%) and temperature ranging from 25−35 ºC.

Rain, high humidity, and soils with high nitrogen content also favors disease development. Wind can spread the fungal spores from plant to plant.

False smut is visible only after panicle exsertion. It can infect the plant during flowering stage.

2.Proposed Solution

A custom classifier is build using IBM visual recognition service and the custom model is integrated. Node-Red service is also integrated.

Firstly the dataset is prepared.A proper dataset compromising images of diseased, healthy and dead leaves are required to improve the accuracy of prediction. A total of 139 mages are collected from different sources, such as the Google websites and field. It included different periods of occurrence of leaf diseases, which are divided into 3 different categories. There are 5 categories representing infected rice leaves and a category representing healthy leaves.

Rice diseases images database is created, which consists of a total of rice diseases and healthy images.

Symptoms of different diseases are seen at different parts of the rice plant such as leaf, stem and grain. Bacterial Leaf Blight disease, Brown Spot disease, Blast furnace disease,False Smut disease occurs on rice leaf. So, we have considered all these parts while capturing images.

To prevent our model from being confused between dead parts and diseased parts of rice plant, we have collected enough images of dead leaf, dead stem and dead grain of rice plants. Images of the dead parts of the plant are considered in the class of healthy plant. We consider a total of five classes. The simultaneous occurrence of diseases has not been considered.

The 4 common rice diseases include rice brown spot (RBS), rice blast furnace, rice false smut, rice bacterial leaf.The images are captured with digital color camera and images have resolutions of 5760 × 3840 pixels. The images have been captured in the rice field in real life scenario. The images have been captured in different types of backgrounds. In some images, the background is the surroundings of the field, and in some other images, the background is different colored papers. This makes

the proposed model robust to any change in background. Weather conditions are also different at different times. Some images have been captured in overcast conditions, some have been captured in sunny weather.

Once captured, the images are assessed by human experts several times and each image is annotated with appropriate acronym. It is very important to label the images with 100% accuracy as they determine the accuracy of testing data. After data annotation, the data is segregated into two datasets. Few of the images are randomly chosen of each class and put them into training set and the rest of the images are put into the test set.

After training testing of the images is performed. So in testing, after giving an image it detects the type of rice crop disease.

An application is built using Node-Red which takes image input from the user and showcases the predicted class on UI

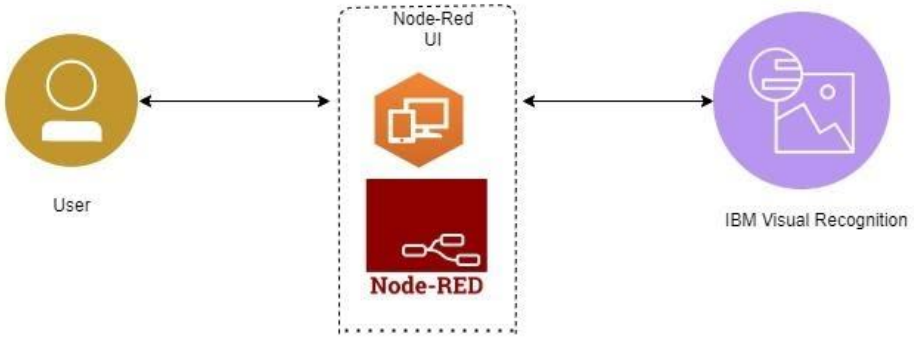
3.Theoretical Analysis

3.1 Technical Architecture

Services Used :

1. IBM Watson Visual Recognition
2. Node-Red

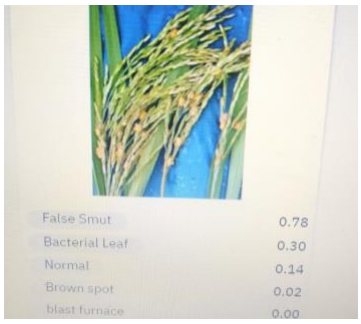
3. Cloud Object Storage Service And Watson Studio Service



4.Experimental Investigations

The five classes are trained and after successful completion of the training testing is done.

