FACULTY OF ENGINEERING AND TECHNOLOGY

Department of Computer Science and Engineering

Global Campus, Jakkasandra Post, Kanakapura Taluk, Ramanagara District, Pin Code: 562 112

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A Project Centric Learning (PCL) Report on

"Crop Disease Prediction Using Machine Learning"

Submitted in partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the project Centric Learning (PCL) work titled **"Crop Disease Prediction Using Machine Learning"** is carried out by **Roshan Kumar (19BTRCS061), Vikash Kumar (19BTRCS105),** a bonafide students of Bachelor of Technology at the Faculty of Engineering & Technology, Jain (Deemed-to-be) University, Bangalore in partial fulfillment for the award of degree in Bachelor of Technology in Computer Science & Engineering, during the year **2022-2023**.

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DECLARATION

We, **Roshan Kumar (19BTRCS061), Vikash Kumar (19BTRCS105)** are students of seventh semester B.Tech in **Computer Science & Engineering**, at Faculty of Engineering & Technology, **Jain (Deemed - to-be) University**, hereby declare that the project Centric Learning (PCL) titled **"Crop Disease Prediction Using Machine Learning"** has been carried out by us and submitted in partial fulfilment for the award of degree in **Bachelor of Technology in Computer Science & Engineering** during the academic year **2022-2023**. Further, the matter presented in the project (PCL) has not been submitted previously by anybody for the award of any degree or any diploma to any other University, to the best of our knowledge and faith.

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Signature of Students

ABSTRACT

With increase in population the need for food is on rise, in such circumstances, plant diseases prove to be a major threat to agricultural produce and result in disastrous consequences for farmers. Early detection of plant disease can help in ensuring food security and controlling financial losses. In this project, we are focusing on the potato disease classification which are affecting the farmers adversely. If a farmer can detect these disease at early time and apply appropriate treatment then it can save lot of waste and prevent their economic losses too. We are proposing the mobile application which will detect the disease of the potato with better accuracy and at backend we are using deep learning.

Keywords: - Potato disease, image processing, segmentation, data augmentation, classification, FastAPI, Tensorflow lite, React Native, React JS, GCP, Mobile Application, Tf serving.

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Chapter 1

INTRODUCTION

The farmers in provincial regions may not able to differentiate the malady which may be available in their harvests. It's not moderate for them to go to agribusiness office and discover what the infection may be. Our principle objective is to distinguish the illness introduce in a plant by analyzing the crop picture with machine learning.

Pests and Diseases results in the destruction of crops or part of the plant resulting in decreased food production leading to food insecurity. Also, knowledge about the pest management or control and diseases are less in various less developed countries. Toxic pathogens, poor disease control, drastic climate changes are one of the key factors which arises in dwindled food production.

Various modern technologies have emerged to minimize postharvest processing, to fortify agricultural sustainability and to maximize the productivity. Various Laboratory based approaches such as polymerase chain reaction, gas chromatography, mass spectrometry, thermography and hyper spectral techniques have been employed for disease identification. However, these techniques are not cost effective and are high time consuming.

In recent times, server based and mobile based approach for disease identification has been employed for disease identification. Several factors of these technologies being high resolution camera, high performance processing and extensive built in accessories are the added advantages resulting in automatic disease recognition.

Modern approaches such as machine learning and deep learning algorithm has been employed to increase the recognition rate and the accuracy of the results. Various researches have taken place under the field of machine learning for plant disease detection and diagnosis, such traditional machine learning approach being random forest, artificial neural network, support vector machine(SVM), fuzzy logic, K-means method, Convolutional neural networks etc.…

Random forests are as a whole, learning method for classification, regression and other tasks that operate by constructing a forest of the decision trees during the training time. Unlike decision trees, Random forets overcome the disadvantage of over fitting of their training data set and it handles both numeric and categorical data.

Chapter 2

LITERATURE SURVEY

[1] S. S. Sannakki and V. S. Rajpurohit, proposed a "Classification of Pomegranate Diseases Based on Back Propagation Neural Network" which mainly works on the method of Segment the defected area and color and texture are used as the features. Here they used neural network classifier for the classification. The main advantage is it Converts to L*a*b to extract chromaticity layers of the image and Categorisation is found to be 97.30% accurate. The main disadvantage is that it is used only for the limited crops.

[2] P. R. Rothe and R. V. Kshirsagar introduced a" Cotton Leaf Disease Identification using Pattern Recognition Techniques" which Uses snake segmentation, here Hu's moments are used as distinctive attribute. Active contour model used to limit the vitality inside the infection spot, BPNN classifier tackles the numerous class problems. The average classification is found to be 85.52%.

