Potato Leaf Disease Prediction

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***Abstract*— The reason behind building this project is to detect or identify potato leaf diseases, having a variety of illnesses. Because our naked eyes can't classify them, but Convolutional Neural Network can easily. You won't believe it when I tell you that the error of some pre-trained Neural Network Architectures is approximately 3%, which is even less than the top 5% error of human vision. On large-scale images, the human top-5 error has been reported to be 5.1%, which is higher than pre-trained networks. Farmers who grow potatoes suffer from serious financial standpoint losses each year which cause several diseases that affect potato plants. The diseases Early Blight and Late Blight are the most frequent. Early blight is caused by fungus and late blight is caused by specific micro-organisms and if farmers detect this disease early and apply appropriate treatment then it can save a lot of waste and prevent economical loss. The treatments for early blight and late blight are a little different so it's important that you accurately identify what kind of disease is there in that potato plant. Behind the scene, we are going to use Convolutional Neural Network – Deep Learning to diagnose plant diseases. Here, we'll develop an end-to-end Deep Learning project in the field of agriculture. We will create a simple Image Classification Model that will categorize Potato Leaf Disease using a simple and classic Convolutional Neural Network Architecture. We'll start with collecting the data, then model building, and finally, we deploy that model in cloud.**

I.INTRODUCTION

The potato is an important food crop that grows throughout the world. It is considered an essential crop in developing and developed countries, contributing to the human diet as a source of carbohydrates, proteins, and vitamins. This crop is native to South America and originates from Peru. The potato is the fourth most important food supply of human societies after wheat, rice, and maize [1]. According to the UN Food and Agriculture Organization statistics, the area under cultivation of the potato in Iran was 161 thousand hectares in 2017, while the harvested crop was about 5.1 million tons [2]. Potatoes can be consumed in various food forms, fresh or processed, including fried potatoes, mashed potatoes, potato chips, and dried granules. There are over 50 potato cultivars in the world, the most important of which are: "Agria", with a relatively high dry matter and resistance to various pests and diseases, is used in the French Fries' food industry. "Arenda", with a very high-yield and resistance to internal bruising; "Almera", with a relatively high dry matter, is suitable for fresh eating. "Burren", with a very high-yield, is very cost-effective for cultivation and has good resistance to diseases. "Picasso", such as the Bourne cultivar, has a high-yield and resistance to disease. "Jelly with a very high-yield and resistance to diseases, has a very customer-friendly yellow color and flesh.

II.LITERATURE SURVEY

In [5], the authors present, review, and recognize the need for developing a rapid, cost-effective, and reliable health monitoring sensor to aid agricultural advancements. They described the currently used technologies, which include spectroscopic and imaging-based plant disease detection methods, as well as volatile profiling-based plant disease detection methods, with the goal of developing ground based sensor systems to aid in monitoring plant health and disease under field conditions. It was decided to use image processing disease recognition approach among other approaches commonly used for plant disease diagnostics, such as double-stranded ribonucleic acid (RNA) analysis, nucleic acid probes, and microscopy, after analysing their work and the analysis presented by the authors

1. Machine Learning Method for Classification and Identification of Potato Cultivars Based on the Reaction of MOS Type Sensor-Array

Author: : Ali Khorramifar Mansour Rasekh , Hamed Karami , Urszula Malaga-Toboła and Marek Gancarz

In response to one of the most important challenges of the century, i.e., the estimation of the food demands of a growing population, advanced technologies have

been employed in agriculture. The potato has the main contribution to people's diet worldwide. Therefore, its different aspects are worth studying. The large number of potato varieties, lack of awareness about its new cultivars among farmers to cultivate, time-consuming and inaccurate process of identifying different potato cultivars, and the significance of identifying potato cultivars and other agricultural products (in every food industry process) all necessitate new, fast, and accurate methods. The aim of this study was to use an electronic nose, along with chemometrics methods, including PCA, LDA, and ANN as fast, inexpensive, and non-destructive methods for detecting different potato cultivars. In the present study, nine sensors with the best response to VOCs were adopted. VOCs sensors were used at various VOCs concentrations (1 to 10,000 ppm) to detect different gases. The results showed that a PCA with two main components, PC1 and PC2, described 92% of the total samples' dataset variance. In addition, the accuracy of the LDA and ANN methods were 100 and 96%, respectively.

