Project Objectives

Team ID	PNT2022TMID30319
Project Name	Fertilizers Recommendation System For Disease Prediction

Preprocess the image

Image preprocessing is improving image statistics so that undesired distortions are suppressed and image capabilities.We will use CNN machine learning algorithm for image classification.

▾ Import Library

```
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
import pandas as pd
import tensorflow
import keras
import os
import cv2
import glob
from skimage import io
import random
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
from keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator,load_img,img_to_array
```

```
from numpy import expand_dims



path = 'Dataset Plant Disease'

path1 = 'Dataset Plant Disease/fruit-dataset/fruit-dataset/train'

path2 = 'Dataset Plant Disease/fruit-dataset/fruit-dataset/test'

train_data_gen = ImageDataGenerator(rescale = 1./255,
                                    shear_range = 0.2,
                                    zoom_range = 0.2,
                                    horizontal_flip = True,
                                    validation_split = 0.30)
test_data_gen = ImageDataGenerator(rescale = 1./255,validation_split = 0.30)
```

Train and Test

```
training_set = train_data_gen.flow_from_directory(path,
                                                  target_size=(64,64),
                                                  batch_size=100,
                                                  class_mode='categorical',
                                                  shuffle=True,
                                                  color_mode='rgb',
                                                  subset = 'training')

testing_set = test_data_gen.flow_from_directory(path,
                                                  target_size=(64,64),
                                                  batch_size=100,
                                                  class_mode='categorical',
                                                  shuffle=True,
                                                  color_mode='rgb',
                                                  subset = 'validation')
```

```
Found 15311 images belonging to 2 classes.
Found 6561 images belonging to 2 classes.
```

Applying CNN Algorithm

For different batch size,the CNN gives different accuracies.The batch size determines the number of iterations per epoch. Another important hyper parameter is the number of epochs.

In [7]:
```
model=Sequential()
```

In [8]:
```
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())

32*(3*3*3+1)
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(6,activation='softmax'))
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 126, 126, 32)      896

 max_pooling2d (MaxPooling2D  (None, 63, 63, 32)       0
 )

 flatten (Flatten)           (None, 127008)            0

 dense (Dense)               (None, 300)               38102700

 dense_1 (Dense)             (None, 150)               45150

 dense_2 (Dense)             (None, 6)                 906

=================================================================
Total params: 38,149,652
Trainable params: 38,149,652
Non-trainable params: 0
_________________________________________________________________
```

Deep neural networks detect the disease

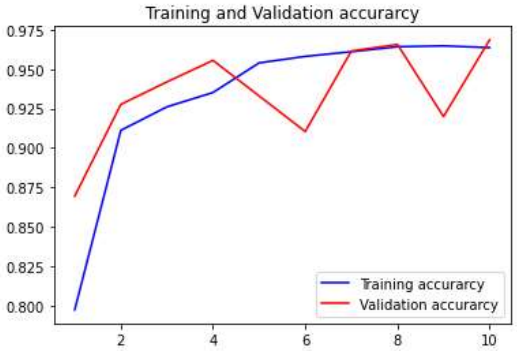
It is more efficient to detect plant leaf disease and easier to obtain higher accuracy when using a novel deep learning approach based on CNNs.

