RAJKIYA ENGINEERING COLLEGE,BIJNOR

Department of Information Technology

Major Project

on

Plant Disease Identification

&

Classification Using Deep Learning

Under the Guidance :

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Introduction

- ✓ For their food, humans essentially depend on the environment.
- ✓ These foods came from trees, crops and plants.
- ✓ Growing of plants and crops certain illnesses are possible.
- ✓ These illnesses put food security at risk, so the detection and classification of plant diseases required.
- ✓ Plant diseases affect the growth of their respective species, therefore their early identification is very important.

Objective

- ✓ To process the data of the leaf picture from plant dataset.
- ✓ Extract the feature from pre-processed data.
- ✓ Accurately classify the leaf disease
- ✓ Evaluate performance analysis.
- ✓ The basic concept is to identify and prevent plant diseases which effect on Growth food yielding plants.

Solution

- ✓ We are using CNN model.
- ✓ The models were trained on a dataset of plant diseases
- ✓ During training and testing, they are evaluated.
- ✓ Our 99.57% Training accuracy rate was achieved with CNN.

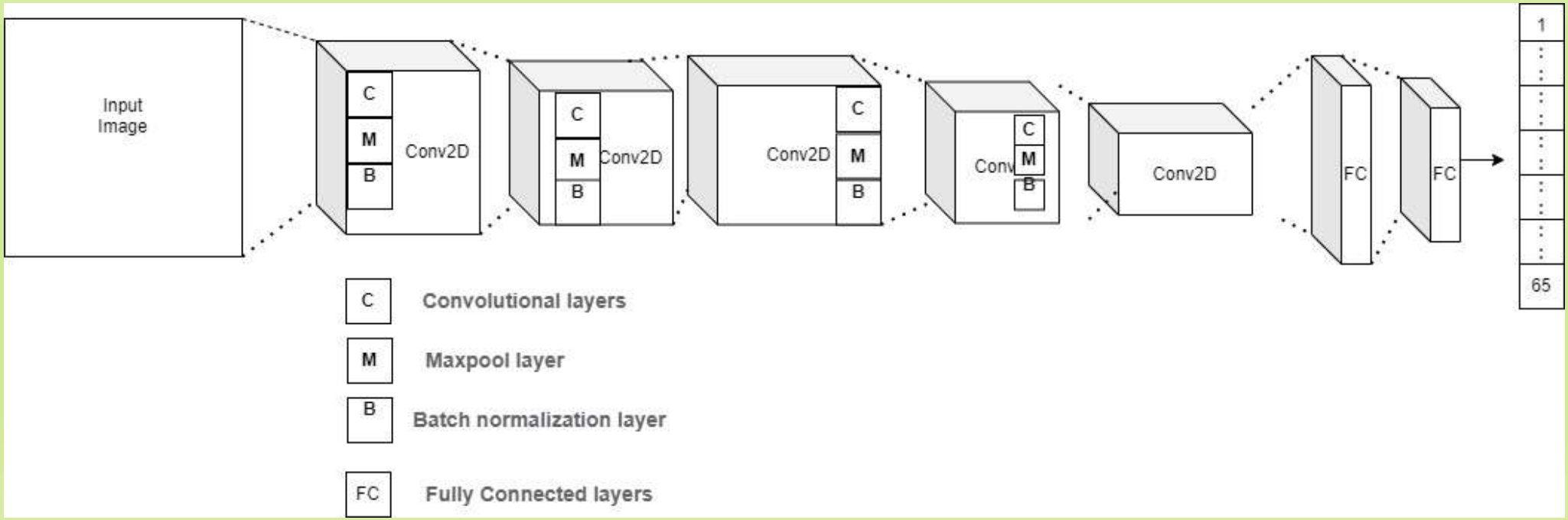
Methodology

- ✓ We collect datasets from two different source.
- ✓ The first from a natural environment containing 15 plant disease classes, and the second from a laboratory containing 50 disease classes
- ✓ Dataset:-Plant Village dataset and Turkey Plant dataset.
- ✓ The Plant Village dataset:
  Consists of healthy and unhealthy leaf images divided into 50 categories by species and disease. These images are laboratory images.
- ✓ Turkey Plant dataset :
  Consists of captured images from the ground environment and divided into 15 categories by species and diseases.

