Title: A comparison between two CNN models to classify Potato leaf disease

1. Contribution:

a. Providing own feature extraction method
b. Developing two CNN models to classify Potato leaf disease
c. Comparing with the developed models
d. Comparing with an existing model

2. Methodology:

We proposed two CNN models to detect potato leaf disease. Figure 1 shows the steps we have followed in our methodology.

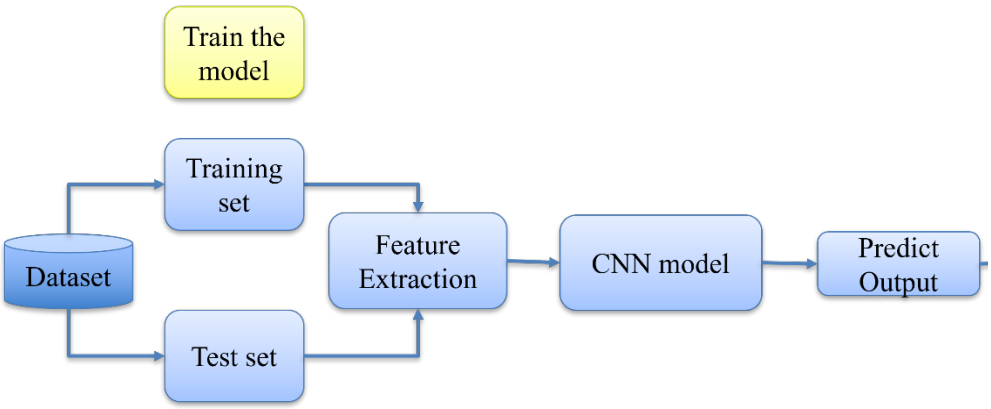


Fig 1: Methodology

a. ***Dataset:*** Dataset: [Potato Leaf Disease Dataset -Kaggle](). There are 3 classes of potato leaf where 2 have leaf images with 2 different diseases such as early blight and late blight and 1 is the healthy leaf. The training data set has 900 images (300 in each class) and 300 for the test dataset (100 for each category).

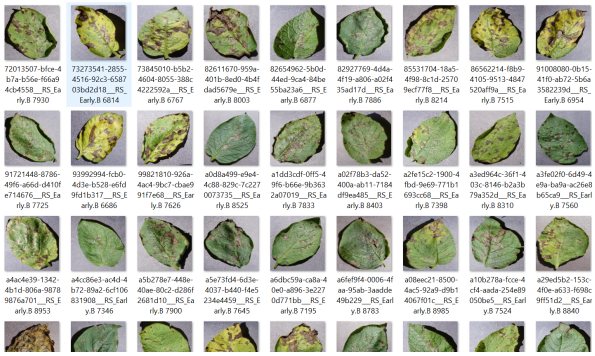


Fig 2: Image of dataset

b. ***Feature Extraction:*** The next step is to extract the features from the images. After reading the image, it is converted from BGR to RGB before resizing to 64 x 64. Then before sending it to the CNN model it is converted from class vector (integers) to binary class matrix.

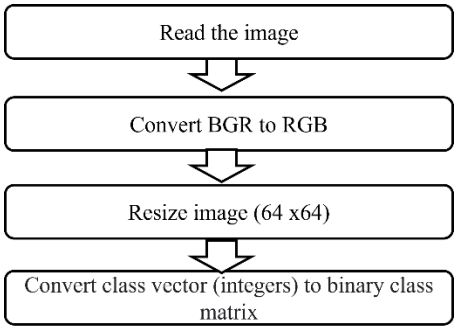


Fig 3: Feature extraction

c. ***Convolutional neural network (CNN):*** We have three 3 x 3 Convolution layers with three 2 x 2 Maxpooling layers in figure 4 and four 3 x 3 Convolution layers with three 2 x 2 Maxpooling layers in figure 5.
We have used 4 dense layers in both cases following a flattened layer.

