In [1]:
```
pwd
```

Out[1]: `'C:\\Users\\rsenthil_1976'`

In [2]:
```
cd E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/fruit-dataset
```

E:\IBM_MY_COURSE\Project\Dataset Plant Disease\fruit-dataset\fruit-dataset

Apply ImageDataGenerator functionality to Train and Test set

Preprocessing

In [3]:
```
from keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizo
test_datagen = ImageDataGenerator(rescale=1)
```

In [4]:
```
pwd
```

Out[4]: `'E:\\IBM_MY_COURSE\\Project\\Dataset Plant Disease\\fruit-dataset\\fruit-dataset'`

In [5]:
```
x_train = train_datagen.flow_from_directory('E:/IBM_MY_COURSE/Project/Dataset Plant Dis
```

Found 5384 images belonging to 6 classes.

In [6]:
```
x_test=test_datagen.flow_from_directory('E:/IBM_MY_COURSE/Project/Dataset Plant Disease
                                        batch_size=32,class_mode='categorical')
```

Found 1686 images belonging to 6 classes.

Import the models

In [7]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPool2D,Flatten
```

Initializing the models

In [8]:
```
model=Sequential()
```

Add CNN Layers

```python
In [9]: model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
```

```python
In [10]: x_train.class_indices
```

```python
Out[10]: {'Apple___Black_rot': 0,
 'Apple___healthy': 1,
 'Corn_(maize)___Northern_Leaf_Blight': 2,
 'Corn_(maize)___healthy': 3,
 'Peach___Bacterial_spot': 4,
 'Peach___healthy': 5}
```

Add Pooling layer

```python
In [11]: model.add(MaxPool2D(pool_size=(2,2)))
```

Add Flatten layer

```python
In [12]: model.add(Flatten())
```

Add Dense Layer

```python
In [21]: model.add(Dense(40, kernel_initializer='uniform',activation='relu'))
         model.add(Dense(20, kernel_initializer='random_uniform',activation='relu'))
```

Add Output Layer

```python
In [24]: model.add(Dense(6,activation='softmax', kernel_initializer='random_uniform'))
```

Compile the model

```python
In [25]: model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

```python
In [26]: len(x_train)
```

```python
Out[26]: 169
```

```python
In [27]: 5384/32
```

```python
Out[27]: 168.25
```

Fit the Model

In [28]:
```python
model.fit_generator(x_train,steps_per_epoch=168,validation_data=x_test,validation_steps
```

```
WARNING:tensorflow:From <ipython-input-28-6de952bde51e>:1: Model.fit_generator (from ten
sorflow.python.keras.engine.training) is deprecated and will be removed in a future vers
ion.
Instructions for updating:
Please use Model.fit, which supports generators.
Epoch 1/3
168/168 [==============================] - 465s 3s/step - loss: 1.3844 - accuracy: 0.458
9 - val_loss: 107.1929 - val_accuracy: 0.6971
Epoch 2/3
168/168 [==============================] - 414s 2s/step - loss: 0.6387 - accuracy: 0.753
4 - val_loss: 62.9415 - val_accuracy: 0.8143
Epoch 3/3
168/168 [==============================] - 382s 2s/step - loss: 0.4579 - accuracy: 0.828
3 - val_loss: 142.3666 - val_accuracy: 0.7356
```

Out[28]: <tensorflow.python.keras.callbacks.History at 0xe6265db040>

Save the Model

In [29]:
```python
model.save("fruit.h5")
```

In [30]:
```python
ls
```

```
 Volume in drive E has no label.
 Volume Serial Number is 7A1E-CC1E

 Directory of E:\IBM_MY_COURSE\Project\Dataset Plant Disease\fruit-dataset\fruit-dataset

08/03/2022  05:23 PM    <DIR>          .
08/03/2022  05:23 PM    <DIR>          ..
08/03/2022  05:23 PM        61,060,920 fruit.h5
08/01/2022  12:40 PM    <DIR>          test
08/01/2022  12:43 PM    <DIR>          train
               1 File(s)     61,060,920 bytes
               4 Dir(s)  54,315,991,040 bytes free
```

Test the Model

In [32]:
```python
from keras.preprocessing import image
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model
import numpy as np
```

In [33]:
```python
model = load_model("fruit.h5")
```

Test Apple_Healthy Class images

In [37]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [39]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
```

In [40]:
```python
pred = model.predict_classes(x)
```

```
WARNING:tensorflow:From <ipython-input-40-fb3bdd339d5d>:1: Sequential.predict_classes (f
rom tensorflow.python.keras.engine.sequential) is deprecated and will be removed after 2
021-01-01.
Instructions for updating:
Please use instead:* `np.argmax(model.predict(x), axis=-1)`,   if your model does multi-
class classification  (e.g. if it uses a `softmax` last-layer activation).* `(model.pre
dict(x) > 0.5).astype("int32")`,   if your model does binary classification  (e.g. if i
t uses a `sigmoid` last-layer activation).
```

In [41]:
```python
pred
```

Out[41]: array([1], dtype=int64)

In [45]:
```python
index =['Apple___Black_rot','Apple___healthy','Corn_(maize)___Northern_Leaf_Blight','Co
```

In [46]:
```python
print('the given image belogs to=',index[pred[0]])
```

```
the given image belogs to= Apple___healthy
```

Test Apple Black Rot class images

In [54]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [55]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred = model.predict_classes(x)
print('the given image belogs to=',index[pred[0]])
```

```
the given image belogs to= Apple___Black_rot
```

Test Corn Northern leaf Blight class images

In [56]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [57]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred = model.predict_classes(x)
print('the given image belogs to=',index[pred[0]])
```

```
the given image belogs to= Corn_(maize)___Northern_Leaf_Blight
```

Test Corn Healthy class images

In [58]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [59]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred = model.predict_classes(x)
print('the given image belogs to=',index[pred[0]])
```

the given image belogs to= Corn_(maize)___healthy

Test Peach Bacterial spot class images

In [60]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [61]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred = model.predict_classes(x)
print('the given image belogs to=',index[pred[0]])
```

the given image belogs to= Peach___Bacterial_spot

Test Peach Healthy class images

In [62]:
```python
img = image.load_img('E:/IBM_MY_COURSE/Project/Dataset Plant Disease/fruit-dataset/frui
```

In [63]:
```python
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred = model.predict_classes(x)
print('the given image belogs to=',index[pred[0]])
```

the given image belogs to= Apple___healthy