A LITERATURE SURVEY ON FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASEPREDICTION

TEAM LEADER: Mahantesh S

TEAM MEMBER: Gowtham.H, Ningaraju.S, Vaigairaj.M, Naveen.S.

ABSTRACT

Agriculture is the main aspect of country development. Many people lead their life from agriculture field, which gives fully related to agricultural products. Plant disease, especially on leaves, is one of the major factors of reductions in both quality and quantity of the food crops. In agricultural aspects, if the plant is affected by leaf disease then it reduces the growth of the agricultural level. Finding the leaf disease is an important role of agriculture preservation. After pre-processing using a median filter, segmentationis done by Guided Active Contour method and finally, the leaf disease is identified by using Support Vector Machine. The disease-based similarity measure is used for fertilizer recommendation.

Keywords: Disease Prediction, Graph Cut Algorithm, Guided Active Contour method, Leaf segmentation, Leaf Feature Identification.

INTRODUCTION

Detection and recognition of plant diseases using machine learning are very efficient in providing symptoms of identifying diseases at its earliest. Plant pathologists can analyze the digital images using digital image processing for diagnosis of plant diseases. Application of computer vision and image processing strategies simply assist farmers in all of the regions of agriculture. Generally, the plant diseases are caused by the abnormal physiological

functionalities of plants. Therefore, the characteristic symptoms are generated based on the differentiation between normal physiological functionalities and abnormal physiological functionalitiesof the plants. Mostly, the plant leaf diseases are caused by Pathogens which are positioned on the stems of the plants. These different symptoms and diseases of leaves are predicted by different methods in image processing. These different methods includedifferent fundamental processes like segmentation, feature extraction and classification and so on. Mostly, the prediction and diagnosis of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.

MATERIAL AND METHODS

A digital camera or similar devices are used to take images of different types, and then those are used to identify the affected area in leaves. Then different types of image-processing techniques are applied to them, the process those images, to get different and useful features needed for the purpose of analyzing later-Plant leaf disease identification is especially needed to predict both the quality and quantity of the First segmentation step primarily based on a mild polygonal leaf model is first achieved and later used to guide the evolution of an energetic contour. Combining global shape descriptors given by the polygonal model with local curvature based features, the leaves are then classified overleaf datasets. In this research work introduce a method designed to deal with the obstacles raised by such complex images, for simple and plant leaves. A first segmentation step based on graph-cut approach is first performed and later used to guide the evolution of leaf boundaries, and implement classification algorithm to classify the diseases and recommend the fertilizers to affected leaves as shown in Figure.

MODULES

- Image Classification Steps
- Image acquisition
- Preprocessing
- Segmentation
- Disease Prediction
- Fertilizer Recommendation

IMAGE CLASSIFICATION STEPS :

The proposed image classification technique is divided into the following steps:

IMAGE ACQUISITION:

To get the image of a leaf so that evaluation in the direction of a class can be accomplished.

PREPROCESSING:

The purpose of image preprocessing is improving image statistics so that undesired distortions are suppressed and image capabilities which are probably relevant for similar processing are emphasized. The preprocessingreceives an image as input and generates anoutput image as a grayscale,an invert anda smoothed one.

SEGMENTATION:

Implements Guided active contour method. Unconstrained active contours applied to the difficult natural images. Dealing with unsatisfying contours, which would try and make their way through every possible grab cut in the border of the leaf. The proposed solution is used the polygonal model obtained after the first step not only as an initial leaf contour but also as a shape prior that will guide its evolution towards the real leaf boundary.

DISEASE PREDICTION:

Leaves are affected by bacteria, fungi, virus, and other insects. Support Vector Machine (SVM) algorithm classifies the leaf image as normal or affected. Vectors are constructed based on leaf features such as color, shape, textures. Then hyperplane constructed with conditions to categorize the pre-processed leaves and also implement multiclass classifier, to predict diseases in leaf image with improved accuracy.

FERTILIZER RECOMMENDATION:

Recommend the fertilizer for affected leaves based on severity level. Fertilizers may be organic or inorganic. Admin can store the fertilizers based on disease categorization with severity levels. The measurements of fertilizers suggested based on disease severity.

