1. Introduction

The world's largest industry is agriculture. As time went on, agriculture evolved, and nearly all of the conventional agricultural techniques were replaced by the use of modern machinery and technology.

The plant diseases effect the production. Identification of diseases and taking necessary precautions is all done through naked eye, which requires labour and laboratories.

2. Literature Survey

2.1 Existing Solutions

Three distinct soybean diseases were found by S.Kaur et al. utilising various colour and textural parameters. P Babu et al. identified plant leaves and their illnesses using a feed-forward neural network and backpropagation. S. For the purpose of identifying leaves and fungal infections in plants, S. Chouhan et al. developed a bacterial-foraging-optimization-based radial-basis-function neural network (BRBFNN).

AlexNet and GoogleNet CNN architectures were utilised by Mohanty et al. to identify 26 distinct plant diseases. By utilising several CNN designs, Ferentinos et al. were able to accurately classify 58 distinct plant diseases. They used real-time photos to evaluate the CNN architecture as part of their strategy. A DL architecture was created by Sladojevic et al. to recognise 13 distinct plant diseases. They trained CNN using the Caffe DL framework. In the area of agriculture, Kamilaris et al. conducted a thorough investigation on the pros and cons of various DL strategies.

2.2 Proposed Solution

Crop diseases must be promptly identified and prevented in order to increase productivity. Since convolutional neural networks (CNNs) have demonstrated outstanding achievements in the field of machine vision, CNN models are used in this application to recognise and diagnose illnesses in plants from their leaves. The proposed solution saves farmers time and cost by assisting them in disease detection in plants by looking for spots on the leaves.

