An Extensive Study On Various Types Of Rice Plant Diseases Using Machine Learning Based Image Processing Techniques

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Abstract- *Rice Plant Disease is one of most serious plant disease as rice crops are crucial source of food among the rural population among the most cereal crops cultivated around the world. One of the important aspects to reduce the effects of the plant diseases is to identify, detect, and to make immediate measures. Conventional manual identification is inefficient, time-consuming and costly. Although the operation of the diseases map is simple, some diseases with high similarity are easy to be misunderstood. In order to determine the plant disease, automation based system based on image processing techniques has become inevitable in field of agriculture. In this paper, an extensive study has been carried out on the Machine learning models based image processing techniques towards determining various types of the Rice Plant Diseases. The image processing techniques are applied for collecting the disease portion of the image and extracting relevant disease-related features along the image enhancement and filtering techniques to eliminate the noise, Inference of complex background and other image related artifacts. In addition, relevant hidden information useful for disease detection based on the extracted features also was extracted using feature selection models. This analysis is to explore the current scenario about the agricultural plant disease identification system using classification algorithm against the plant diseases such as rice blast, bacterial blight and brown spot. Finally outline of the proposed methodology as framework to predict the prognosis of the plant disease has provided. Evaluation of models has been carried out on the rice plant disease data.*

Keywords- Rice Plant Disease, Image Classification, Machine Learning, Disease Identification

I. INTRODUCTION

Rice Plant is one of world's major food crops which are stable in cultivation and it is related to nation development in agriculture sector. Thus it is becoming important to secure and monitor the rice plant against various diseases and serious losses due to climatic changes. Especially rice plant diseases are major consideration among the farmers. In order to determine the rice plant diseases using conventional manual process is labour intensive and time consuming. To eliminate the aforementioned issues, automated system to detect the plant disease has been enabled using the image processing and data mining paradigms[1]. Image Processing technique using machine learning models towards rice plant disease gain significant attention in recent years on accurate estimation of diseases at right time.

Image processing techniques has proven to be accurate and economic practises in measuring the rice plant diseases on various parameters[2]. In this work, an extensive survey has been made on comparing the different machine learning model employed on diagnosis of the plant diseases by identifying the leaf characteristics. In this part, various clustering algorithms, classification algorithms and feature selection algorithms[3] for disease diagnosis and recognition has been analysed on various datasets. Those techniques have been used for segmentation, extracting features, normalizing the extracted feature and it is to select the optimal feature. Otherside image recognition technique has been analysed which ensures good accuracy on various types of the rice plant disease such as rice blast, bacterial blight and brown spot[4].

The remainder of this paper is organized as follows: We discuss the review of literature in Section 2 and presents machine learning technique for plant disease mining models in Section 3. Section 4 provides objective of the work and section 5 outlines the proposed methodology. Section 5 provides conclusion of the work.

II. REVIEW OF LITERATURE

In this section, various existing model applied to diagnosis of the plant disease on rice plant by utilizing machine learning model has been detailed as follows.

2.1 Automated leaf disease detection in different crop species through image features analysis and One Class Classifiers

In this method, an automated way of crop disease identification on various leaf sample images corresponding to different crop species employing Local Binary Patterns (LBPs) for feature extraction and One Class Classification for classification has been analysed and it uses a dedicated One Class Classifier for each plant health condition[5]. The algorithms trained on various plant leaves have been tested in a variety of crops to achieve a very high generalization behavior. This particular model eliminates conflict resolution between One Class Classifiers to provide the correct identification when ambivalent data examples possibly belong to one or more conditions.

Drawbacks of the model

- Color based feature extraction fails to map exact area of the disease affected plant in terms of axis and area

2.2 Identification of Alfalfa Leaf Diseases Using Image Recognition Technology

In this method, Common leaf spot (caused by Pseudopeziza medicaginis), rust (caused by Uromyces striatus), Leptosphaerulina leaf spot (caused by Leptosphaerulina briosiana) and Cercospora leaf spot (caused by Cercospora medicaginis) are the four common types of alfalfa leaf diseases has been analysed using image recognition technique. Initially a sub-image with one or multiple typical lesions was obtained by artificial cutting from each acquired digital disease image. Then the sub-images were segmented using twelve lesion segmentation methods integrated with clustering algorithms such as K_means clustering, fuzzy C-means clustering and K_median clustering. Finally supervised classification algorithms using logistic regression analysis, Naive Bayes algorithm, classification and regression tree, and linear discriminant analysis have been carried out on the obtained features to identify lesion image[6].

Drawbacks of the model

- Sudden changes in the Intensity values fails to incorporate the homengentity and correlation based analysis

2.3 Computer vision based on approach to detect rice leaf diseases using texture and color descriptors

In this method, a computer vision based automatic system for the diagnosis of diseases caused by pests in the rice plants has been proposed. Automatic disease detection using computer vision approach involves three types of feature extraction such as Diseased area of the leaf, textural descriptors using gray level co-occurrence matrix (GLCM) and color moments are extracted from diseased and non-diseased leaf images resulting in 21-D feature vector[7]. Genetic algorithm based feature selection approach is employed to select relevant features and to discard redundant features, generating a 14-D feature vector that reduces the complexity. Finally support vector machine (SVM) is used for classification of the leaf diseases.

