

Paddy Leaf Disease Detection using Machine Learning

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Abstract—Nowadays, Farmers are facing loss in crop production due to many reasons. One of the major problems for the above issue is crop diseases. This is due to a lack of knowledge about the disease and pesticides or insecticides available in order to control the disease. But finding the current disease and providing the best remedies requires expert opinion or prior knowledge in order to control the disease. This is time-consuming and expensive. In order to solve the above issue we are developing a Machine Learning model using a K-Means and SVM algorithm to detect the paddy crop disease using the image and provide a suitable remedy. The remedies provide appropriate information regarding pesticide or insecticide to be used in order to cure the disease.

Index Terms— Machine Learning Model: K – MEANS and SVM Algorithms. Training Model: Disease Detection - Bacterial Blight & Rice Blast.

I. INTRODUCTION

India's most of the economy comes from Agriculture and it is the second-largest producer of Wheat and Rice. Indian agriculture is composed of many crops like paddy, wheat, sugarcane, oilseeds, vegetables, and fruits. Due to emerging growth in the population, the agriculture sector needs better advancement using the latest technologies.

For a better yield, the crop should be healthy. Therefore a highly effective and cost efficient method is needed for the fast detection of crop disease. Paddy is one of the important food crops in the world and India is the largest producer of paddy. Paddy is infected by some disease which is caused by fungi, bacteria, and viruses. But farmers lose a 37 % estimated average of paddy due to paddy crop diseases every year. The major issue is farmers are unable to identify the disease properly and they do not know the proper preventive methods in order to control the disease. There are a number of remedial measures available like varieties of pesticides or insecticides to control the crop diseases and increase the crop production. But finding the current disease and providing best remedies requires expert opinion or prior knowledge in order to control the disease. This is time consuming and expensive.

The presence of disease on the plant is reflected on leaves by showing some specific symptoms related to that disease. These specific symptoms act as a feature in order to detect the particular disease. Using these features we developed a machine learning model of the latest technology which is less expensive and provides accurate results with less span of time while detecting the paddy crop diseases and provides the best remedies such as insecticides or pesticides in order to control the disease. We have taken only two paddy diseases that occur frequently and lead to more loss in paddy crop production.

II. PADDY DISEASES

Paddy is frequently affected by Rice Blast and Bacterial Blight diseases, this leads to decrease in paddy crop production.

A. Rice Blast

Rice Blast is caused by a fungus named *Magnaporthe oryzae* and it affects the leaf collar, neck and leaf node of the paddy crop.



Fig 1: Rice Blast

B. Bacterial leaf blight

- Bacterial leaf blight is caused by bacteria called *Xanthomonas oryzae*.
- Bacterial leaf blight is one of the deadly and destructive diseases of paddy and it may lead to crop loss of 75%.
- Blight causes yellowing and drying of leaves.



Fig 2: Bacterial Leaf Blight

C. Problem Definition

The basic problems regarding with crop is on the field, a fast and accurate recognition and classification of the Disease is required by inspecting the infected leaf images also recognize the severity of the Disease .There are two main characteristics of plant-disease detection machine-learning methods that must be achieved, they are: speed and accuracy. The damage diagnosis of different crops and vegetables has traditionally been done manually. Several efforts have been made to use image processing systems to automate the process through this research work.

“To Detect Diseases on leaves of the plant and recommend the pesticide as per the types of disease to Farmer”

III. METHODOLOGY

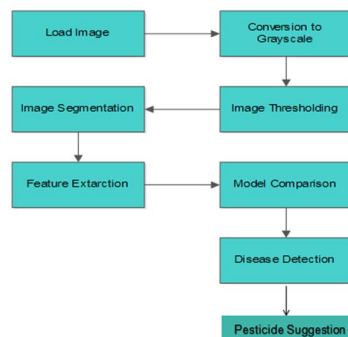


Fig 3: Methodology

A. Description

The figure 3 shows the basic Methodology of the project.

User will upload an leaf image that image will be converted into a greyscale image for faster processing, after greyscale the image thresholding will be done and then image segmentation will be displayed to the user after that feature extraction will be done and then model comparison will take place. This diagram indicates the process of program. Processes are represented in the steps that are performed in the system, image will be given as input to the system and the output will be the disease detected and Pesticide Suggestion. in the end the system will detect the disease and the output will be viewed by the user.

