

import the libraries

In [15]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import
Dense, Convolution2D, MaxPooling2D, Flatten
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

Image Augmentation

In [3]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255, zoom_range=0.2, horizontal_f
lip=True, vertical_flip=False)
test_datagen=ImageDataGenerator(rescale=1./255)
```

In [4]:

```
x_train=train_datagen.flow_from_directory(r'/content/drive/MyDrive/Dataset
Plant Disease/fruit-dataset/fruit-
dataset/train', target_size=(128,128), class_mode='categorical', batch_size=24
)
```

Found 5384 images belonging to 6 classes.

In [5]:

```
x_test=test_datagen.flow_from_directory(r'/content/drive/MyDrive/Dataset
Plant Disease/fruit-dataset/fruit-dataset/test", target_size=(128,128),
```

```
class_mode='categorical', batch_size=24)
```

Found 1686 images belonging to 6 classes.

Create the model

In [6]:

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import
Dense, Convolution2D, MaxPooling2D, Flatten
```

Add Layers

In [7]:

```
model=Sequential()
```

In [9]:

```
model.add(Convolution2D(32, (3,3), input_shape=(128,128,3), activation='relu')
)
```

In [10]:

```
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
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
```

```
=====
Total params: 896
Trainable params: 896
Non-trainable params: 0
```

---

In [11]:

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

In [12]:

```
model.add(Dense(6,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['ac
curacy'])
len(x_train)
```

Out[12]:

```
225
```

In [13]:

```
1238/24
```

Out[13]:

```
51.583333333333336
```

**fit the model**

In [14]:

```
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,valid
ation_steps=len(x_test),epochs=10)
```

Epoch 1/10

```
225/225 [=====] - 2639s 12s/step - loss: 1.3354 -
accuracy: 0.7652 - val_loss: 0.4907 - val_accuracy: 0.8215
```

Epoch 2/10

```
225/225 [=====] - 172s 762ms/step - loss: 0.2829 -
accuracy: 0.9008 - val_loss: 0.1736 - val_accuracy: 0.9383
```

Epoch 3/10

```
225/225 [=====] - 179s 794ms/step - loss: 0.2056 -
accuracy: 0.9296 - val_loss: 0.1954 - val_accuracy: 0.9312
```

Epoch 4/10

```
225/225 [=====] - 172s 765ms/step - loss: 0.1694 -
accuracy: 0.9383 - val_loss: 0.2187 - val_accuracy: 0.9253
```

Epoch 5/10

```
225/225 [=====] - 179s 796ms/step - loss: 0.1539 -
accuracy: 0.9461 - val_loss: 0.1366 - val_accuracy: 0.9543
```

Epoch 6/10

```
225/225 [=====] - 172s 765ms/step - loss: 0.1428 -
accuracy: 0.9491 - val_loss: 0.1668 - val_accuracy: 0.9442
```

Epoch 7/10

```
225/225 [=====] - 175s 774ms/step - loss: 0.1333 -
accuracy: 0.9538 - val_loss: 0.1976 - val_accuracy: 0.9253
```

Epoch 8/10

```
225/225 [=====] - 174s 774ms/step - loss: 0.1172 -
accuracy: 0.9590 - val_loss: 0.0944 - val_accuracy: 0.9674
```

Epoch 9/10

```
225/225 [=====] - 172s 763ms/step - loss: 0.1143 -
accuracy: 0.9569 - val_loss: 0.1306 - val_accuracy: 0.9561
```

```
Epoch 10/10
225/225 [=====] - 179s 795ms/step - loss: 0.0913 -
accuracy: 0.9673 - val_loss: 0.1848 - val_accuracy: 0.9460
```

Out[14]:

save the model

In [16]:

```
model.save('fruitdata.h5')
```

Testing the model

In [17]:

```
model=load_model('fruitdata.h5')
```

In [18]:

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [19]:

```
img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/fruit-
dataset/fruit-dataset/test/Apple___healthy/01efa999-757d-487e-8250-
27c7854c0ca8___RS_HL_7515.JPG",target_size=(128,128))
```

In [21]:

```
img
```

Out[21]:



In [22]:

```
img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/fruit-
dataset/fruit-dataset/test/Apple___healthy/01efa999-757d-487e-8250-
27c7854c0ca8___RS_HL_7515.JPG",target_size=(128,128))
img
```

Out[22]:



