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POTATO LEAF DISEASES DETECTION USING DEEP NEURAL NETWORK

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Abstract- *Potato is the main important food crop in the world. Potato is a temperate crop developed under subtropical conditions in India. The potato is a vegetable crop which has always been the 'poor man's friend'. The potato crop is being cultivated in the country for the last more than 300 years. For vegetable purposes, it has become one of the main popular crops in this country. Potatoes are an economical food; they supply a source of low-cost energy to the human diet. Potato popularly called as 'The king of vegetables'.Every year the production of this crop decreases due to many reasons, one of the most important reason is leaf blight. This leaf blight is classified into early blight and late blight .If these diseases are detected at an early stage, the fertilizer can be used at the proper time and the productivity can be improved. This paper aim is to detect and classify the potato leaf diseases and the healthy leaves. The proposed model used CNN algorithm and it has achieved more than 97% accuracy.*

Index Terms- Potato, CNN, Early blight, Late blight, Healthy leaves

I INTRODUCTION

Potatoes are one of the vegetables that many people like to eat. The botanical name of potato is Solanum tuberosum .Some people like to cook these potatoes in various ways. After rice, wheat and corn, potato is the most popular food in the world. 5,000 years ago, Central American tribes cultivated hundreds of varieties of tubers and ate only these on a daily basis.

The potato spread to all continents in the 16th century AD by the Spanish explorers from Chile to Ecuador. After rice and wheat, potato is the most consumed. It is also the world's most important commercial commodity as it can be grown in all climates. It can be seen in the food plate of people of all countries. Many people have done various researches so far.

Many technologies in the field of science are used for potato cultivation. Although many technologies have been developed, it is difficult to diagnose potato leaf diseases. In this paper CNN model was proposed to detect and classify potato leaf diseases. By this way leaf can be easily detect and classify as early blight, late blight and the healthy leaves and increase the production by using appropriate fertilizer.

II LITERATURE REVIEW

Varsha et al. (2023) [1] worked with potato plant leaves to detect healthy leaf, early blight, and late blight diseases, and also calculated the infected area of the plant leaf. They used a customized convolutional neural network to classify the leaf disease and achieved 96.0% accuracy for the CNN model.

Anushka et al.(2022)[2] used deep learning techniques and convolution neural network classification based approach to detect the late blight, early blight and healthy leaf images of potato plant. They found that CNN was the best way to perform this type of classification object. This model gained 91.41% of validation accuracy.

Xudong Li et al.(2022)[4] model framework could effectively reduce the impact on potato leaf segmentation in the wild environment, improve the accuracy of disease spot segmentation, and provide technical support for potato leaf disease detection and prevention. The framework presented consisting of three models of CNN can be applied to other crops with some adjustments.

Jalal Sadoon et al. (2020) [3] made a analysis to detect and classify the diseases from apple plant leaf images in an effective way using the concept of DNN as a deep neural network approach. The accuracy of the proposed PDDS for apple leaf has improved from the experiments, it was concluded that the accuracy of the proposed model with SURF and GOA as an optimization technique increases by 18.03% maximum from existing techniques with fast detection and classification.

III MATERIALS AND METHODS

The below figure shows the flow of the potato leaf diseases detection model. The model was developed in python language. For data automation, model tracking, performance monitoring, and model retraining tensor flow has been used. Implementation of neural networks has been done using keras. For visualize the data, and analyze the result jupyter notebook was used.

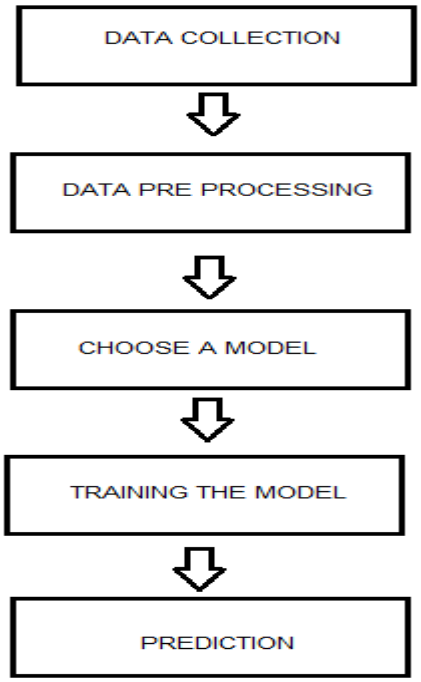

Fig: 1 Block diagram of the model

3.1 Data Collection

Data were from the kaggle dataset Kaggle is an online community platform for data scientists and machine learning enthusiasts. More than 2500 images haven been used. Sample potato leaf dataset are given below.