B. System Implementation

K – Means Algorithm

Algorithm 1 <i>k</i> -means algorithm
1: Specify the number k of clusters to assign.
2: Randomly initialize k centroids.
3: repeat
4: expectation: Assign each point to its closest centroid.
5: maximization: Compute the new centroid (mean) of each cluster.
6: until The centroid positions do not change.

C. Description

K-Means Clustering is a concept that falls under Unsupervised Learning. This algorithm can be used to find groups within unlabelled data. In contrast to traditional supervised machine learning algorithms, K-Means attempts to classify data without having first been trained with labeled data. Once the algorithm has been run and the groups are defined, any new data can be easily assigned to the most relevant group.

D. SVM Algorithm

SVM Algorithm
Input: k, m, q, C, γ , and termination criterion
Output: Optimal value for SVM parameters and classification accuracy
Begin
Initialize k solutions
call SVM algorithm to evaluate k solutions
$T = \text{Sort}(S_1, \dots, S_k)$
while classification accuracy $\neq 100\%$ or number of iteration $\neq 10$ do
for $i = 1$ to m do
select S according to its weight
sample selected S
store newly generated solutions
call SVM algorithm to evaluate newly generated solutions
end
$T = \text{Best}(\text{Sort } S_1, \dots, S_k + m), k)$
end
End

E. Description

Support vector machine (SVM) is a supervised Machine Learning Algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n -dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

F. Paddy Leaf Disease Detection(Snapshots) :

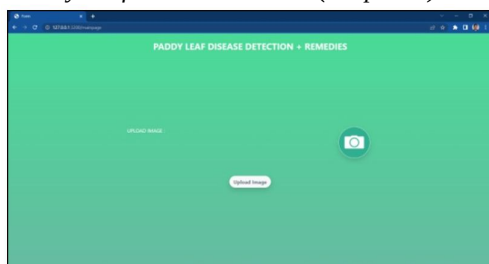


Fig 4: Home Page

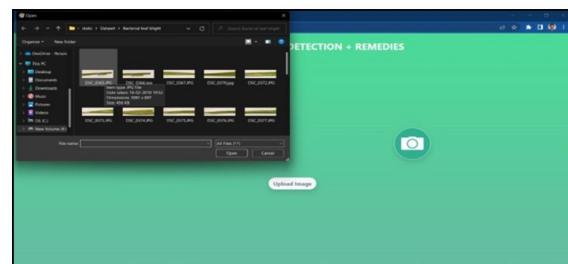


Fig 5: Uploading Image

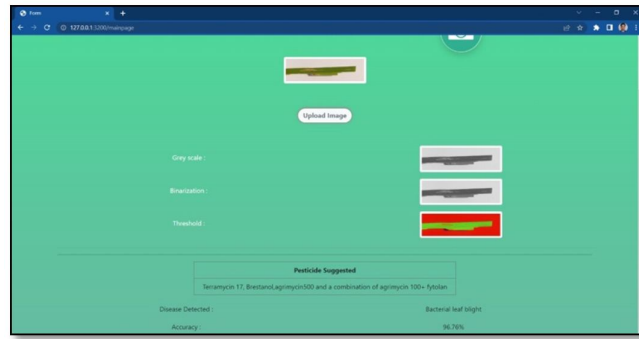


Fig 6: Disease Detection and Pesticide Suggestion

The above snapshots shows the clear picture of how our project is detecting the Disease in Paddy leaf i.e. Rice Blast and Bacterial Leaf Blight and Suggests the Pesticides to the Farmer so that a Farmer can overcome from Loss of Crop and It shows whether the leaf is Diseased or not based on the datasets we have provided. As mentioned before, the Disease is detected based on the features we have provided and thus will be processed in the algorithm we are using i.e. K - MEANS and SVM.

IV. CONCLUSION

This project provides an efficient way for leaf disease detection. There are main characteristics of disease detection are speed and accuracy. Hence there is working on development of automatic, efficient, fast and accurate which is used for detection of disease on unhealthy leaf. Work can be extended for development of hybrid algorithms & neural networks in order to increase the recognition rate of final classification process. Further, it is needed to compute the amount of disease present on leaf.

V. FUTURE WORK

In the future, more studies on the use of ANN and CNN can be done to observe the implications of their use, performance, and utility. The system can be enhanced in the way that it can detect more number of diseases and the system accuracy and time can also be reduced more.

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