ALGORITHM USED

Support Vector Machine (SVM)

SVM CLASSIFICATION ALGORITHM:

SVM is a binary classifier to analyze the data and recognize the pattern for classification. The main goal is to design a hyperplane that classifies all the training vectors in different classes. For linear separable data sets, training vectors of a different class of pairs(am,bm), where m = 1,2,3,4 …,t

am ϵ Rn(Reference Vector

bm ϵ { +1, -1}

SOFTWARE REQUIREMENTS

SOFTWARE REQUIREMENTS

- Operating system :windows 10
- IDE :python spyder

HARDWARE REQUIREMENTS

- Processor : Intel i3
- Hard Disk Capacity : 300 GB
- RAM : 4.00 GB
- Monitor : 15” Color Monitor
- Keyboard : 102 Keys

PROPOSED METHOD

The proposed approach was organized in such a manner, that it is universal to all the users in the world.

ADVANTAGES PROPOSED METHOD

- Our proposed system is that it was user friendly and highly efficient.
- The proposed system maintain privacy and also predicts accuracy.

EXISTING METHOD

The method was prone to various disadvantages. Even when the framework was digitalized, it has certain problems as, predicting a diverse fertilizer for a soil type, certain files regarding the leaf disease or soil type or fertilizer

DISADVANTAGES:

- The process of finding the soil type, identifying the leaf disease and preferring the fertilizer were all carried out manually.
- In other situation the system may not provide the needed support .

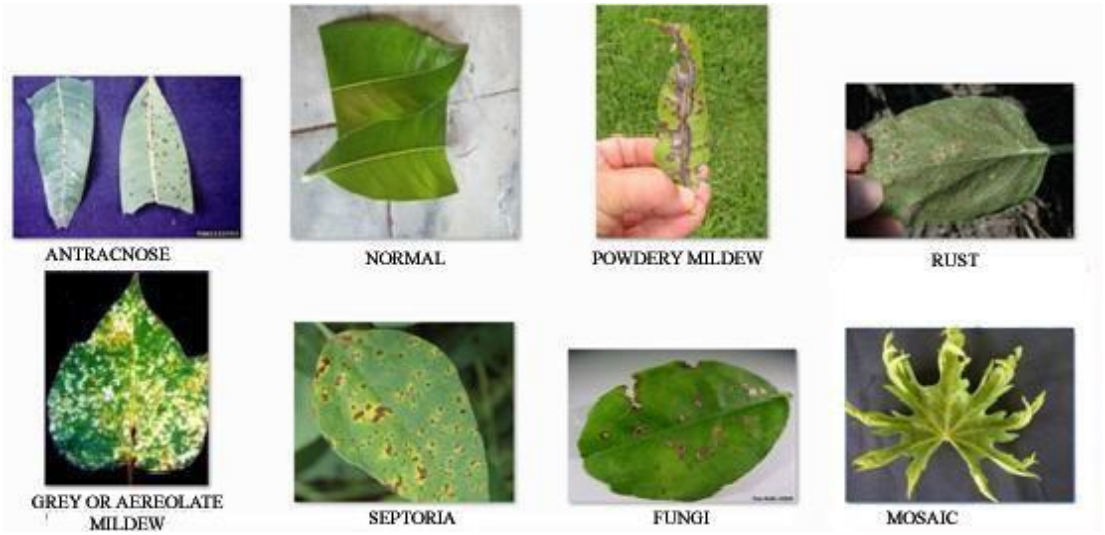
DEVELOPMENT TOOLS

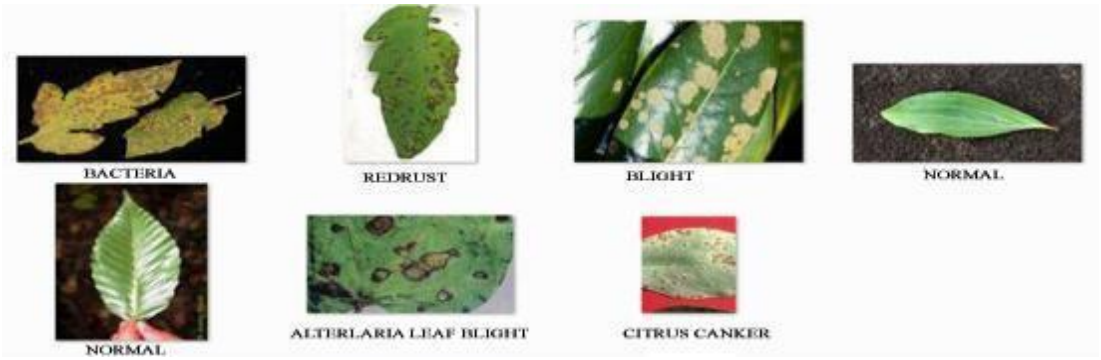
```
import tensorflow.keras.preprocessing
import load_model
import os
import numpy as np
import pandas as pd
import tensorflow as tf
import render_template
import requests
import secure_filename
import set_session
```

