Web Application For Potato Leaf Diseases Detection With Message Alert

S Balasaraswathi
Department of Computer Science And Engineering
Vandayar Engineering College, Thanjavur, Tamilnadu

Abstract- *Potato is the most important and widely consumed food in the world. India is one of the top producing countries of potato as most of the people here choose it for cultivation. Potato cultivation is an excellent source of good income. Despite this, production is reduced due to changes in climate and insects attacking the leaves. If these are corrected at the beginning, the yield can be increased. This project aim is to develop the web application to detect and classify the potato leaf diseases such as late blight, early blight and the healthy leaves, and send the results to the telegram. Here CNN algorithm has been used for the project and it has achieved 97% accuracy.*

Keywords- Potato leaf, CNN, Telegram, Early blight, Late blight, Healthy leaves

I. INTRODUCTION

The botanical name of potato is Solanum tuberosum .This vegetable originated in South America and it is now grown all over the world. Potato is an important food crop that is used in a variety of cuisines. A large portion of the world's population consumes this vegetable daily. Also, the reason for such a large consumption of potatoes is, they are compatible with any other vegetable. Potatoes come with essential nutrients. These include minerals, vitamins C and B6.

Potatoes contain starch, protein, essential fat and carbohydrates. Hence, they are a pocket friendly energy source for everyone. Potato is used in various commercial fast foods such as chips or fries. Therefore, fast food chains are using potatoes in large quantities to meet the needs of consumers and this vegetable is in high demand. It is also used to make starch for commercial purposes. Hence, it ranks fourth in terms of important food crops. Apart from being a tasty vegetable, potato proves to be a profitable crop. Potatoes require a bit of extra attention as they are a highly nutritious food.

With the latest technology and modern farming techniques, potatoes can yield significantly higher yields. This results in higher returns than other crops. Even though it gives profit most of the plants are affected heavily by the early blight and late blight diseases. To improve crop productivity and quality. It should be detected earlier to avoid the loss of productivity. It is important to grow any crop with proper care. In this paper, the CNN model has been proposed to detect and classify the leaf diseases web application. This will help the farmers to take remedy against the affected leaves.

II. LITERATURE REVIEW

Anushka et al. (2022) [1] used CNN algorithm for detecting and analyzing the potato leaf diseases. This project predicted with an accuracy of 91.41% for testing with 30% test data and 70% train data.

Sabbir ahmed et al. (2022) [2] used pretrained MobileNetV2 architecture and a classifier network for effective prediction of tomato leaf diseases. Traditional augmentation approaches were replaced by runtime augmentation to avoid data leakage and address the class imbalance issue. On the evaluation of tomato leaf images from the Plant Village dataset their architecture achieved 99:30% accuracy with a model size of 9:60MB and 4:87M floating-point operations, making it a suitable choice for low-end devices

Deep Kothari et al. (2022) [3] introduced Google Net, Resnet50, and the VGG16 convolutional neural network architecture model to create an accurate classification system for potato leaf disease detection. Their experiment achieved 97% accuracy for the first 40 CNN epochs, indicating the feasibility of the deep neural network approach.

Md. AshrafulIslam et al.(2022) [4] presented a Convolutional Neural Network based approach to identify and classify two common potato infections. Their proposed model was observed to outperform with 99.91% accuracy during training, 99.80% accuracy during validation.

Sahana Uday Naik et al. (2021) [5] demonstrated CNN method to recognize the plant diseases in non-real. The experiment demonstrated that the CNN obtained 97% accuracy in non-real time. Using the leaf images and the CNN was used to detect the plant disease and remedies.

III. MATERIALS AND METHODS

This project has been divided in to following modules:

1. Data collection
2. Data preprocessing
3. Data splitting
4. Training the model
5. Model evaluation
6. Web application development
7. Prediction and Receiving message through telegram