Fig: 2 Late blight

Fig: 3 Healthy leaves

Fig: 4 Early blight

3.2 Data Preprocessing

Rescaling and resizing processes were taken place. Resizing images is a critical pre-processing step in computer vision. Principally, deep learning models train faster on small images. A larger input image requires the neural network to learn from four times as many pixels, and this increase the training time for the architecture. Rescaling multiplies the height and width of the image by a scaling factor. If the scaling factor is not identical in the vertical and horizontal directions, then rescaling changes the spatial extents of the pixels and the aspect ratio.

3.3 Choose a Model

Many networks are available for image and speech recognition. In this model CNN have been used. CNNs are fully connected feed forward neural networks. CNNs are very effective in reducing the number of parameters without losing on the quality of models.

3.4 Training the Model

Trained the model for 40 epochs, used Adam optimizer for optimization.

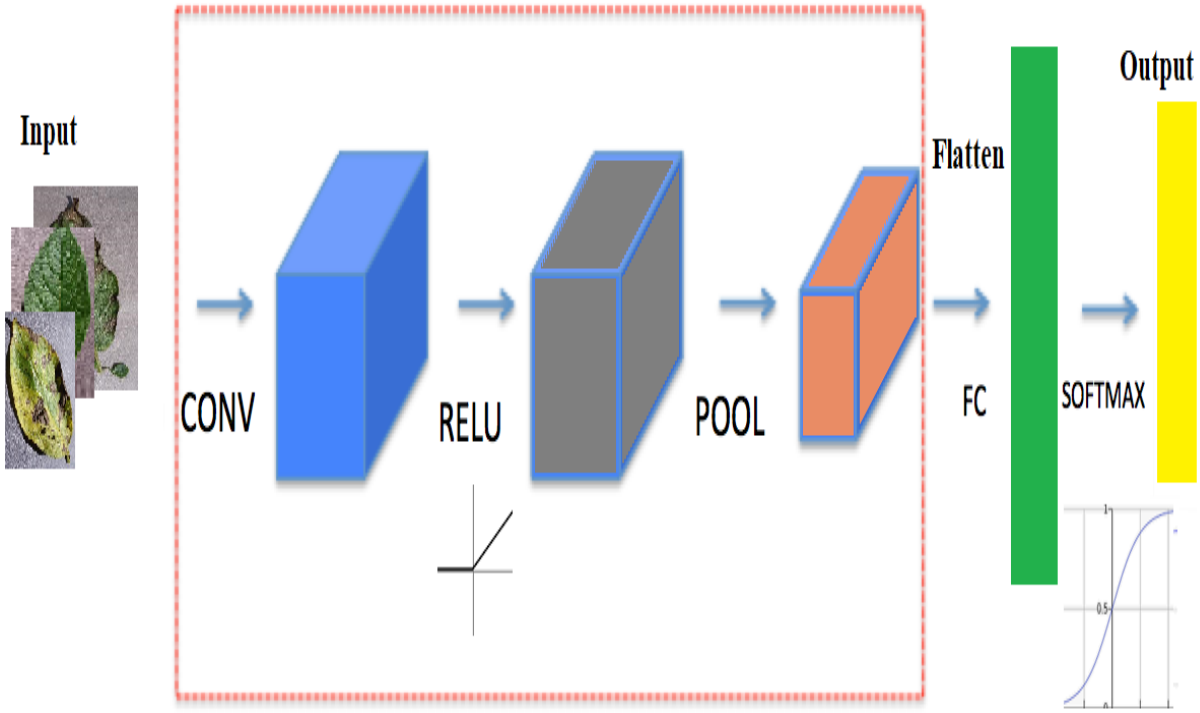

Fig: 5 CNN Architecture

3.5 Model Evaluation

The process of using different evaluation metrics to understand a potato leaf diseases detection model's performance, as well as its strengths and weaknesses.

