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CNN-BASED POTATO LEAF DISEASE DETECTION USING DEEP LEARNING (DL)

Vaishnavi Patil*1

*1UG Student, Department Of Information Technology, B.K Birla College Kalyan,
(Empowered Autonomous Status), Kalyan, Maharashtra, India.

ABSTRACT

In this paper, CNN-based potato leaf disease detection using deep learning. A model was developed for a classification of plant leaf diseases from the leaf image using efficient deep learning architecture potato during the growth season, several illnesses can affect plants it can be concluded that potatoes are the number one vegetable all over the world. Our dataset consists of high-resolution images of healthy potato leaves and leaves infected with common diseases such as late blight, early blight, and black scarf. the proposed model will strongly identify and detect diseases of potato leaf stand by image processing methods in a research paper. CNN (Convolutional Neural Network) model is used to detect the disease from image classification of potato leaf because CNN & gives better results than others. The algorithm is used for this research the area (LeNet) model. potatoes are several cultivations that play a crucial role in global food security; however, it is susceptible to various disease that can significantly impact crop yield. Timely and accurate disease detection is essential for effective disease management.

Keywords: Image Processing, Potato Leaf Disease Detection, Feature Extraction, Deep Learning (CNN).

I. INTRODUCTION

This research paper presents a comprehensive investigation into the application of CNN-based deep learning techniques for the early and accurate detection of potato leaf diseases Potatoes are all over the world's people and are also an important basic food in many countries around the world too. Potatoes are also called the root of all vegetables. Potatoes are among the major vegetables in agricultural regions and it is farmed and utilized all over the world potatoes are a high-protein food with several health benefits, but there are numerous diseases associated with potatoes that hamper production. Potatoes are a good enterprise vegetable crop. Around 130 and 95 we provide a model for automatic plant disease identification based on Convolutional Neural Network (CNN). To categorize potato leaves into three classes detect potatoes with healthy blight, early blight, & late blight. We can develop a strong food security system as it is a great source of vitamins & minerals. Potatoes farming dominates as an occupation within the agriculture domain in more than 125 countries.

Fig 1. Potatoes leaves

This study detects and classifies potato leaf diseases using a deep learning algorithm in the (LeNet) model. The importance of the research, the role of CNNs, and the potential benefits of applying this technology in potato leaf disease detection. By employing CNNs, which are a type of deep learning model specialized in image recognition, the system can analyze images of potato leaves to determine whether they are afflicted by common diseases such as late blight, early blight, or potato leaf roll virus. The process involves several keys. This can lead to a decrease in the usage of harmful pesticides and fungicides, thereby promoting more sustainable and environmentally friendly farming practices. Additionally, it contributes to the overall food security of regions dependent on potato production. Potatoes leaf cultivation is a cornerstone of global agriculture, providing sustenance to millions. However, it faces a recurring challenge in the form of leaf diseases, which can have

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devastating consequences on crop yield and quality swift and accurate disease detection is critical for effective disease management, and Convolutional Neural Networks (CNNs) offer a promising solution.

II. RELATED WORK

Detection of potato leaf diseases using deep learning and CNNs has been an active area of research. In [1] paper the authors proposed a study of sentimental analysis of CNN-based, deep learning techniques. Paper [2] A Convolutional Neural Network Approach Potato Leaf diseases detection for early detection of late blight disease in potato leaves. Paper [3] the study introduced a CNN-based model for early detection of late blight disease in potato leaves. Paper [4] talks about the use of a deep learning framework in sentimental analysis performing CNN-based experiments and achieving outstanding outcomes.

III. METHODOLOGY

In conducting this research, the critical first step was dataset collection of potato leaf disease detection using the CNN (LeNet) model. Deep Convolutional Neural Network is utilized in this study to identify infected and healthy leaves, as well as to detect illness in affected plants. And that data preprocessing the model. Photos are used to train the model, and the output is determined by the input leaf.

A) DATASET COLLECTION

The dataset used in this project is the pictures of potato leaves divided into three categories. The healthy leaves, late blight, and early blight are the " Plant village dataset". In data collection.