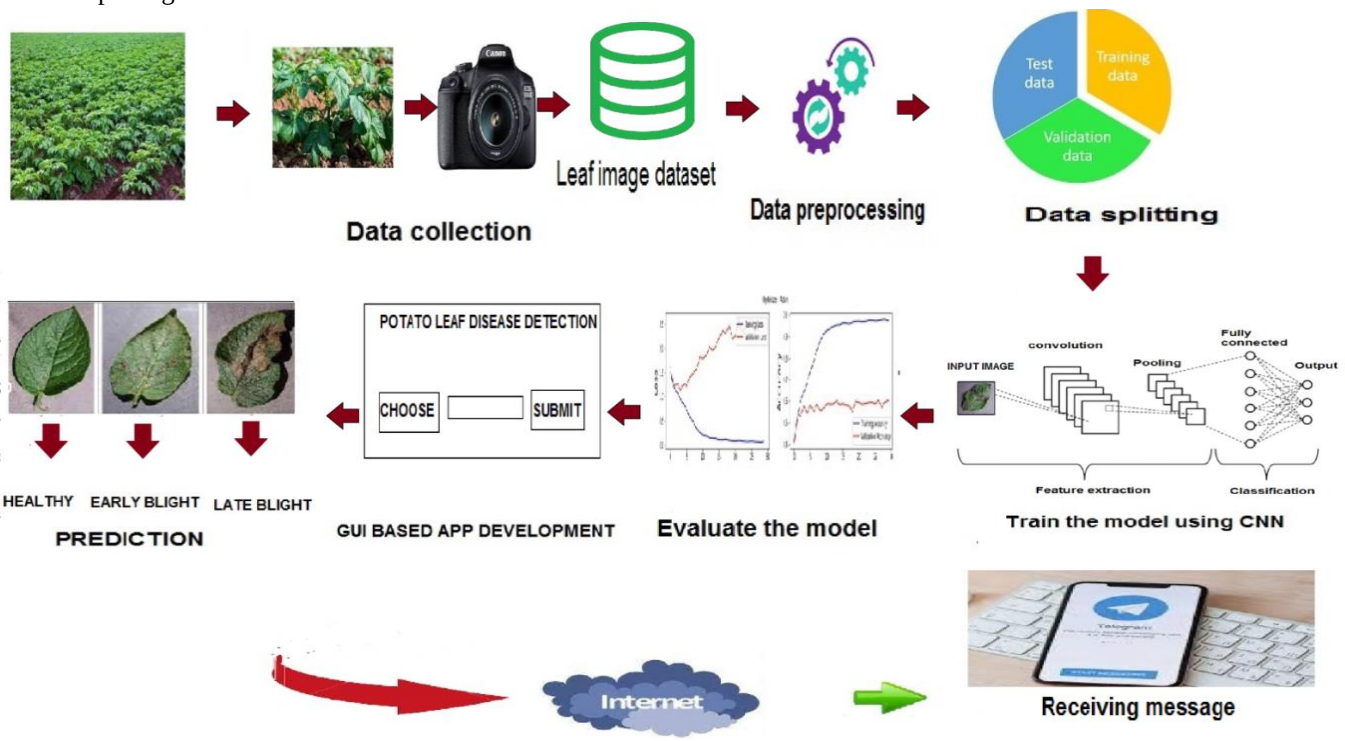

Fig: 1 Proposed System architecture

1. Data collection

Data were collected from kaggle dataset more than 2000 images had been taken.

Sample images are given below

Fig: 2 Early blight

Fig: 3 Late blight

Fig: 4 Healthy leaves

2. Data preprocessing

Data preprocessing is required tasks for cleaning the data and making it suitable for a machine learning model which also increases the accuracy and efficiency of a machine learning model. Augment the data to simply increase the quantity of data. Data augmentation is a technique of artificially increasing the training set by creating modified copies of a dataset using existing data.

It includes making minor changes to the dataset or using deep learning to generate new data points. This aids in the reduction of over fitting. Resize and rescale to the entire dataset. The contrast and lighting settings of the photographs can be changed. The images can be flipped horizontally and vertically.

3. Data splitting

In this stage split the dataset into training, validation, and testing data. Here, 80:20 ratios were taken. Training split was used to train the model. After each loop (epoch) of the training split, the validation split was used to determine model performance. After training stops (epoch(s)), testing split was used to perform a one-time assessment of the model.

4. Training the model

In this project CNN algorithm is used for training. CNN has high accuracy, and because of the same, it is useful in image recognition.