Hyperparameters: CNN

- Input data — Image
- Input image shape — 224 × 224 × 3
- Batch size — 64
- No. of epochs — 100
- Loss function — Categorical_Crossentropy
- Activation function — ReLU, SoftMax
- Learning rate — 0.001
- Optimizers — Adam
  RMSprop
  SGD
  Adagrad
- Dropout rate — 0.3

CNN Architecture



Current Progress

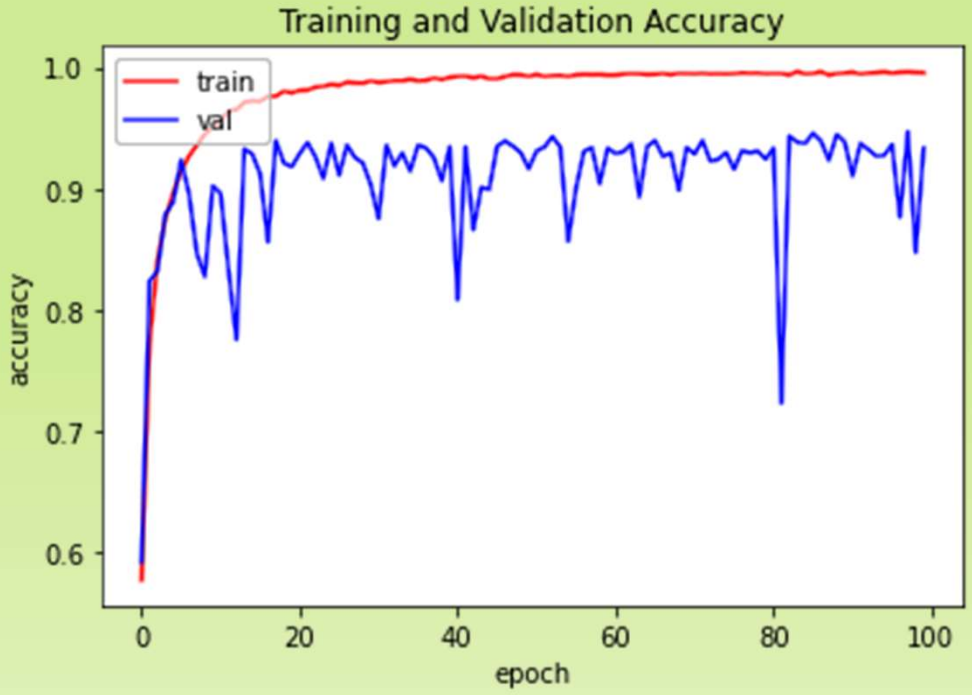
Learning Model

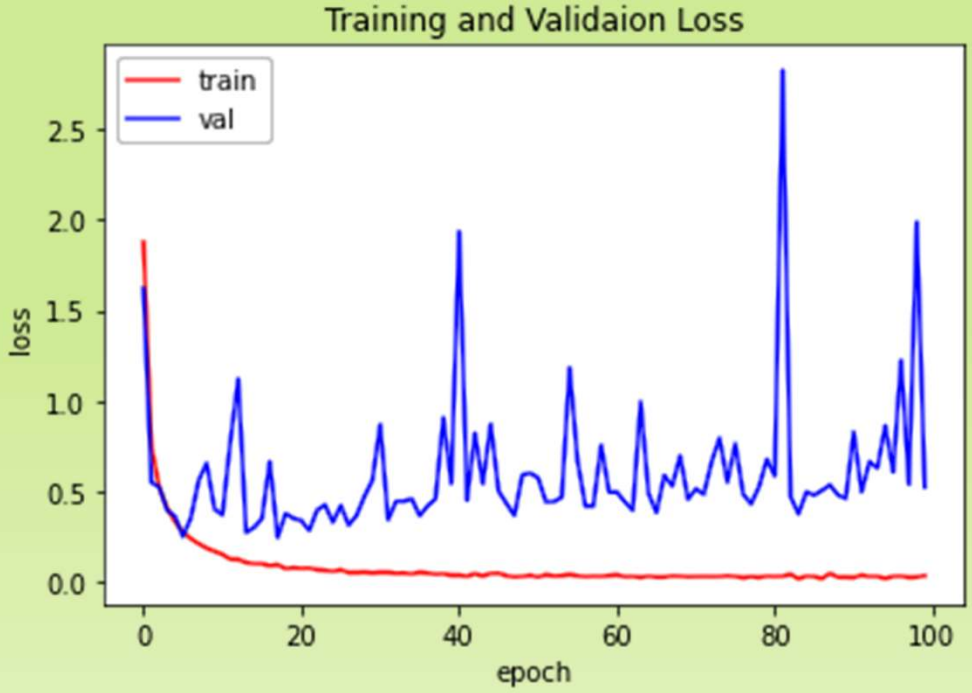
In [11]:
```
history = model.fit(
    train_generator,

    epochs=100,
    verbose=1,
    callbacks=[callbacks],
    validation_data=validation_generator

)
```

```
0.9269
Epoch 95/100
884/884 [==============================] - 4987s 6s/step - loss: 0.0206 - accuracy: 0.9964 - val_loss: 0.8623 - val_accuracy:
0.9274
Epoch 96/100
884/884 [==============================] - 4983s 6s/step - loss: 0.0316 - accuracy: 0.9953 - val_loss: 0.6081 - val_accuracy:
0.9364
Epoch 97/100
884/884 [==============================] - 4972s 6s/step - loss: 0.0333 - accuracy: 0.9960 - val_loss: 1.2243 - val_accuracy:
0.8766
Epoch 98/100
884/884 [==============================] - 4955s 6s/step - loss: 0.0264 - accuracy: 0.9964 - val_loss: 0.5393 - val_accuracy:
0.9470
Epoch 99/100
884/884 [==============================] - 5010s 6s/step - loss: 0.0281 - accuracy: 0.9959 - val_loss: 1.9859 - val_accuracy:
0.8475
Epoch 100/100
884/884 [==============================] - 5004s 6s/step - loss: 0.0359 - accuracy: 0.9957 - val_loss: 0.5243 - val_accuracy:
0.9336
```

