Rice Crop Disease Prediction Using IBM Visual Recognition

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Abstract - Agriculture is an important part of human society because it is an essential need of every organism that exists on this planet. Paddy crop cultivation is very significant for humans, especially in the Asian subcontinent. Since human beings are considered as one of the most intelligent species, we must protect the importance and productivity of agriculture. Since the entry of the IT industry, there has been some need for improvement in the productivity in agriculture. It has done a lot of work in the healthcare of agriculture. In recent past days, due to excessive use of chemicals and pesticides, diseases in plants have increased at a higher rate. These diseases in agricultural plants cannot be neglected as they can be harmful in later stages. Also due to lack of technical knowledge, sometimes it becomes difficult for human beings to detect these diseases alone with their naked eyes. The spread of diseases has increased drastically in recent past years. Globalization, trade, and climate change, as well as reduced resilience in production systems etc , are the major reason for the disease in the paddy crop in agriculture. Plant pathogens can be fungal, bacterial, viral damage plant parts above or below the ground. Identifying symptoms and knowing when and the way to effectively control diseases is crucial.

Key Words: paddy crop, IBM Watson, Node-RED,

1.INTRODUCTION

Agriculture development is one of the most powerful strategies to end extreme indigence and boost the shared prosperity of society. Agricultural production also aims to feed 9.7 billion people by 2050. A large part of the income in the world comes from agriculture. In addition, there are major risks in agricultural growth, poverty reduction, and food security due to frequent climatic changes and other weather factors. The negative impact of climate change on agriculture begins at both the national and global levels, as well as the loss of jobs for many farmers. Human error also plays a major role in destroying agriculture, since excessive use of pesticides and insecticides destroys crops. It is essential to note as well that disease has a very nasty effect on agriculture. Plant diseases are just as critical as those that affect people. If not treated in time, may lead to the destruction of the plant.

The paddy crop serves as a major source of employment, employing people as farmers across the Asian subcontinent. It is not only a source of employment but also helps to a certain extent to end poverty. The Asian subcontinent consumes a great deal of rice. Rice is a staple food in more than 100 countries worldwide, where it is consumed with more than one meal a day. It is especially low cost, making itself accessible to everyone. It is high calories and starch. But recently there have been a few difficulties in developing paddy crops. As not cured early, it may lead to a huge loss of Paddy Crop.

Nowadays there have been some challenges in growing the paddy crop. Some of the major factors for this are climatic conditions, lighting conditions, humidity, nutrients, fertilizer, and farming condition. Manual detection of those diseases is often time-consuming as it cannot be detected by the naked eye it can result in incorrect diagnosis and misuse of pesticides. The proposed model detects what disease the plant is suffering from. There are various categories of diseases, this may be blast furnace, brown spot, and Sheath Blight, etc.

This model uses Visual Recognition for the prediction of disease of the rice crop. The data sets have been created and then trains on them to give the desired result. This model is run in Cloud Object Storage Service by IBM.

2. RELATED WORK

[1] Anup Vibhute had surveyed different applications of image processing in agriculture. They discussed image processing according to the image processing

has been proved to be an effective tool for analysis in various fields and applications

[2] S.D.Khirade and A.B.Patil give out a survey on different image processing techniques used for the detection of plant disease using leaf images. This paper describes different detection methods like image acquisition, image pre-processing, feature extraction, image segmentation, and classification. This paper discussed the methods which are used for the detection of plant diseases using their leaves images. This paper also discussed some segmentation used in plant disease detection.

[3] H. Wang the works in this presented plant disease detection. Their paper intends to focus on the survey of the application of image processing in the agriculture fields such as imaging techniques, fruit grading. This paper presents some of the existing image processing techniques in agriculture. Image processing techniques in agriculture are mainly used for image categorization based on shape, size, color, and texture for decision-making.

[4] T. Suman had surveyed on detection and classification of leaf disease. Their paper is intended to aid in the detection and classification of leaf disease of grape using the SVM classification technique. They also discussed Image Processing which is one of the widely used techniques is adopted for plant leaf disease detection and classification. First, the diseased region is found using segmentation by K-means clustering, then both colour and texture features are extracted.