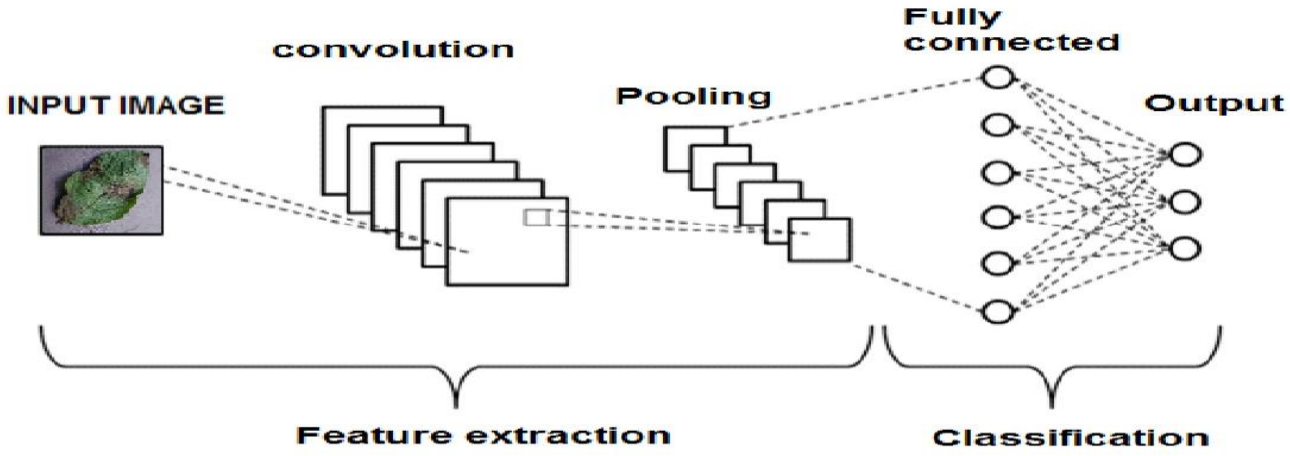

Fig: 5 CNN ARCHITECTURE

A convolution tool that separates and identifies the various features of the leaf image for analysis in a process called as Feature Extraction. The network of feature extraction consists of many pairs of convolutional or pooling layers. A fully connected layer that utilizes the output from the convolution process and predicts the class of the leaf image based on the features extracted in previous stages. This CNN model of feature extraction aims to reduce the number of features present in a dataset. It creates new features which summarizes the existing features contained in an original set of features. Trained the model for 20 epochs.

5. Model evaluation

The three main metrics used to evaluate a classification model are accuracy, precision, and recall.

Confusion matrix is an important tool to evaluate our classifier performance. It provides us a clear picture of the performance of the classifier. It creates a matrix where we can find the frequency of hits and misses of each labels.

Confusion matrix can be used to compute following parameters: Precision, Recall, and F1-Score

	precision	recall	f1-score	support
Late blight	0.99	0.98	0.98	204
Healthy	0.93	0.87	0.90	31
Early blight	0.95	0.97	0.96	195
accuracy			0.97	430
macro avg	0.96	0.94	0.95	430
weighted avg	0.97	0.97	0.97	430

Fig: 6 Confusion matrix

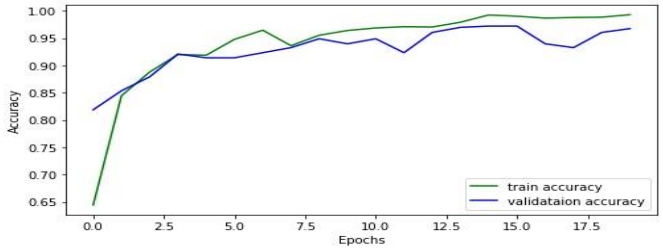

Fig: 7 Accuracy of the model

6. Web application development

The web application has been developed in Visual studio IDE using python language with flask backend. The template has been designed using HTML and CSS.