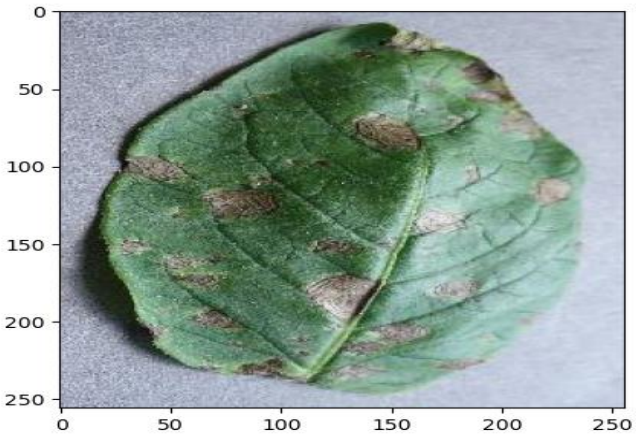

Fig 2. Dataset image

B) Data processing

Detecting potato leaf diseases using a Convolutional Neural Network (CNN) like the LeNet model involves several steps, including data processing. The data including processing accuracy are 97.40% of validation accuracy. this are Train-Test-Validation process. Image resizing consistent size to ensure uniformity and normalize the pixel values of the images to a specific (usually between 0 and 1 for better model training). Data Augmentation Apply data augmentation techniques. Continue this step Train-Test Spilt your dataset into training and testing sets to evaluate the model performances. The model architecture is used to (the LeNet) model or a modified version suitable for your task. And that specific problem and input image sizes. The model heavily depends on the quality and quantity of your dataset, the (LeNet) model architecture, and the effectiveness of data processing.

IV. RESULTS AND DISCUSSION

We create a CNN neural network using an image dataset of the LeNet modeling used to Max pooling and conv layers, over the above data and compute accuracy and their performance to find the best neural network that can be used to detect the diseases of potato on the input image fed.

Validation

We fit our model with the training dataset are CNN model data while monitoring its performance on the validation set. The dataset images are in the Train-Test-Validation process.

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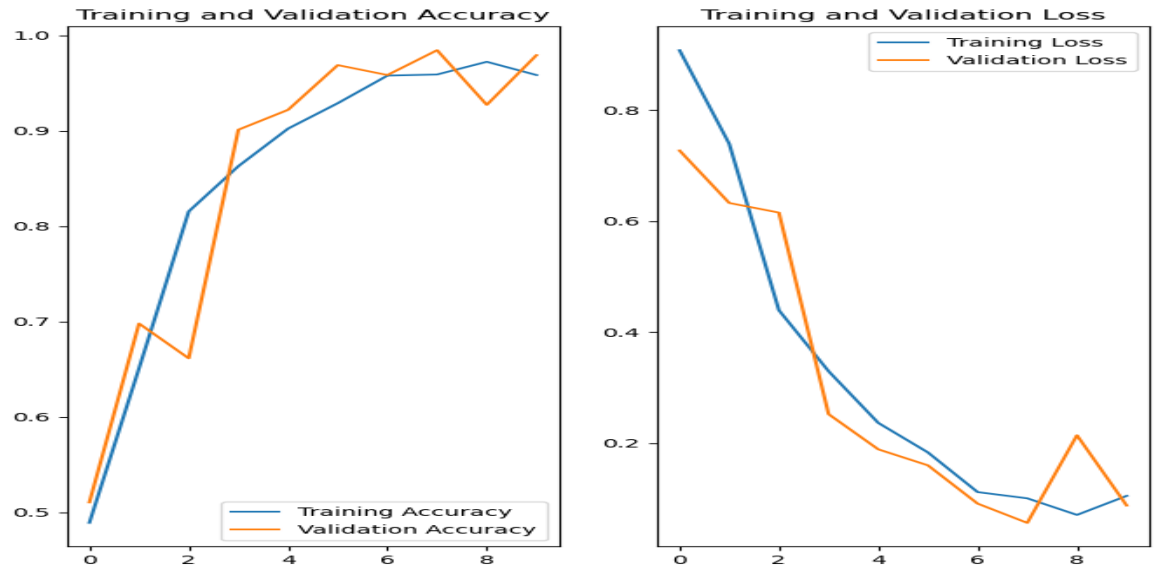

Fig 3. CNN train-test accuracy validation.