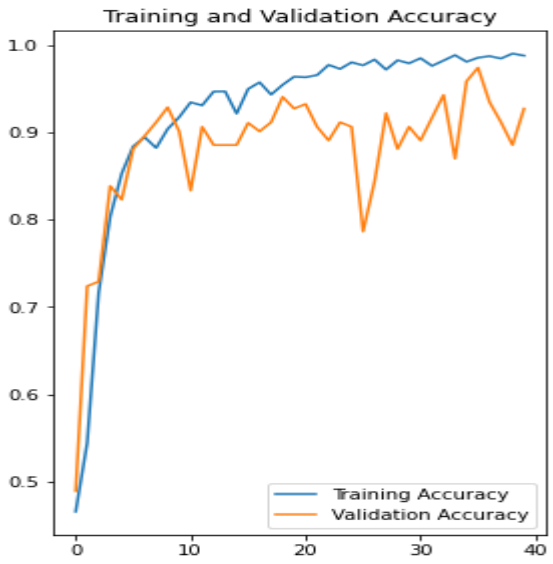

Fig: 6 Accuracy Visualization

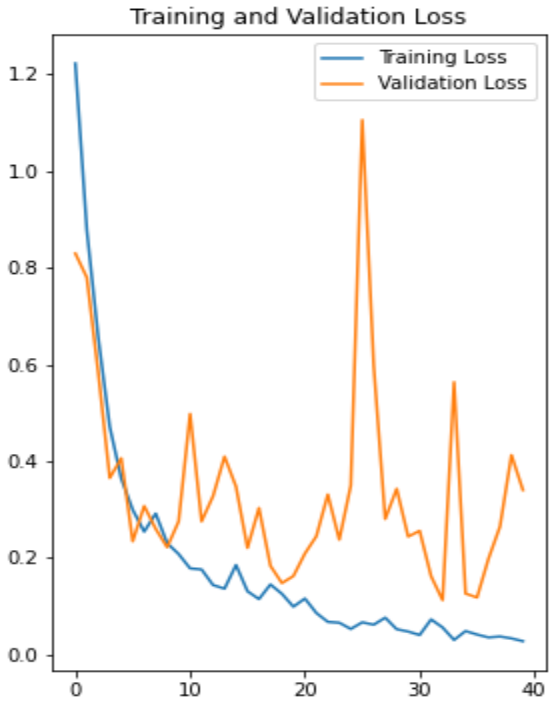

Fig: 7 Loss Visualization

IV RESULTS

The proposed model successfully detected the potato leaf diseases with the help of CNN and achieved more than 97% accuracy. Below figures show the output of the proposed model.