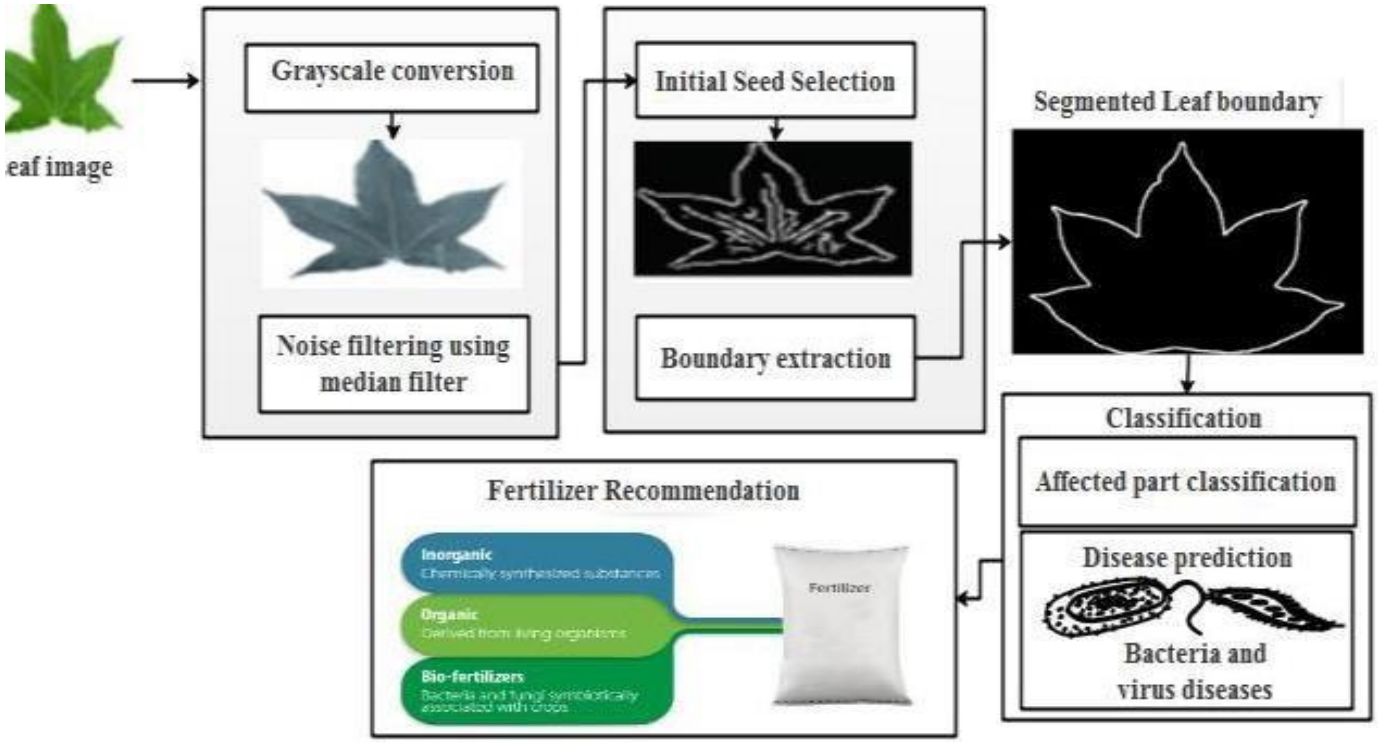
RESULTS AND DISCUSSION

To compare the performance of the proposed SVM method with the existing CNN (Convolutional Neural Network) method. Metrics such as True Positive, False Positive, True Negative, FalseNegative are used. The proposed method is implemented using .NET. The code

existing CNN method was written in Python was downloaded from theweb [https://github.com/cs-chan/Deep-Plant]. 15 images were captured using a camera for testing purpose is given in Figure







True Positive: True Positive is an outcome where the model correctly predicts positive class.False Positive: False Positive is an outcome where the model incorrectly predicts positive class.True Negative: True Negative is an outcome where the model correctly predicts negative class.False Negative: False Negative is an outcome where the model incorrectly predicts negative class.The True Positive, False Positive, True Negative, and False Negative value for captured 15 images .

CONCLUSIONS

The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

FUTURE SCOPE

The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits. Using the fertilizers to improve the plant growth and high yield.

REFERENCES

1. Reyes Angie .K, Juan C. Caicedo,and Jorge E. Camargo, "Fine-tuning Deep Convolutional Networks for Plant Recognition", InCLEF (Working Notes), 2015.