Drawbacks of the model

- Feature vector with high dimensionality will lead to misclassification error on determining the diseased segment

2.4. Detection and Classification of Rice Diseases: An Automated Approach Using Textural Features

In this method, detection and classification of diseases for various plants has been carried out on the structure of the plant and appearance of the disease on the plant. In this work, Support vector Machine is used to analyze and classify plant diseases on optimizing parameters (gamma, nu) for maximum efficiency[8]. The process consists of two phases, i.e. training phase and disease prediction phase. The approach identifies disease on the leaf using trained classifier. The model process the outcome with less misclassification error and high accuracy.

Drawbacks of the model

- Extraction of this model limits to certain edges

2.5. A clustering framework based on FCM and texture features for denoising patch patterns with variable density

In this method, object detection using ensemble technique has been used to identify the plant diseases on combining multiple low-level image features with high-level context. This method combines fuzzy c-means (FCM) clustering and texture features energy, contrast, homogeneity and correlation, which can characterize the densities of image[9]. Finally, the filtered low and high density image patches are combined to obtain the final denoising results of the patch patterns with variable density. Finally the filtering strength applied in high density fringes can be different from that in low density fringes in a patch pattern, which can improve the performance of any filtering method in the denosing of patch patterns with variable density.

Drawbacks of the model

- Fuzzy clustering generates the non appropriate strategies which lead to large computation cost on determination of feature weight.

III. OVERVIEW OF DEEP LEARNING TECHNIQUE TO DETECT RICE PLANT DISEASES

Rice Plant disease diagnosis necessitates the modelling of plant diseases and detection process of the plant which inherently utilizes the feature extraction, feature selection and classification model. In order to reduce the computation cost and to increase the accuracy of the diagnosis of disease, deep learning technique has been projected on basis of location and feature of rice diseases. Deep learning architecture has inbuilt multi layer for feature extraction and classification.

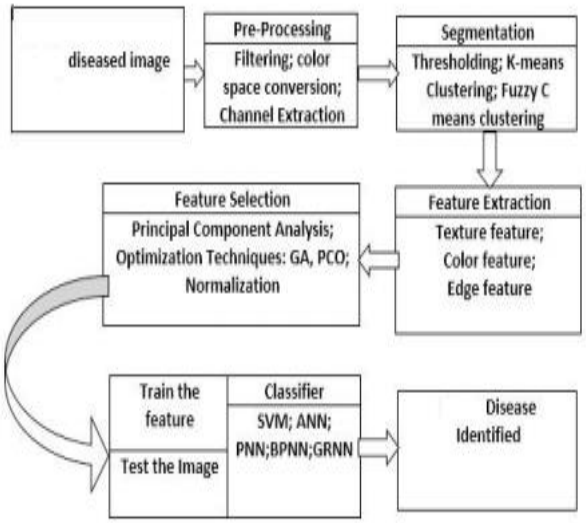

Figure 1: Flow of the Disease Diagnosis Architecture using Machine Learning Techniques

It is to provide an efficient classification of objects even when there are a smaller number of examples of training per class. Figure 1 Represents the architecture of the disease diagnosis process using machine learning model. Using deep structured learning concepts designed, it is easy to detect and distinguish the diseased with the healthy crop images.

Objective of the work

Research is focused on plant disease identification and classification. The objective of the study is to detect the disease of rice plant life at their earlier stages and its type of diseases. The diagnosis technique towards identification of the stages of the disease has been computed on the leaf characteristics. The objective of the work is to segment the region which can be constructed using Convolutional Neural Network with effective strategies towards diagnosis of the disease outcome on the rice plant leaves.

Outline of the methodology

In deep learning architectures, analysing of the large amount of data with varied characteristics of plant structures more accurately and finding more significant prediction of the diseases is becoming essential in current research. To enable the effective solution, a novel framework has to be established on inclusive of solutions to handle above mentioned difficulties. The framework composed of methodology is as follows

- **Eagle strategy enabled Deep Convolution Neural Network Based Rice Leaf Disease Detection**

The particular methodology is employed as diagnosis technique toward plant disease using deep learning model termed as Deep Convolution Neural Network with eagle strategies to predict the prognostic outcome of the Rice plant disease and its disease types. The model determines the regions related to the infected area.

- **Hyper Parameter optimization of Deep Convolution Neural Network to identity mineral deficiency**

Optimization of the CNN techniques has been carried out on hyper parameter using quantum annealing to optimize the complexity of the segmented region processing on estimating the global minima of the error function towards identifying the mineral deficiency in the rice plant of the image collected[10].

IV. CONCLUSION

In this paper, an extensive study on the machine learning technique to diagnosis of rice plant disease has been presented in detail. It has been analysed on various processing step of the machine learning paradigms on basis of preprocessing, feature extraction, feature selection and feature classification against characteristic of plant leaves. Especially diagnosis model deals on classifying the disease region accurately on the underlying extracted features. These analyses help to model a new methodology as framework for disease identification and interventions on various characteristics of the plant leaves to numerous kinds of diseases along the identification of mineral deficiency in the plant.

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