IV. RESULTS

The potato leaf disease web application was successfully developed, CNN performed significantly in potato plant leaf disease detection and achieved 97% accuracy. After predicting the result it was successfully received through telegram. Below figures show the output of the proposed model

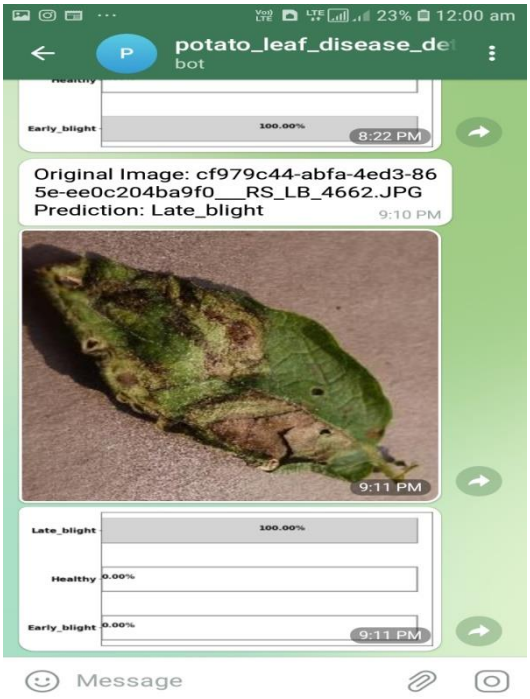

Fig: 8 Telegram message

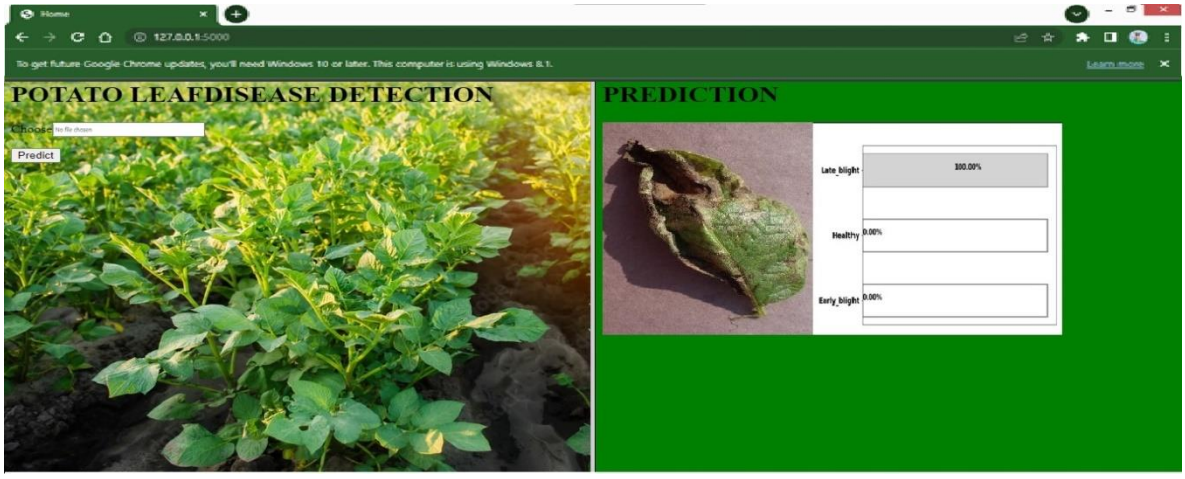

Fig: 9 Potato leaf disease prediction

V. CONCLUSIONS

This project will be very helpful for the research people in agriculture field and farmers for early prediction of the leaves and to take remedy measures. Early detection increases the productivity in potato cultivation. This will increase the economic status. It helps to earn more income and make farming businesses successful.

REFERENCES

[1] Anushka Bangal, Dhiraj Pagar, Hemant Patil, Neha Pande, “Potato leaf disease detection and classification using CNN", in IJRPR, vol. 3, no 5, pp. 1510-1515, May 2022

[2] Sabbir ahmed, Md. Bakhtiar hasan, Tasnim ahmed, Md. Redwan karim sony, and Md. Hasanul kabir,"Less Is More: Lighter and Faster Deep Neural Architecture for

Tomato Leaf Disease Classification", in IEEE Access, vol.10, no.6, pp.68868-68884, July 2022

[3] Deep Kothari, Harsh Mishra,Mihir Gharat,Vishal Pandey,Rashmi Thakur, "Potato Leaf Disease Detection using Deep Learning", in IJERT, vol. 11,no 11, November2022

[4] Md.AshrafulIslam, Md.HanifSikder, "A Deep Learning Approach to Classify the Potato Leaf Disease" Journal of Advances in Mathematics and Computer Science, vol. 37,no.12,pp.143-155,December 2022

[5] Sahana Uday Naik, Sudhakara B, Rashmi K,"Plant disease detection using leaf images", in IRJET, vol.08, no.07, July 2021