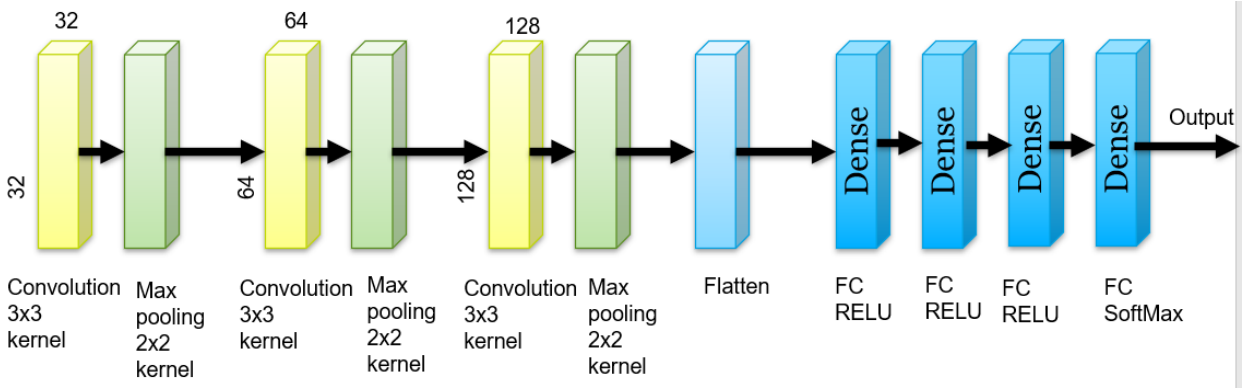


Fig 4: CNN model with 3 layers

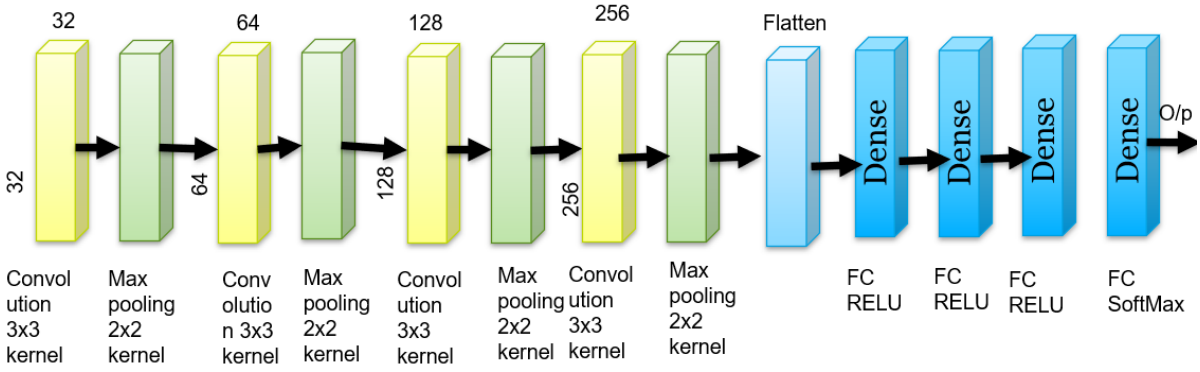


Fig 5: CNN model with 4 layers

Table 1 shows the summary of these models

Table 1: Summary of the model's

Hyperparameter	Description
# convolution layer	3 and 4
# max pooling layer	3 and 4
Activation function	Relu
Learning rate	0.001
Number of epochs	75
Batch Size	128
Optimizer	Adam
Dropout	0.4

3. Result analysis:

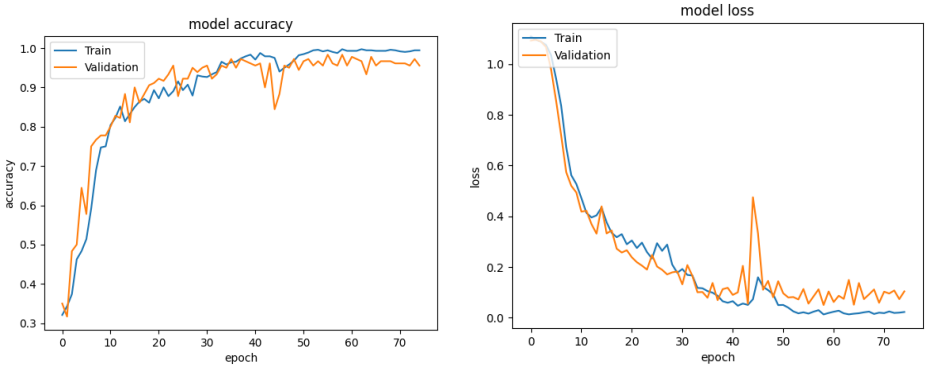
Table 2 shows the accuracy of the proposed two models.

Table 2: Accuracy of the proposed models

CNN Models	Train accuracy	Test Accuracy
With 3 layers	99.72	98.33
With 4 layers	99.86	98.33

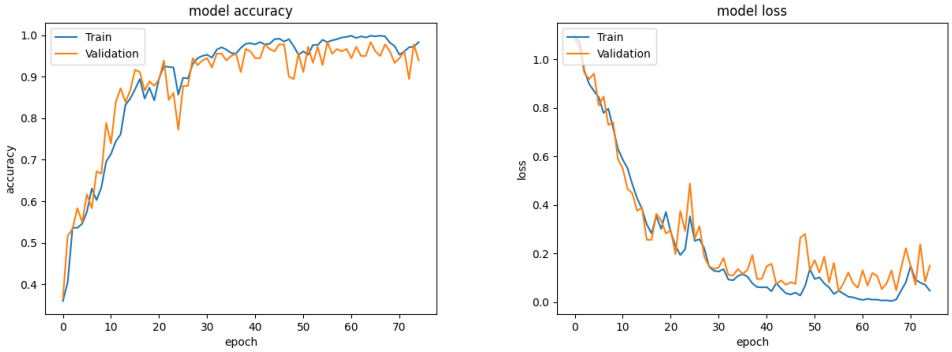
The result shows that for both models, the test accuracy is the same whereas there is an insignificant difference between train accuracy which is 0.14.

Fig 6 shows the accuracy and loss curve of the CNN model with 3 layers and Fig 7 shows the CNN model with 4 layers.



(a) (b)

Fig 6: (a) Accuracy curve (b) Loss curve for CNN model with 3 layers



(a) (b)

Fig 7: (a) Accuracy curve (b) Loss curve for CNN model with 4 layers