In [23]:

```
x=image.img_to_array(img)
x
```

Out[23]:

```
array([[111., 122., 152.],
       [110., 121., 151.],
       [118., 129., 159.],
       ...,
       [184., 198., 225.]])
```

```

[187., 201., 228.],
[180., 194., 221.]],

[[124., 135., 165.],
[117., 128., 158.],
[121., 132., 162.],
...,
[178., 192., 219.],
[191., 205., 232.],
[179., 193., 220.]],

[[123., 134., 164.],
[117., 128., 158.],
[114., 125., 155.],
...,
[180., 194., 221.],
[189., 203., 230.],
[179., 193., 220.]],

...,

[[114., 128., 157.],
[118., 132., 161.],
[125., 139., 168.],
...,
[177., 191., 217.],
[187., 199., 223.],
[180., 192., 216.]],

[[120., 134., 163.],
[125., 139., 168.],
[122., 136., 165.],
...,
[189., 197., 216.],
[188., 197., 214.],
[186., 195., 210.]],

[[127., 141., 170.],
[118., 132., 161.],
[118., 132., 161.],
...,
[160., 167., 183.],
[172., 180., 191.],
[190., 199., 208.]]], dtype=float32)

```

In [24]:

```

x=np.expand_dims(x,axis=0)
x

```

Out[24]:

```

array([[[[111., 122., 152.],
          [110., 121., 151.],
          [118., 129., 159.],
          ...,
          [184., 198., 225.],
          [187., 201., 228.],
          [180., 194., 221.]],

```

```

[[124., 135., 165.],
 [117., 128., 158.],
 [121., 132., 162.],
 ...,
 [178., 192., 219.],
 [191., 205., 232.],
 [179., 193., 220.]],

[[123., 134., 164.],
 [117., 128., 158.],
 [114., 125., 155.],
 ...,
 [180., 194., 221.],
 [189., 203., 230.],
 [179., 193., 220.]],

...,

[[114., 128., 157.],
 [118., 132., 161.],
 [125., 139., 168.],
 ...,
 [177., 191., 217.],
 [187., 199., 223.],
 [180., 192., 216.]],

[[120., 134., 163.],
 [125., 139., 168.],
 [122., 136., 165.],
 ...,
 [189., 197., 216.],
 [188., 197., 214.],
 [186., 195., 210.]],

[[127., 141., 170.],
 [118., 132., 161.],
 [118., 132., 161.],
 ...,
 [160., 167., 183.],
 [172., 180., 191.],
 [190., 199., 208.]]], dtype=float32)

```

In [25]:

x

Out[25]:

```

array([[[111., 122., 152.],
 [110., 121., 151.],
 [118., 129., 159.],
 ...,
 [184., 198., 225.],
 [187., 201., 228.],
 [180., 194., 221.]],

[[124., 135., 165.],
 [117., 128., 158.],
 [121., 132., 162.],
 ...,

```

```

[178., 192., 219.],
[191., 205., 232.],
[179., 193., 220.]],

[[123., 134., 164.],
[117., 128., 158.],
[114., 125., 155.],
...,
[180., 194., 221.],
[189., 203., 230.],
[179., 193., 220.]],

...,

[[114., 128., 157.],
[118., 132., 161.],
[125., 139., 168.],
...,
[177., 191., 217.],
[187., 199., 223.],
[180., 192., 216.]],

[[120., 134., 163.],
[125., 139., 168.],
[122., 136., 165.],
...,
[189., 197., 216.],
[188., 197., 214.],
[186., 195., 210.]],

[[127., 141., 170.],
[118., 132., 161.],
[118., 132., 161.],
...,
[160., 167., 183.],
[172., 180., 191.],
[190., 199., 208.]]]], dtype=float32)

```

In [26]:

```

y=np.argmax(model.predict(x),axis=1)
1/1 [=====] - 0s 201ms/step

```

In [27]:

```

index=['Apple__Black_rot','Apple__healthy','Corn_(maize)__Northern_Leaf_
Blight','Corn_(maize)__healthy','Peach__Bacterial_spot','Peach__healthy'
]
index[y[0]]

```

Out[27]:

```

'Apple__healthy'

```

In [28]:

```

img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/fruit-
dataset/fruit-dataset/test/Apple__healthy/01efa999-757d-487e-8250-
27c7854c0ca8__RS_HL_7515.JPG",target_size=(128,128))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)

```

```
index=['Apple__Black_rot','Apple__healthy','Corn_(maize)__Northern_Leaf_
Blight','Corn_(maize)__healthy','Peach__Bacterial_spot','Peach__healthy'
]
index[y[0]]
```

```
1/1 [=====] - 0s 48ms/step
```

Out[28]:

```
'Apple__healthy'
```