3. BACKGROUND STUDY

The objective of this research is to identify what type of disease the rice plant is suffering from. The diseases that the paddy crop is suffering from are described below.

A. Brown Spot

This disease is the black spots that form on the leaves of the rice plant. Brown spot has traditionally been ignored as one of the most common and most damaging diseases in rice crops. This disease are often identified by its symptoms just like the death of seedlings, death of huge areas of the leaf, brown spots, or black spots. It comes under the fungal class. It causes both quantity and quality loss. It causes a 5% yield loss all over South and South East Asia. Normally, the most obvious sign of this damage is numerous spots on the leaves that can ultimately kill an entire leaf. An infection in the seed can result in unfilled grains or seeds that are spotted or discoloured. We can make sure the rice plant is not suffering from this disease by providing the crop with the correct amount of nutrients and by avoiding water stress. Treating seeds with the chemical can also be helpful as it decreases the chance of infection.

Figure 1. Brown Spot

B. Bacterial Leaf

The bacterial blight of rice, which is one of the most destructive diseases of rice, is also known as bacterial blight. During severe epidemics, crop losses can reach 75 percent, affecting millions of hectares of rice each year. Bacterial blight first appears as water-soaked streaks along the leaf tips and margins. The streaks can grow larger, and eventually they yield a milky material that dries into yellow droplets.

Figure 2. Bacterial Leaf

C. False Smut

It is a plant pathogen that causes the disease False Smut of rice which reduces both grain yield and grain quality. More than 40 countries are affected by the disease, particularly the rice-producing countries in Asia. But also in the U.S. As the common name suggests, it is not true smut (fungus), but an ascomycete. Infected rice kernels are always destroyed by the

disease. This disease is caused by chlamydospores present in the soil. It occurs mainly as qualitative damage to rice crops caused by the false smut pathogen. Rice planted earlier in the growing season can also reduce false smut disease.

Figure 3. False Smut

4. OUR PROPOSED MODEL

In our proposed models the very first task that we did is creating an account on IBM Watson and add of IBM Watson studio to it. To create a front end of models add Node-RED in the Watson studio where we use node from giving palate.

To create a visual recognition service we have to train the model. To train models in custom object detection we have created custom models as per the given guidelines in the documentation of IBM studio. v3 API & SDK gives reference to that model and v4 API & SDK give support languages. Train a model is an easy step that is done without coding. After the trained model, classify the images from the database. The upload zip files of crop images on the database.

Visual Recognition custom object detection identifies the location and item in an image & based on a set of images in the training data model.

Behind each node, we write code in template node write HTML, CSS, and JavaScript code which is core node in Node-RED. In the function node, we have the default msg. payload method.

In Visual Recognition, we pass the API key which was generated at the time of the training model. Service end-point and msg node gives the msg as an output

5. IMPLEMENTATION

For our Visual Recognition Service, we have used this architecture. In this architecture there are 3 main components.

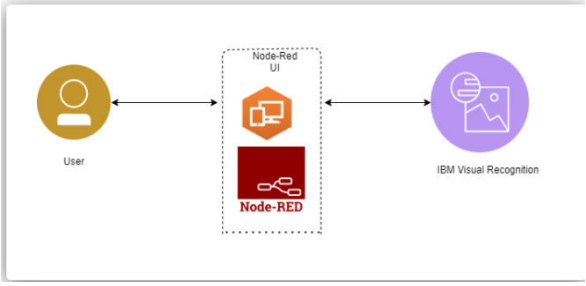

Figure 4. Service Architecture

A] User: Here user plays an important role in this service architecture. As per the input given by the user, the service gives the output. To give an input user have to click the image of the crop and submit it to the Node-Red UI through the front end. Also, the user will get the output from the front end.

B] Node-RED UI: The Node-RED program is for visualizing code, and it was originally developed by IBM for connecting hardware devices, APIs, and internet services as a part of the IoT. It provides a JavaScript function editor that is accessible through a web browser. Display nodes appear on the UI dashboard. There are multiple display pages called tabs, and each tab has a name. A Page can contain display nodes grouped into Groups. Whenever you drag a node onto the flow canvas, you must edit it in order to target a tab and a group. Users can create quick and easy dashboards for live data.