2. Hamrouni .L, Aiadi .O, Khaldi .B and Kherfi .M.L, "Plants Species Identification usingComputer Vision Techniques",Revue des

Bioressources7, no. 1, 2018.

3. Dimitrovski, Ivica, GjorgjiMadjarov, DragiKocev, and PetreLameski, "Maestra at LifeCLEF 2014 Plant Task: Plant Identification using Visual Data", InCLEF (WorkingNotes), pp. 705-714, 2014.

4. Naresh, Y. G., and H. S. Nagendraswamy, "Classification of medicinal plants: an approach using modified LBP with symbolic representation",Neurocomputing173, pp:1789-1797, 2016.

5. Kaur, Lakhvir, and Vijay Laxmi, "A Review on Plant Leaf Classification and Segmentation",International Journal Of Engineering And Computer Science5, no. 8,2016.

6. Kadir, Abdul, Lukito Edi Nugroho, AdhiSusanto, and Paulus InsapSantosa, "Leaf classification using shape, color, and texture features", arXiv preprint arXiv:1401.4447,2013.

LITERATURE REVIEW

[1] The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

Advantages : The prediction and diagnosing of leaf diseases are depending on the segmenta- tion such as segmenting the healthy tissues from diseased tissues of leaves.

Disadvantages : This further research is implementing the proposed algorithm with the ex- isting public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.

[2] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems(ICIIECS), IEEE,2017.

Advantages: The system detects the diseases on citrus leaves with 90% accuracy.

Disadvantages: System only able to detect the disease from citrus leaves.The main objective of this paper is image analysis & classification techniques for detection ofleaf diseases and classification. The leaf image is firstly preprocessed and then does the fur- ther work. K-Means Clustering used for image segmentation and then system extract the GLCM features from disease detected images. The disease classification done through the SVM classifier.

Algorithm used: Gray-Level Co-Occurrence Matrix (GLCM) features, SVM, K-Means Clustering .

[3] Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018

Advantages: The system helps to compute the disease severity.

Disadvantages: The system uses leaf images taken from an online dataset, so cannot imple- ment in real time.

This paper mainly focuses on the detecting and classifying the leaf disease of soybean plant. Using SVM the proposed system classifies the leaf disease in 3 classes like i.e. downy mil- dew, frog eye, and septoria leaf blight etc. The proposed system gives maximum average classification accuracyreported is ~90% using a big dataset of 4775 images.

Algorithm used: SVM.

[4] Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aero- space Technology, ICECA 2017.

Advantages: It is simple and cost effective system for plant leaf disease detection.

Disadvantages: Any H/w failures may affect the system performance.

The current paper proposesan android application for irrigation and plant leaf disease detection with cloud and IoT. For monitoring irrigation system they use soil moisture and temperature sensor and sensor data send to the cloud. The user can also detect the plant leaf disease. K-means clustering used for feature extraction.

Algorithm used: K-means clustering,

Other than this there are some other levels which can be used for sentimental analysis these are- document level, sentence level, entity and aspect level to study positive and negative, interrogative, sarcastic, good and bad functionality, sentiment without sentiment, conditional sentence and author and reader understanding points.

[5] The author proposes a method which helps us predict crop yield by suggesting the best crops. It also focuses on soil types in order to identify which crop should be planted in the field to increase productivity. In terms of crop yield, soil types are vital. By incorporating the weather details of the previous year into the equation, soil information can be obtained.

Advantages : It allows us to predict which crops would be appropriate for a given climate.Using the weather and disease related data sets, the crop quality can also be improved. Pre-diction algorithms help us to classify the data based on the disease, and data extracted fromthe classifier is used to predict soil and crop.

Disadvantages : Due to the changing climatic conditions, accurate results cannot be predictedby this system.

[6] The current work examines and describes image processing strategies for identifying plant diseases in numerous plant species. BPNN, SVM, K-means clustering, and SGDM are the most common approaches used to identify plant diseases.

Disadvantages : Some of the issues in these approaches include the impact of background data on the final picture, optimization of the methodology for a specific plant leaf disease,and automation of the technique for continuous automated monitoring of plant leaf diseasesin real-world field circumstances.

[7] The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing

CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

Advantages : The prediction and diagnosing of leaf diseases are depending on the segmenta- tion such as segmenting the healthy tissues from diseased tissues of leaves.

Disadvantages : This further research is implementing the proposed algorithm with the ex- isting public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.