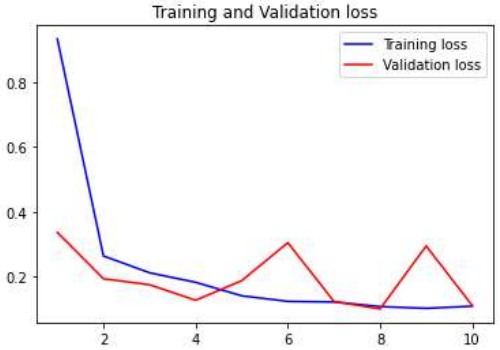
```
Upload=files.upload()

for path in Upload.keys():
  input=image.load_img(path,target_size=(128,128))
  x=image.img_to_array(input)
  x=np.expand_dims(x,axis=0)
  y=np.argmax(model.predict(x),axis=1)
  index=['Pepper,_bell___Bacterial_spot','Pepper,_bell___healthy','Potato___Early_blight','Potato___Late_blight','Potato___healthy','Tomato___Bacteria
  index[y[0]]
  print(index[y[0]])
```

```
Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving 00d8f10f-5038-4e0f-bb58-0b885ddc0cc5___RS_Early.B 8722.JPG to 00d8f10f-5038-4e0f-bb58-0b885ddc0cc5___RS_Early.B 8722.JPG
Saving 0a8a68ee-f587-4dea-beec-79d02e7d3fa4___RS_Early.B 8461.JPG to 0a8a68ee-f587-4dea-beec-79d02e7d3fa4___RS_Early.B 8461.JPG
Saving 0a47f32c-1724-4c8d-bfe4-986cedd3587b___RS_Early.B 8001.JPG to 0a47f32c-1724-4c8d-bfe4-986cedd3587b___RS_Early.B 8001.JPG
Saving 0a0744dc-8486-4fbb-a44b-4d63e6db6197___RS_Early.B 7575.JPG to 0a0744dc-8486-4fbb-a44b-4d63e6db6197___RS_Early.B 7575.JPG
Saving 0a6983a5-895e-4e68-9edb-88adf79211e9___RS_Early.B 9072.JPG to 0a6983a5-895e-4e68-9edb-88adf79211e9___RS_Early.B 9072.JPG
Saving 0a79700b-f834-41f5-ae51-6ceda6f67a48___RS_Early.B 8951.JPG to 0a79700b-f834-41f5-ae51-6ceda6f67a48___RS_Early.B 8951.JPG
Saving 0ad3ba53-f01b-403b-a99d-5991eed85045___RS_Early.B 7600.JPG to 0ad3ba53-f01b-403b-a99d-5991eed85045___RS_Early.B 7600.JPG
Saving 0bbb8bce-2020-416b-8bd6-c160c2db9921___RS_Early.B 8386.JPG to 0bbb8bce-2020-416b-8bd6-c160c2db9921___RS_Early.B 8386.JPG
1/1 [==============================] - 0s 423ms/step
Tomato___Septoria_leaf_spot
1/1 [==============================] - 0s 31ms/step
Potato___Early_blight
1/1 [==============================] - 0s 31ms/step
Pepper,_bell___healthy
1/1 [==============================] - 0s 31ms/step
Tomato___Septoria_leaf_spot
1/1 [==============================] - 0s 31ms/step
Potato___Early_blight
1/1 [==============================] - 0s 29ms/step
Potato___Early_blight
1/1 [==============================] - 0s 30ms/step
Tomato___Septoria_leaf_spot
1/1 [==============================] - 0s 35ms/step
Potato___Early_blight
```

Accuracy of the model

Fruit

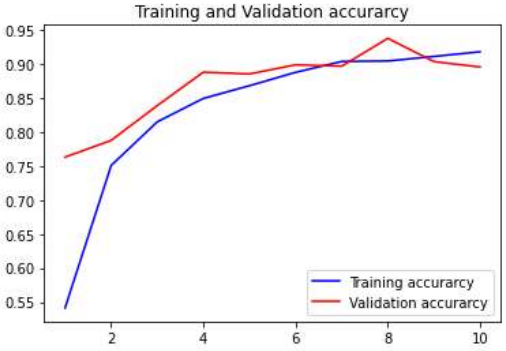


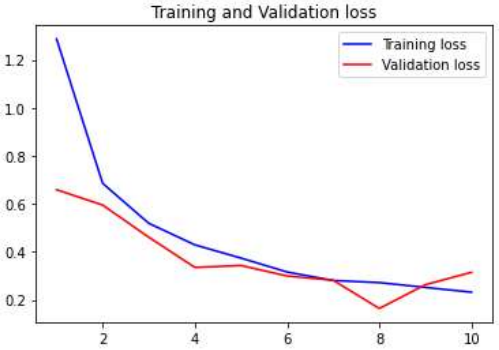


Test accuracy : 97.1

Train accuracy : 97.9

Vegetable





Test accuracy : 89.5

Train accuracy : 89.5

Web application of flask framework

Flask is a small and lightweight Python web framework that provides useful tools and features that make creating web applications in Python.