C] IBM Visual Recognition Service: This service uses a deep learning algorithm to analyse images for the contents. The output contains the keyword that provides information about the image. Visual Recognition Custom Object Detection identifies items and their location in an image based on a set of images with labelled training data that we provide in the

database. Deep learning is a subset of machine learning where neural network algorithms are inspired by the human brain and perform a task repeatedly and gradually improve the response.

D] LINKING NODES

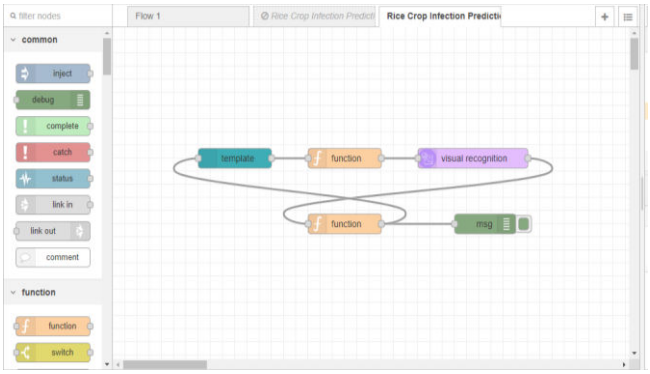

Figure 5. Linking Nodes

In above figure you can see how we connect nodes in Node-RED UI and its data-flow.

I] Template: There are two template nodes in node-red. They are the HTML template node and the dashboard template node. HTML template node which is a core node, and is located in the function section.

II] Function: This node allows JavaScript code to be run against the messages that we passed through it. The message is passed in as an object called msg that will have a a msg.payload property containing the body of the message.

III] Msg: The message that passes through a data flow are plain JavaScript objects that can have a payload property. This is the default property that most nodes will work with.

E] Process Flow Model

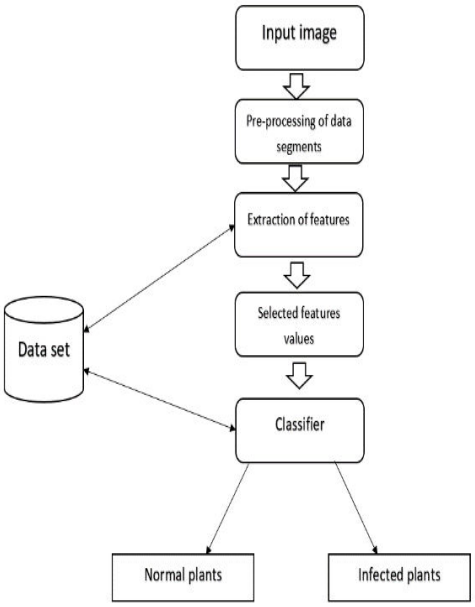

Figure 6.FlowChart

5. RESULT

After testing the model with the testing data, the model successfully predicted what type of diseases the rice plant might be suffering from.

6. CONCLUSIONS

In the agricultural industry, widespread disease is one of the Principle causes of low yield. Most commonly, the disease is detected and identified when it advances to a severe stage. The result is a loss of time, yield, and money. The proposed system permits early detection of the disease on the leaf even before symptoms appear. Thus, it is possible to conserve losses and lower dependency on expertise to a certain extent. It can assist someone who has less knowledge about the disease.

We can then extract the features associated with the disease Based on these goals. One of the reasons that disease detection in plants is important in the agricultural field is that having diseases in plants is quite natural. Plant diseases can be detected automatically, as it reduces the amount of work

required to monitor a large field of crops, and it detects symptoms of disease
at an early stage, that is when they appear on plant leaves. The purpose of this paper is to describe a method by which plant leaf diseases can be detected and diagnosed, which hopefully will be beneficial to farmers everywhere who would like to improve the health of their crops and treat the afflicted ones at an early stage. Our proposed system is intended to contribute positively to the field of agriculture.

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