[3] Aakanksha Rastogi, Ritika Arora and Shanu Sharma," Leaf Disease Detection and Grading using Computer Vision Technology &Fuzzy Logic". K-means clustering used to segment the defected area; GLCM is used for the extraction of texture features, Fuzzy logic is used for disease grading. They used artificial neural network (ANN) as a classifier which mainly helps to check the severity of the diseased leaf.

[4] Godliver Owomugisha, John A. Quinn, Ernest Mwebaze and James Lwasa, proposed" Automated Vision-Based Diagnosis of Banana Bacterial Wilt Disease and Black Sigatoka Disease "Color histograms are extracted and transformed from RGB to HSV, RGB to L*a*b.Peak components are used to create max tree, five shape attributes are used and area under the curve analysis is used for classification. They used nearest neighbors, Decision tree, random forest, extremely randomized tree, Naïve bayes and SV classifier. In seven classifiers extremely, randomized trees yield a very high score, provide real time information provide flexibility to the application.

[5] uan Tian, Chunjiang Zhao, Shenglian Lu and Xinyu Guo," SVM-based Multiple Classifier System for Recognition of Wheat Leaf Diseases," Color features are represented in RGB to HIS, by using GLCM, seven invariant moment are taken as shape parameter. They used SVM classifier which has MCS, used for detecting disease in wheat plant offline.

It's crucial to be able to predict the arrival of diseases and pests in crops, in addition to correctly detecting and identifying them. Real-time meteorological data obtained by un

manned observation planes, as well as long-term data analysis from weather stations, have been used to create models capable of anticipating disease occurrence. In [6], the General Infection Model, proposed in [7], was used for assessing the prediction capabilities of the system. It was found that, if integrated systems such as this are implemented and various input data-sets essential for interrelationship analyses are collected, accurate plant disease prediction systems can be constructed.

When it comes to forecasting occurrences, it's crucial to know which variables will have an inflfluence on what is being forecast. In the work by Henderson et al. [8] this was done by discovering which weather variables inflfluence the forecast. On the other hand, Lasso et al. [9] determined the time period window for each weather variable and crop-related feature that is the most signifificant for the appearance of coffee leaf rust disease in coffee crops.

In [10], Small et al. used weather data, information on potato and tomato crops re sistance to late blight (from published literature and fifield experiments), and management strategies, to create a web-based decision support system that allows the dynamic pre diction of disease outbreaks, with an emphasis on the late blight disease on tomato and potato crops. The work proposed by Ghaffari et al. [11] addresses the very early detection of diseases in tomato crops using atmospheric data and volatile organic compounds. Plants produce a wide spectrum of volatile organic compounds in reaction to physical and biotic stress, as well as infection [12]. In [11], the diseases under study were the powdery mildew and spider mites.

A model developed by Diepeveen et al. in [13] can be used in agriculture to understand the inflfluence of location and temperature on crops. In addition, elements such as soil, humidity, rainfall, and moisture were found to have an inflfluence on crop yield [14]. Plant diseases and pest development are greatly inflfluenced by weather and environ ment conditions [15]. Humidity is a favorable condition for the development of fungus diseases. The humidity can be caused by the weather or by poor watering practices that cause a high wetness among the leaves, making tomatoes more susceptible to diseases, e.g., leaf mold or bacterial spot [16]. In addition, temperature is a primary driver of insect development, affecting their metabolic rate and population growth [17].

Plants absorb part of the radiation coming from the sun and reflflect the rest. Depending on the health of the plant, the amount of radiation absorbed and reflflected differs. This difference can be used to distinguish between healthy and diseased plants and to assess the severity of the damage [17].

Chapter 3

OBJECTIVE AND METHODOLOGY

3.1 Objective

Our aim is to prevent the wastage of crop as it needs lot of effort to grow a crop and wastage never worth it.

It will also help the farmers to prevent from financial losses.

As the accessibility to reach the correct department to analyse the disease in the crop is very limited, so we will help our farmers to find the solution by their own.

It will definitely deal with the problem of food insecurity in the country.

The better accuracy of identification of disease is our primary aim with our best working model.

3.2 Methodology

We will collect the different healthy and unhealthy pictures of potato disease from the online platform and classify the dataset. After that we will use train the dataset with CNN(Convolutional Neural Network) model.

We will use FastAPI framework to work with the real time image of the potato crop disease to identify, it contains any disease or not.

We will deploy the model in mobile application with the help of React JS and GCP(Google Cloud Platform), to provide efficient to the farmers.