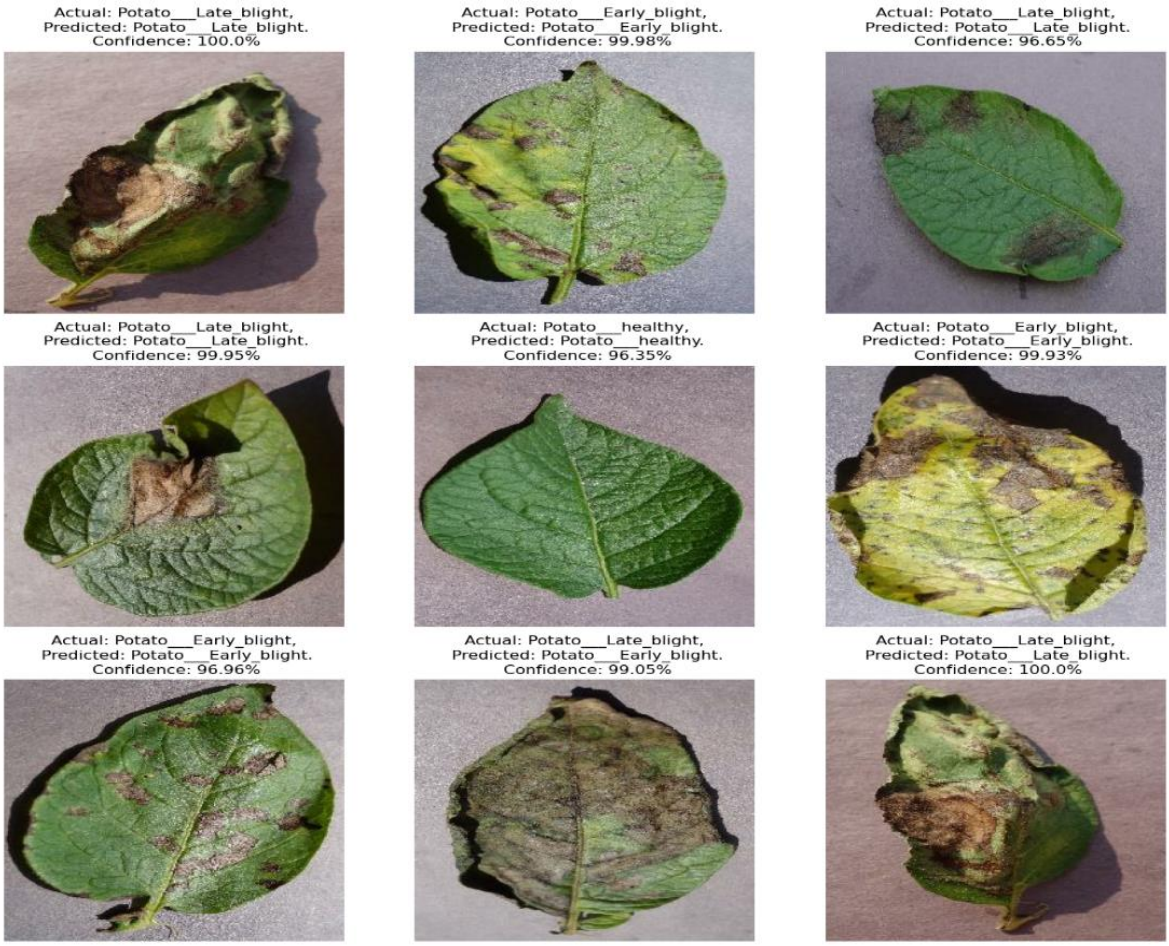

Fig 4. Training, Validation Loss detection.

V. CONCLUSION

In this paper with the help of deep learning techniques and Convolutional Neural Networks detect the disease of every type of crop in that late blight, early blight healthy leaf images of potato. Our study successfully implemented a Convolutional Neural Network (CNN) deep learning model, specifically the LeNet architecture, for the task of potato leaf disease detection. We collected a diverse dataset of potato leaf images, which included

healthy leaves and leaves affected by various diseases. Our trained model demonstrated impressive performance in accurately classifying these images, achieving a high level of accuracy in disease identification. Which has practical applications in agriculture for early disease detection and intervention.

VI. FUTURE WORK

This may involve deploying this model as part of a smart agriculture system for real-time disease monitoring in potato crops. In that CNN (Convolutional Neural Network) model. We aim to create an android application that can detect the disease of every type of crop. (For example:- Potato, Tomato, Cotton, and Groundnut) and they can be provided paper solutions for these diseases of the crop.

VII. REFERENCES

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