2. Image Processing Techniques for detection of leaf disease.

Author: Arthi Rathod, Bhavesh Tanawal and Vatsal Shah.

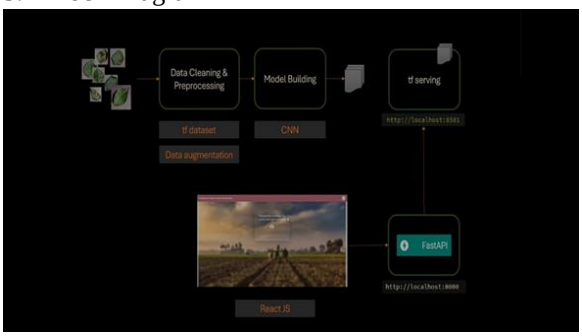
In agriculture research of automatic leaf disease detection is essential research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect symptoms of disease as soon as they appear on plant leaves. The term disease is usually used only for destruction of live plants. This paper provides various methods used to study of leaf disease detection using image processing. The methods studies are for increasing throughput and reduction subjectiveness arising from human experts in detecting the leaf disease[1].digital image processing is a technique used for enhancement of the image. To improve agricultural products automatic detection of symptoms is beneficial.

III.PROBLEM STATEMENT

Farmers who grow potatoes suffer from serious financial standpoint losses each year which cause several diseases that affect potato plants. The diseases Early Blight and Late Blight are the most frequent. Early blight is caused by fungus and late blight is caused by specific micro-organisms and if farmers detect this disease early and apply appropriate treatment then it can save a lot of waste and prevent economical loss. The treatments for early blight and late blight are a little different so it's important that you accurately identify what kind of disease is there in that potato plant. Behind the scene, we are going to use Convolutional Neural Network – Deep Learning to diagnose plant diseases.

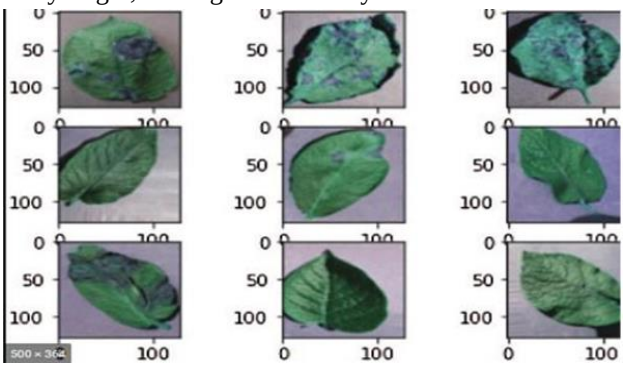
PROPOSED WORK.

3.1 Block Diagram



3.2 Dataset

The dataset used is a kaggle dataset: PlantVillage Dataset | Kaggle The dataset has images belonging to classes like Early blight,late blight and healthy.



3.3 Data Preprocessing

We firstly augment the data to simply increase the quantity of data.Data Augmentation is a process that generates several realistic variants of each training sample, to artificially expand the size of the training dataset. This aids in the reduction of overfitting. In data augmentation, we will slightly shift, rotate, and resize each image in the training set by different percentages, and then add all of the resulting photos to the training set. This allows the model to be more forgiving of changes in the object's orientation, position, and size in the image. The contrast and lighting settings of the photographs can