Current Progress

Accuracy and Loss of CNN Model





Current Progress

Evaluation of CNN Model

Evaluate Model

In [13]:
```
test_datagen = ImageDataGenerator(rescale=1./255)

test_generator = test_datagen.flow_from_directory(test_dir,
                                                  batch_size=1,
                                                  target_size=(224, 224),
                                                  shuffle = False,
                                                  class_mode='categorical')

filenames = test_generator.filenames
nb_samples = len(filenames)

loss, acc = model.evaluate(test_generator,steps = (nb_samples), verbose=1)
print('accuracy test: ',acc)
print('loss test: ',loss)
```

```
Found 7118 images belonging to 65 classes.
7118/7118 [==============================] - 462s 65ms/step - loss: 0.5718 - accuracy: 0.9279
accuracy test:  0.9279292225837708
loss test:  0.5718039870262146
```

Comparison Table

Different Optimizers Summary

Optimizer name	Training Acc.(%)	Testing Acc.(%)	Val Acc.(%)
Adam	99.57	92.79	92.79
RMSprop			
SGD			
Adagrad			

Result

CNN Model accuracy 92.79

Nobility

Our CNN has the diverse capability to classify Diseases can be both types of laboratory and as well as ground images.

Conclusion

- we have been experienced in this deep learning model how to design a CNN model has been implemented to detect and classify the different categories of plant disease.

Contribution

- ✓ Dataset is collected from Plant Village dataset and Turkey Plant dataset dataset, images in the dataset are in different resolution.
- ✓ To solve the problem of overfitting batch-normalization and dropout layer are added in model.
- ✓ A model has been developed which can detect and classify 65 plants diseases such as ***(1) Apple Scab, Venturia inaequalis (2) Apple Black Rot, Botryosphaeria obtusa (3) Apple Cedar Rust, Gymnosporangium juniperi-virginianae (4) Apple healthy (5) respectively*** etc.
- ✓ This model has achieved 99.57% accuracy on training, 92.79% on validation and 92.97% on test data.

Future Scope

- ✓ The forecasting of disease in early stage, so that appropriate measures can be taken to minimize the loss in crops.
- ✓ Our project have shown pretty good accuracy. It can be implemented in real time mobile applications and web services, so that formers can identify diseases simply by taking photo of suspected leaves of plants.
- ✓ Other than plant leaf disease identification, it can also be used for identification and classification of nutrients deficiency of plant leaves.
- ✓ Creating and training a CNN model from scratch is a tedious process , this model can be used to detect and classification of other plant disease too, by simply training the model using respected dataset.

Thank You