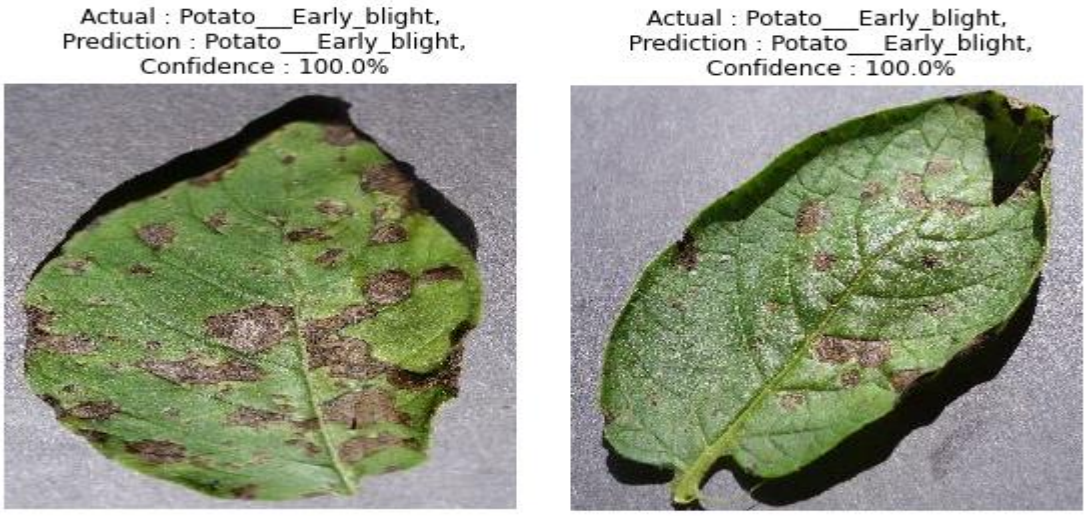

Fig: 8 Early blight detection

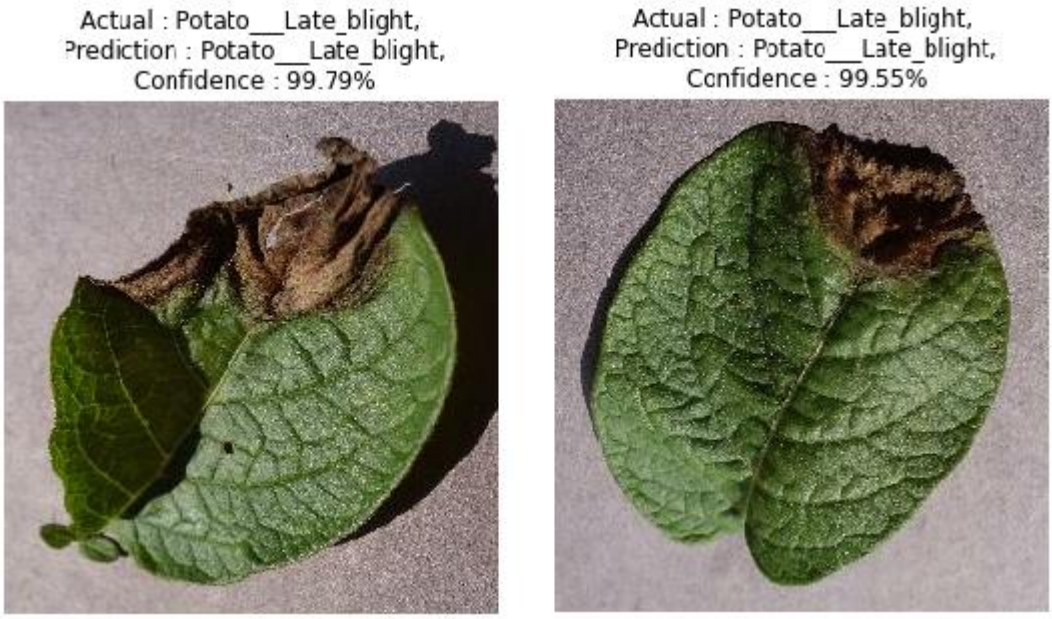

Fig: 9 Late blight prediction

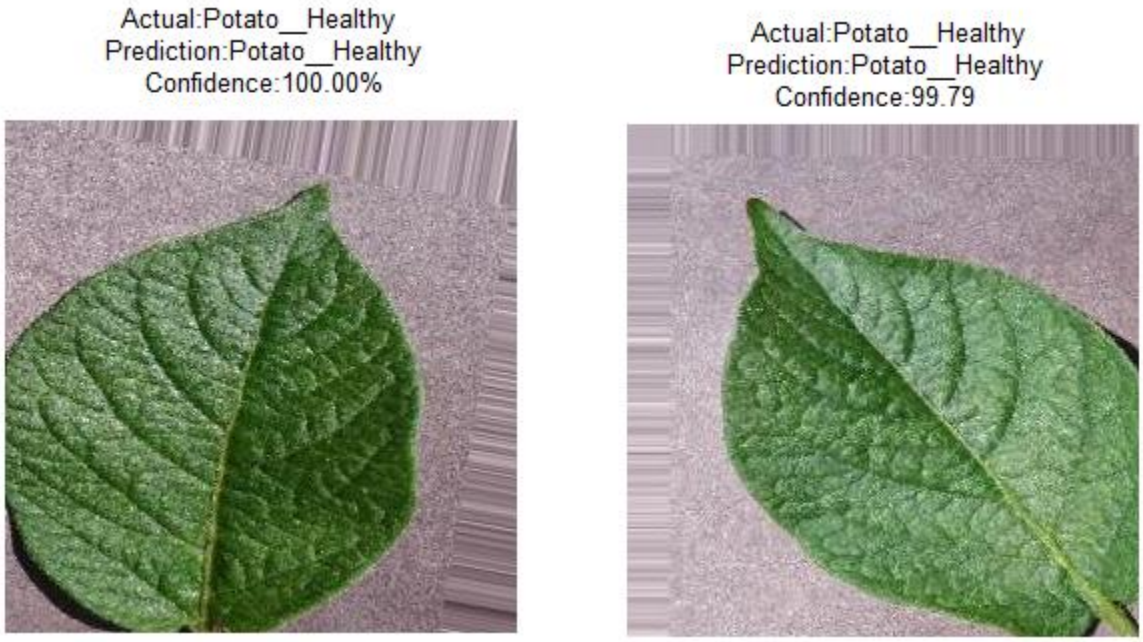

Fig: 10 Healthy leaves prediction

V CONCLUSIONS

This model will be very helpful for the research people in agriculture field and farmers for detecting the leaf diseases. Early detection increases crop production and it will reflect in the economic status also. By using this method other plant leaf diseases also be detected effectively.

REFERENCES

[1] Varsha P. Gaikwad1 and Dr. Vijaya Musande 2023. Potato plant leaf disease detection using CNN model. European Chemical Bulletin, 12(1), 516-527

[2] Xudong Li, Yuhong Zhou, Jingyan Liu, Linbai Wang,Jun Zhang and Xiaofei Fan.2022.The Detection Method of Potato Foliage Diseases in Complex Background Based on Instance Segmentation and Semantic Segmentation.13.Frontiers,doi: 10.3389/fpls.2022.899754

[3] Anushka bangal,Dhiraj Pagar, Hemant Patil, Neha Pande.2022.Potato leaf disease detection and classification using cnn.IJRPR,3(5):1510-1515

[4] Jalal Sadoon Hameed Al-bayati and Burak Berk .2020.Evolutionary Feature Optimization for Plant Leaf Disease Detection by Deep Neural Networks. International Journal of Computational Intelligence Systems, 13(1):12–23