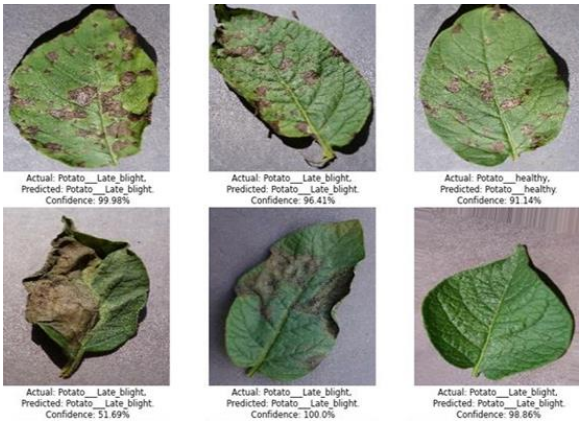
be changed. The images can be flipped horizontally and vertically. We may expand the size of our training set by merging all of the modifications.

3.4 Model Building

We create a CNN neural network using Max Pooling and Conv layers. The Relu which is a non linear activation function is used in the hidden layers while the output layer has SoftMax activation function.

3.5 Validation

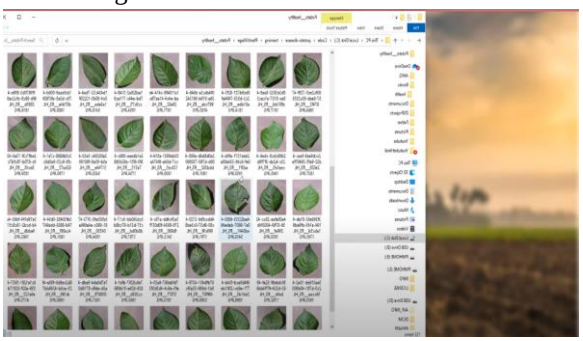
We fit our model over training data and find the results and based on it compute the accuracy scores. The train test validation is shown below**.**



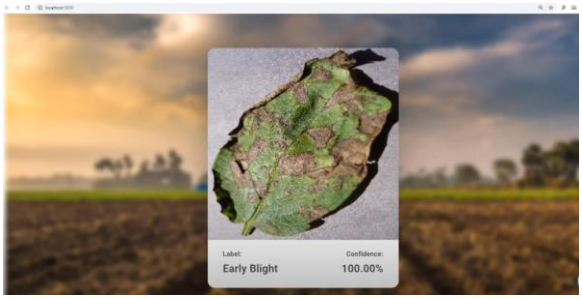
IMPLEMENTATION

Drag and drop Image from the system file folder.

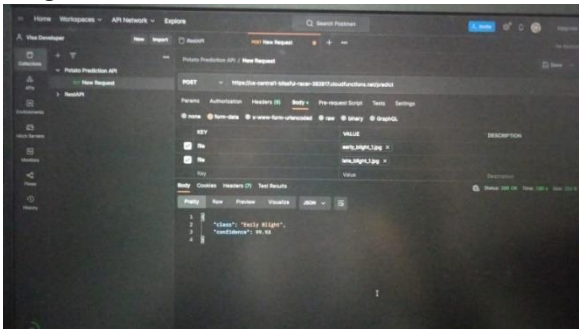
Select image from the folder



After dropping the image, wait for some time until it finishes it's preprocessing . Then you'll get the result.



We can also get results in postman API by providing our GCP link in request section and selecting the images form our local PC.



IV. CONCLUSION

In this model, we have used the concept of CNN and have developed a model to classify conditions in the potato leaves like early blight, late blight and healthy achieving classification accuracy of around 97%. The data augmentation process helps the model to be more robust. Our technique can help farmers in detecting diseases in theirIn future, Several user friendly interfaces will be adopted. This package shall prove to be powerful in satisfying all the requirements of the users. It is with utmost faith that we present this software to you hoping that it will solve your problems and encourage you to continue appreciating technology because it is meant to change and ease all our work that seems to be very difficult. early stages and in enhancing their crop yields.

In future, We could improve the robustness of our model by using Gan for data creation and Transfer Learning for improving model accuracy. Gan will help us to make the model more forgiving of changes in the object's orientation, position, and size in the image. Transfer Learning will help us to develop a model that is more robust and accurate.

REFERENCE

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