[8] In this paper, we propose a user-friendly web applicationsystem based on machine learning and web-scraping calledthe 'Farmer's Assistant'. With our system, we are successfully able to provide several features - crop recommendation using Random Forest algorithm, fertilizer recommendation using arule based classification system, and crop disease detection using EfficientNet model on leaf images. The user can provide the input using forms on ouruser interface and quickly gettheir results. In addition, we also use the LIME interpretability method to explain our predictions on the disease detectionimage, which can potentially help understand why our modelpredicts what it predicts, and improve the datasets and models using this information.

Advantages : For crop recommendation and fertilizer recommendation, we can provide the availability of the same on the popular shopping websites, and possibly allow users to buy the crops and fertilizers directly from our application.

Disadvantages : To provide fine-grained segmentations of the diseased portion of the dataset.this is not possible due to lack of such data. However, in our application,we can integrate a segmentation annotation tool where theusers might be able to help us with the lack. Also, we can usesome unsupervised algorithms to pin-point the diseased areas in the image. We intend to add these features and fix thesegaps in our upcoming work.

References:

[1] Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018

[2] Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.

[3] Ms. Kiran R. Gavhale, Ujwalla Gawande, Plant Leaves Disease detection using ImageProcessing Techniques, January 2014.
https://www.researchgate.net/profile/UjwallaGawande/publication/314436486_An_Overview_of_the
_Research_on_Plant_Leaves_Disease_detection_using_Image_Processing_Techniques/links/5d37106
64585153e591a3d20/An-Overviewof-the-Research-on-Plant-Leaves-Diseae
detection-using-Image-ProcessingTechniques.pdf

[4] Duan Yan-e, Design of Intelligent Agriculture Management Information System Based on
IOT‖, IEEE,4th, Fourth International reference on Intelligent Computation Technology andAutomation, 2011
https://ieeexplore.ieee.org/document/5750779

[5] R. Neela, P. Fertilizers Recommendation System For Disease Prediction In Tree LeaveInternational journal of scientific & technology research volume 8, issue 11, november 2019
http://www.ijstr.org/final-print/nov2019/Fertilizers-Recommendation-System-For-Disease-Prediction- In-Tree-Leave.pdf .

[6] Swapnil Jori1, Rutuja Bhalshankar2, Dipali Dhamale3, Sulochana Sonkamble , Healthy Farm: Leaf Disease Estimation and Fertilizer Recommendation System using Machine Learning,International Journal of All Research Education and Scientific Methods (IJARESM), ISSN: 2455-6211

[7] Detection of Leaf Diseases and Classification using Digital Image Processing
International Conference on Innovations in Information, Embedded and Communication Sys- tems(ICIIECS), IEEE,
2017.
Shloka Gupta ,Nishit Jain ,Akshay Chopade, Farmer's Assistant: A Machine LearningBasedApplication for Agricultural Solutions

S.NO	TITLE	AUTHOR NAME	YEAR OF PUBLICATION	TECHNOLOGY / ALGORITHM USED	DRAWBACKS
1	Fertilizers Recommendation System For Disease Prediction In Tree Leave	R. Neela, P. Nithya	11, November 2019	Image Processing,CNN Algorithm	The Process Of Finding The Soil Type, Identifying The Leaf Disease And Preferring The Fertilizer Were All Carried Out Manually.
2	Design And Implementation Of Fertilizer Recommendation System For Farmers	Kanaga Suba Raja Subramanian	November 2020	Machine Learning, Random Forest Algorithm, NPK Detection	In Other Situation The System May Not Provide The Needed Support
3	Soil Based Fertilizer Recommendation System For Crop Disease Prediction System	Dr.P. Pandi Selvi , P. Poornima	2, Mar-Apr 2021	IOT, Cloud Computing And Data Mining, CNN&ANN Algorithm	In Any Failure In Device Result Will Be Not Shown
4	IOT Based Crop Recommendation, Crop Disease Prediction And Its Solution	Rani Holambe, Pooja Patil, Padmaja Pawar, Saurabh Salunkhe , Mr.Hrushikesh Joshi	10,OCT-2020	IOT, Machine Learning, ANN Algorithm.	Excessive Use Of Fertilisers Damages The Plants And Reduces Soil Fertility
5	Farmer’s Assistant: A Machine Learning Based Application For Agricultural Solutions	Shloka Gupta, Nishit Jain, Akshay Chopade, Aparna Bhonde	24 APR 2022	Deep Learning, Machine Learning, CNN Algorithm	Leaching Occurs And The Fertilisers Reach The Rivers Causing Eutrophication