3. Theoretical Analysis

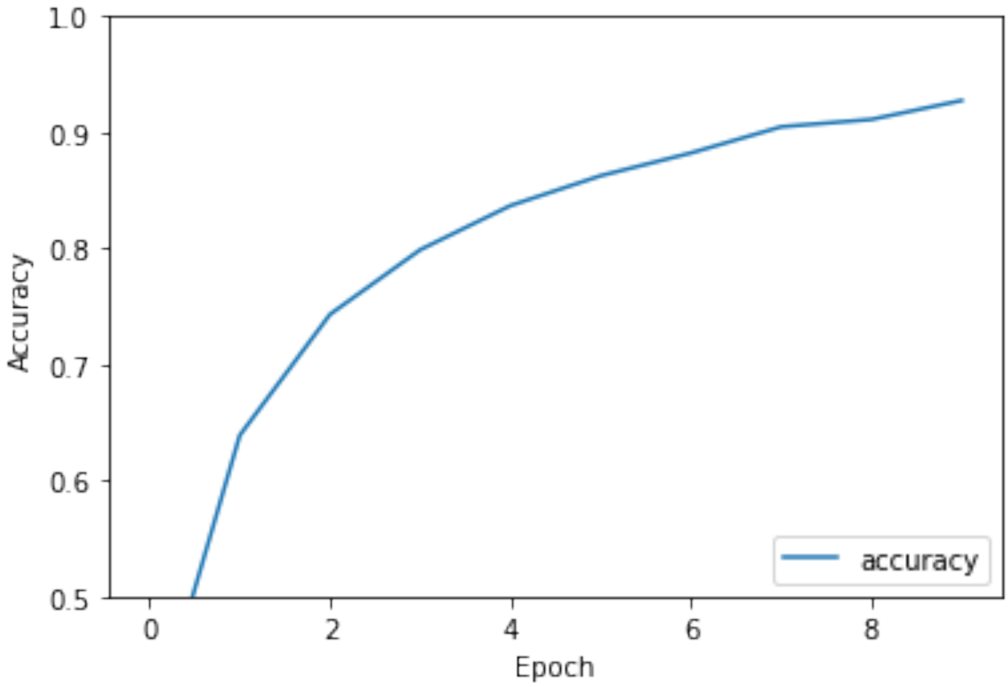
3.1 Block Diagram

3.2 Hardware/ Software Requirements

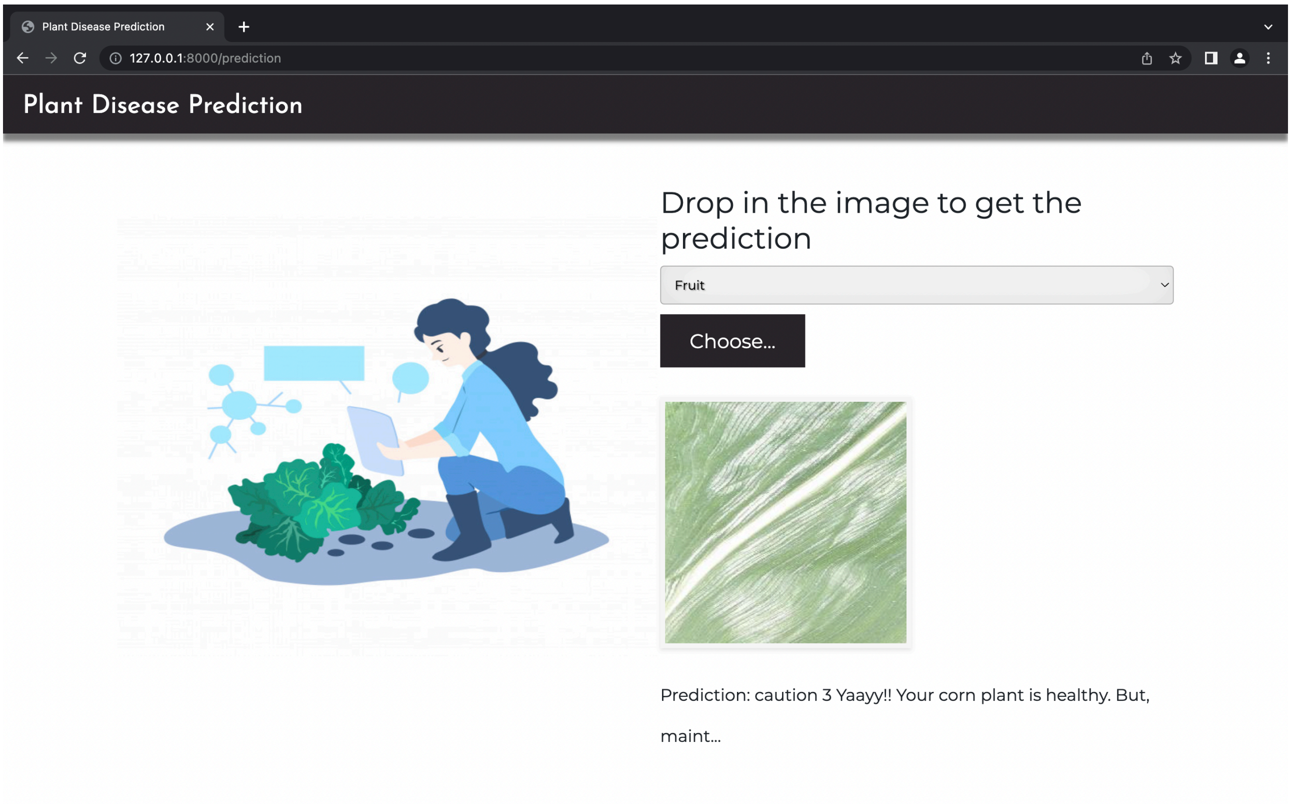
4. Experimental Investigations

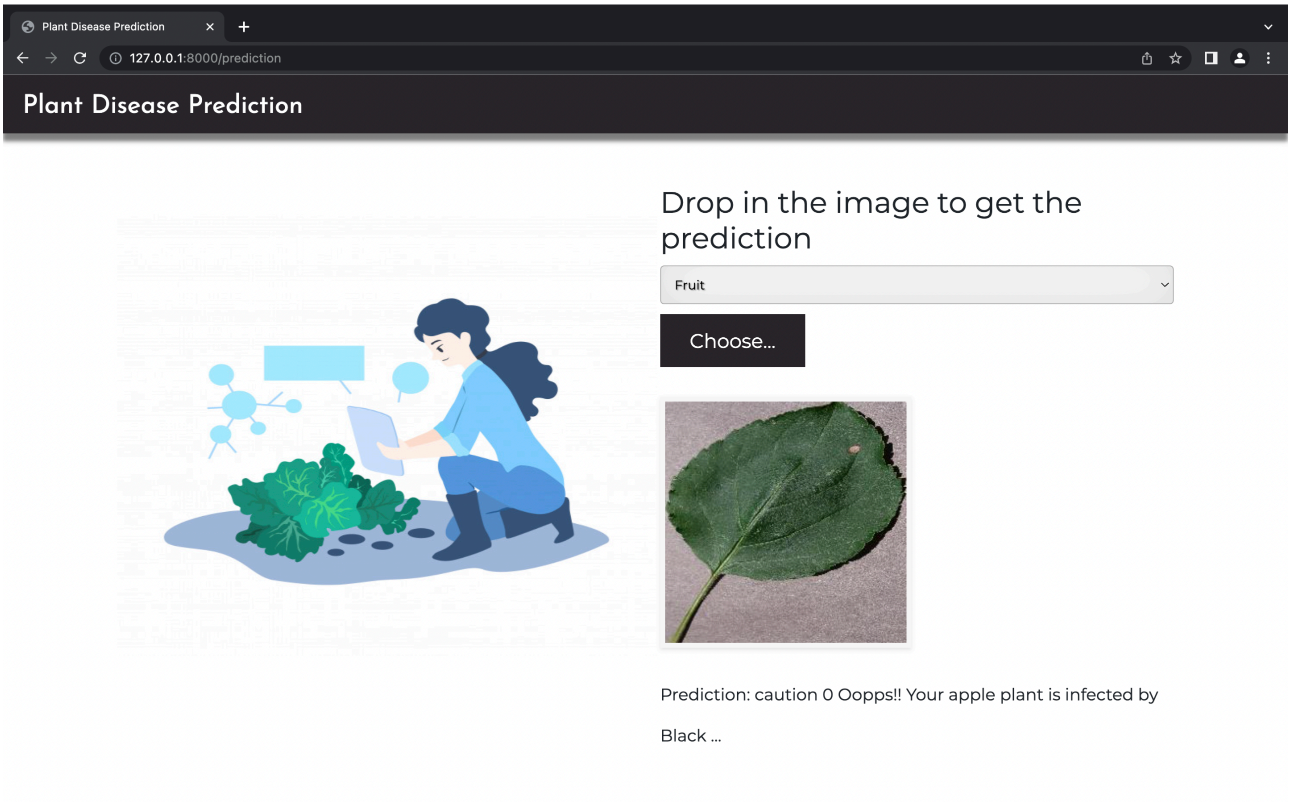
The proposed CNN model consists of a convolution layers and three fully connected layers. Each convolution layer has a 3 × 3 kernel and the number of filters used is 32. Rectified linear unit (ReLU) is used as the activation function. The convolution layer is followed by a maxpool layer with a pool size 2 and stride value 2 to reduce dimensionality of the feature maps. We then flatten to transform a two-dimensional matrix of features into a vector which is then fed into a dense layer. The first two dense layer, comprises of 40 and 20 nodes with ReLU as an activation function. Finally, we added the last dense layer, composed of nodes equaling the number-of- classes with softmax as an activation function, which will be the output layer of the CNN. The proposed model then saved as 'fruit.h5' and 'vegetable.h5' for later use.