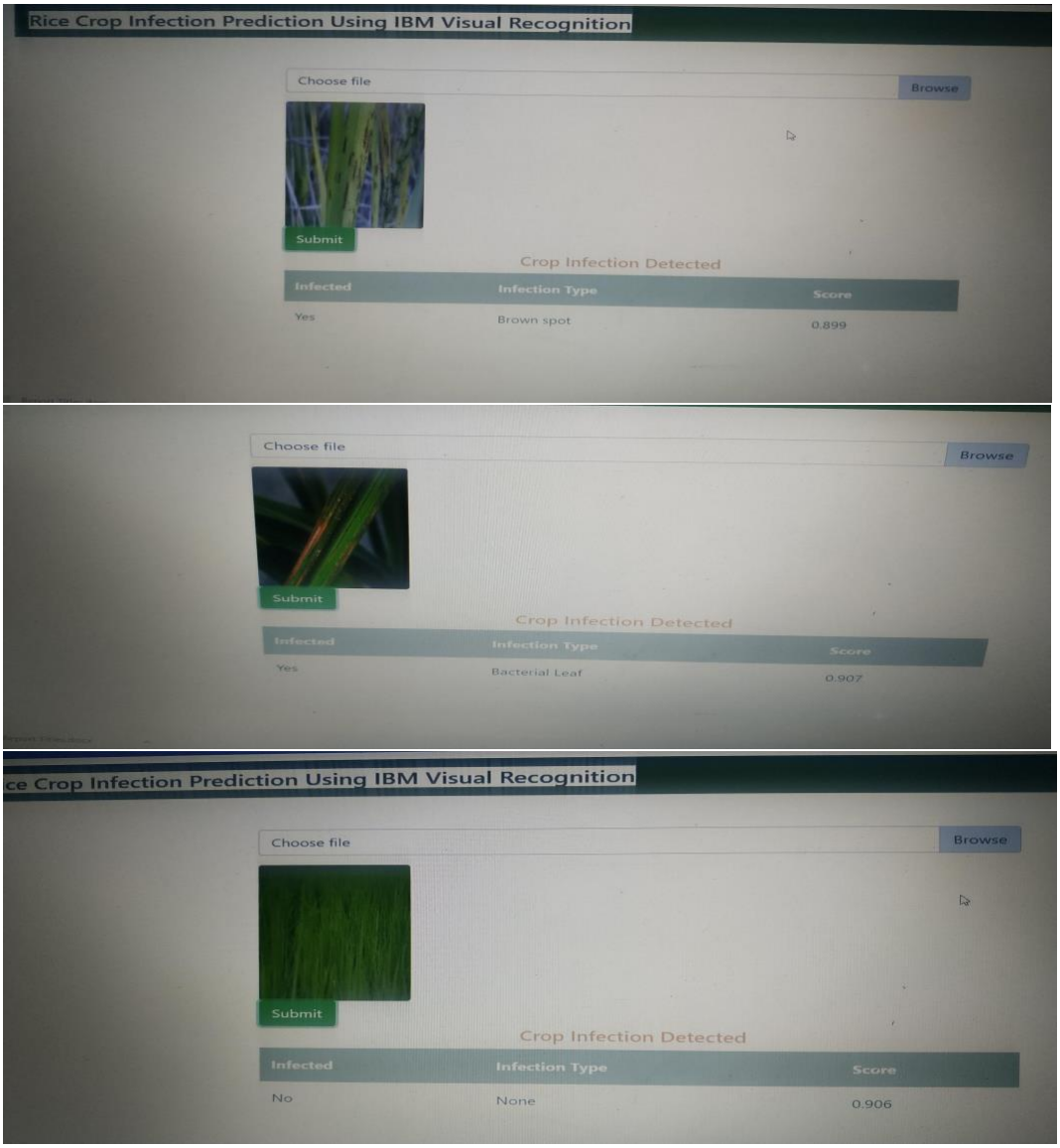
After testing the following output is generated after giving an image as input



5. Result

This project provides the identification of various rice crop diseases. Visual recognition model provides an efficient way for detecting the rice crop diseases.

The below images are the result of different diseases of a rice crop.



6.Advantages and disadvantages

The visualization technique is used for clear understanding of the rice crop diseases for example the disease brown spot is detected by using visual recognition model. It makes it quick and easy to train and test custom models. The custom classifier

which is built in this project produces score for each image for each class. The features are automatically deduced and optimally tuned for desired outcome. The deep learning architecture is flexible to be adapted to new problems in the future.

The drawbacks re very large amount of data is required in order to perform better than other techniques. It is expensive to train due to complex data models. It is not easy to comprehend output based on mere learning and requires classifiers to do so.

7.**Applicationa of deep learning for computer vision**

1. Image classification
2. Image synthesis
3. Object detection
4. Image reconstruction
5. Object ssegmentation

8.Conclusion

Though there are several methods in automated plant disease detection, it still lacks in efficiency and accuracy.. In addition, no commercial tools are available for accurate identification of plant diseases.In this project, deep learning method was explored in order to automatically classify and detect rice plant diseases from leaf images. The developed model was able to detect leaf presence and distinguish between healthy leaves and 4 different diseases. Due to the absence of dataset for rice plant exclusively, a database for rice diseases were created and the images were labelled. Various augment techniques were used to extend the dataset. The dataset was trained and has achieved a high accuracy of 99.53% . In the future research, the types of diseases to be detected will be increased. Also new models will be implemented to reduce the time and improve the accuracy.

9.Future Scope

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10.Bibliography

International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277-3878, volume, issue-5S3, February 2019

11. Appendix

A) source code


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