Chapter 4

SYSTEM DESIGN

System design involves system architecture and working of the modules. The functioning of the system is explained using UML diagrams.

4.1 System Architecture

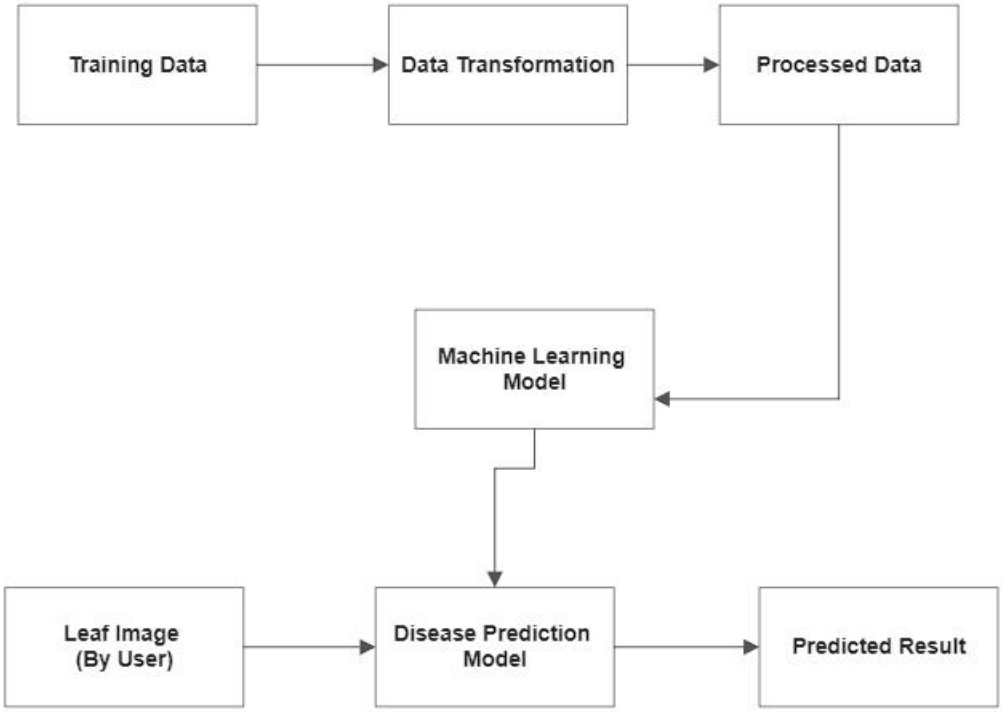

Fig. Potato Disease Prediction

The image of the potato leaf is sent as input for the model which then returns the prediction i.e., if the image contains arly blight (caused by fungus) or late blight (caused by specific microorganism) or else it is the healthy leaf.
The result will show the prediction to the farmers with conviently.

Chapter 5

HARDWARE AND SOFTWARE REQUIREMENTS

The following are basic hardware and software required to train and test the program.

5.1 Hardware Requirements

1. Processor : Intel Dual-Core processor.
2. RAM : 2-4 GB.
3. HDD : 10 GB.

5.2 Software Requirements

1. Operating System - Windows 10,8,7,Windows 2007/XP.
2. Documentation -MS Word, MS PowerPoint, MS Excel.
3. Language - Python

Chapter 6

RESULTS AND DISCUSSION

6.1 Implementation

The project was initiated to help the problems of the farmers in real time. The model will take leaf of potato as an input and based on the input provided, it will predict the disease it bears or else it will show the leaf is healthy. We have used the tensorflow and keras library to train our model.We have used FastAPI as our frontend api to have a better interface. We have also used the Postman application to use it as external link to use it as an interface to use any plant leaf image as an input and give the result.

6.2 Results and Discussion

Our project will help the farmers to easily identify the disease of potato. It will be very convenient to use as they don't have to worry about moving to another area for the search of people to successfully analyse the disease of the pototo. It will prevent the financial loss of the farmers. More importantly, there will be the proper defense for the threat of food insecurity in the society or in country. There may be disbalance of supply chain in the market which may cause the hike of the product cost drastically.

Chapter 7

CONCLUSION AND FUTURE WORK

7.1 Conclusion

Our proposed solution will add values to the society and help the farmers to know the accurate disease of the potato crop and hence can cure the disease more accurately and prevent from the financial losses and also prevent wastage of crop. Our application is made with user friendly and predict the disease more accurately.

7.2 Future Work

We will make our model more accurate with the latest dataset of the potato disease classification. We will make the model more convenient and easy to use. There will be the mobile based application which will predict the potato disease in the real time.

Chapter 8

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