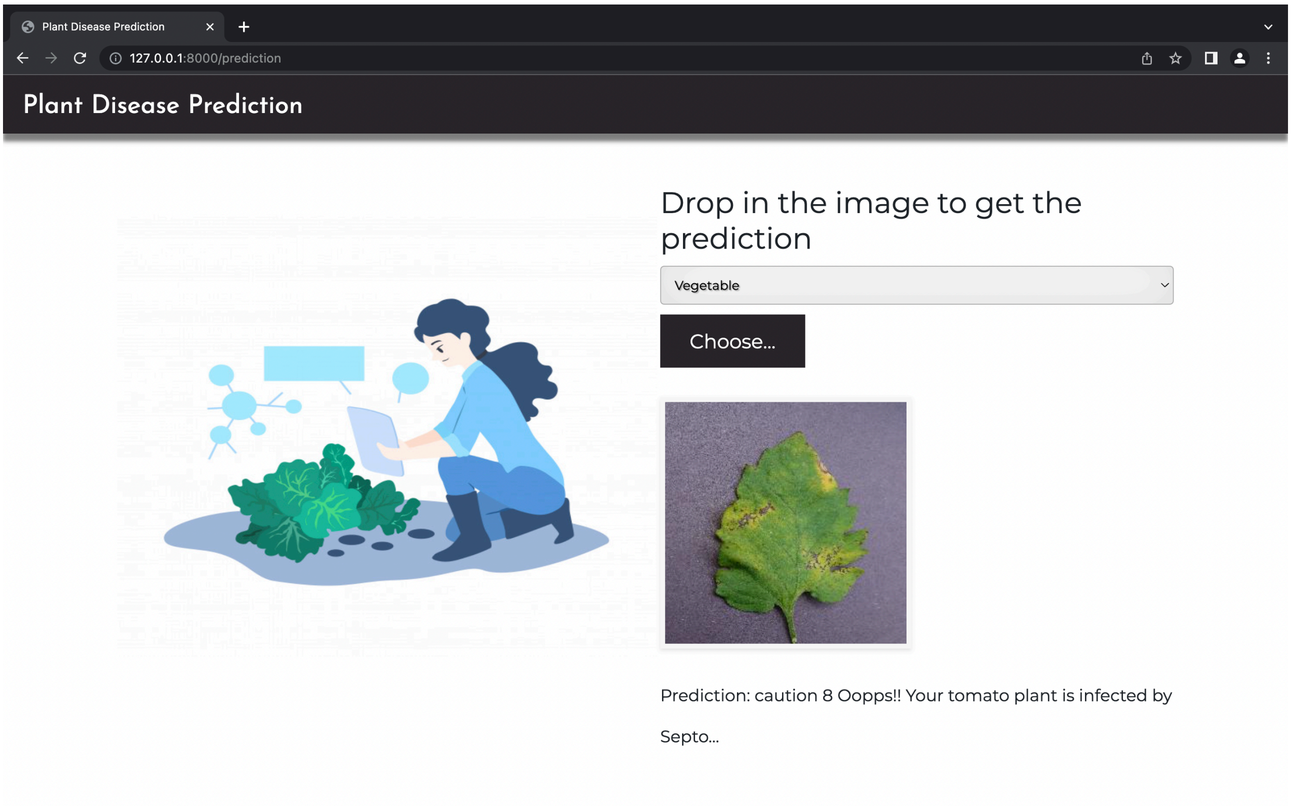
5. Result

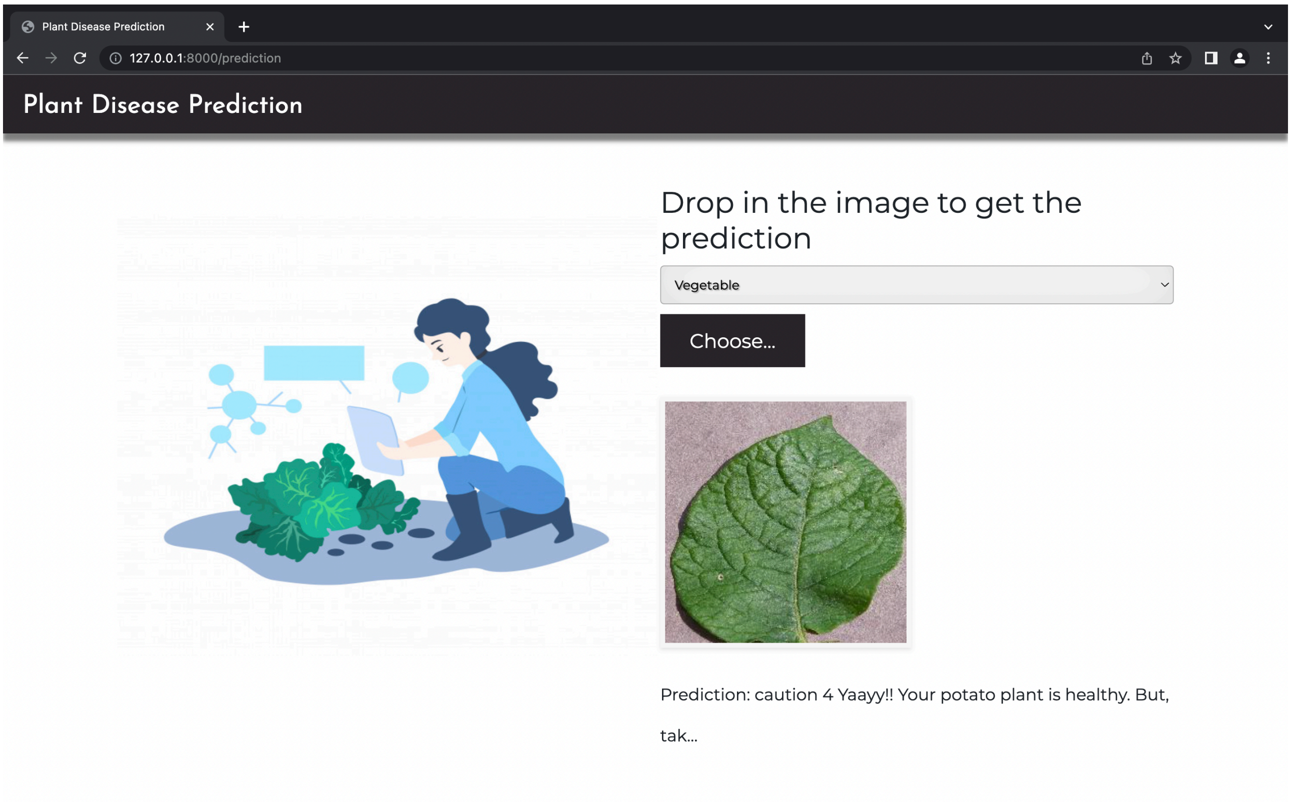


'Accuracy' is used as the performance metric to evaluate the proposed CNN model and for fruit classification the proposed CNN model gave 93.18% accuracy and vegetable classification the proposed model gave 91.48% accuracy. The proposed CNN is deployed on web and sample screenshots are given below:


Plant Disease Prediction
127.0.0.1:8000/prediction
Plant Disease Prediction
Drop in the image to get the prediction
Fruit
Choose...
Prediction: caution 3 Yaayy!! Your corn plant is healthy. But,
maint...


Plant Disease Prediction
127.0.0.1:8000/prediction
Plant Disease Prediction
Drop in the image to get the prediction
Fruit
Choose...
Prediction: caution 0 Oopps!! Your apple plant is infected by
Black ...


Plant Disease Prediction
127.0.0.1:8000/prediction
Plant Disease Prediction
Drop in the image to get the prediction
Vegetable
Choose...
Prediction: caution 8 Oopps!! Your tomato plant is infected by Septo...


Plant Disease Prediction
127.0.0.1:8000/prediction
Plant Disease Prediction
Drop in the image to get the prediction
Vegetable
Choose...
Prediction: caution 4 Yaayy!! Your potato plant is healthy. But, tak...

6. Conclusion

The proposed solution identifies the healthy and infected plants from leaves and recommendation is given for the infected plants.