import the libraries

In [18]:

```
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 [1]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [2]:

```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_f
lip=True,vertical_flip=False)
```

In [3]:

```
test_datagen=ImageDataGenerator(rescale=1./255)
```

In [4]:

```
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/Dataset
Plant Disease/Veg-dataset/Veg-dataset/train_set",target_size=(128,128),

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

```
Found 11386 images belonging to 9 classes.
```

In [5]:

```
x_test=test_datagen.flow_from_directory(r'/content/drive/MyDrive/Dataset
Plant Disease/Veg-dataset/Veg-
dataset/test_set',target_size=(128,128),class_mode='categorical',batch_size
=24)
```

```
Found 3416 images belonging to 9 classes.
```

add layers

In [6]:

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

In [7]:

```
model=Sequential()
```

In [8]:

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

In [9]:

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

In [10]:

```
model.add(Flatten())
```

In [11]:

```
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 [12]:

```
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

In [13]:

```
model.add(Dense(9,activation='softmax'))
```

In [14]:

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['ac
curacy'])
```

In [15]:

```
len(x_train)
```

Out[15]:

```
475
```

In [16]:

```
1238/24
```

Out[16]:

```
51.583333333333336
```

fit the model

In [17]:

```
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
475/475 [==============================] - 3275s 7s/step - loss: 1.4156 - a
ccuracy: 0.6092 - val_loss: 0.8031 - val_accuracy: 0.7178
Epoch 2/10
475/475 [==============================] - 375s 789ms/step - loss: 0.5598 -
accuracy: 0.8004 - val_loss: 0.5123 - val_accuracy: 0.8150
Epoch 3/10
475/475 [==============================] - 362s 762ms/step - loss: 0.4634 -
accuracy: 0.8402 - val_loss: 0.3696 - val_accuracy: 0.8718
Epoch 4/10
475/475 [==============================] - 364s 765ms/step - loss: 0.3832 -
accuracy: 0.8669 - val_loss: 0.2470 - val_accuracy: 0.9183
Epoch 5/10
475/475 [==============================] - 364s 765ms/step - loss: 0.3210 -
accuracy: 0.8873 - val_loss: 0.3565 - val_accuracy: 0.8741
Epoch 6/10
475/475 [==============================] - 360s 758ms/step - loss: 0.2831 -
accuracy: 0.9040 - val_loss: 0.4657 - val_accuracy: 0.8352
Epoch 7/10
475/475 [==============================] - 371s 781ms/step - loss: 0.2453 -
accuracy: 0.9135 - val_loss: 0.1700 - val_accuracy: 0.9458
```

```
Epoch 8/10
475/475 [==============================] - 361s 760ms/step - loss: 0.2693 -
accuracy: 0.9062 - val_loss: 0.3006 - val_accuracy: 0.8967
Epoch 9/10
475/475 [==============================] - 373s 786ms/step - loss: 0.2177 -
accuracy: 0.9257 - val_loss: 0.1678 - val_accuracy: 0.9429
Epoch 10/10
475/475 [==============================] - 373s 786ms/step - loss: 0.2082 -
accuracy: 0.9288 - val_loss: 0.1483 - val_accuracy: 0.9494
```

Out[17]:

save the model

In [19]:

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

test the model

In [23]:

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

In [25]:

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

In [26]:

```
img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/Veg-
dataset/Veg-dataset/test_set/Potato___Early_blight/b7883606-5157-4dc1-b965-
fc10f8fe1796___RS_Early.B 7598.JPG")
img
```

Out[26]:

In [27]:

```
x=image.img_to_array(img)
img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/Veg-
dataset/Veg-dataset/test_set/Potato___Early_blight/b7883606-5157-4dc1-b965-
fc10f8fe1796___RS_Early.B 7598.JPG",target_size=(128,128))
img
```

Out[27]:

In [28]:

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

Out[28]:

```
array([[[156., 163., 191.],
        [158., 165., 193.],
        [155., 162., 190.],
        ...,
        [109., 113., 140.],
        [109., 113., 140.],
        [113., 117., 144.]],

       [[166., 173., 201.],
        [166., 173., 201.],
        [159., 166., 194.],
        ...,
        [110., 114., 141.],
        [104., 108., 135.],
        [109., 113., 140.]],

       [[168., 175., 203.],
        [160., 167., 195.],
        [152., 159., 187.],
        ...,
        [110., 114., 141.],
        [101., 105., 132.],
        [110., 114., 141.]],

       ...,

       [[160., 161., 181.],
        [162., 163., 183.],
        [155., 156., 176.],
        ...,
        [103., 101., 122.],
        [ 99.,  97., 118.],
        [105., 103., 124.]],

       [[155., 156., 176.],
        [150., 151., 171.],
        [152., 153., 173.],
        ...,
        [109., 107., 128.],
        [102., 100., 121.],
        [107., 105., 126.]],

       [[157., 158., 178.],
        [156., 157., 177.],
```

```
        [149., 150., 170.],
        ...,
        [ 92.,  90., 111.],
        [119., 117., 138.],
        [ 96.,  94., 115.]]], dtype=float32)
```

In [29]:

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

In [30]:

```
x
```

Out[30]:

```
array([[[[156., 163., 191.],
         [158., 165., 193.],
         [155., 162., 190.],
         ...,
         [109., 113., 140.],
         [109., 113., 140.],
         [113., 117., 144.]],

        [[166., 173., 201.],
         [166., 173., 201.],
         [159., 166., 194.],
         ...,
         [110., 114., 141.],
         [104., 108., 135.],
         [109., 113., 140.]],

        [[168., 175., 203.],
         [160., 167., 195.],
         [152., 159., 187.],
         ...,
         [110., 114., 141.],
         [101., 105., 132.],
         [110., 114., 141.]],

        ...,

        [[160., 161., 181.],
         [162., 163., 183.],
         [155., 156., 176.],
         ...,
         [103., 101., 122.],
         [ 99.,  97., 118.],
         [105., 103., 124.]],

        [[155., 156., 176.],
         [150., 151., 171.],
         [152., 153., 173.],
         ...,
         [109., 107., 128.],
         [102., 100., 121.],
         [107., 105., 126.]],

        [[157., 158., 178.],
         [156., 157., 177.],
         [149., 150., 170.],
```

```
        ...,
        [ 92.,  90., 111.],
        [119., 117., 138.],
        [ 96.,  94., 115.]]]], dtype=float32)
```

In [31]:

```
y=np.argmax(model.predict(x),axis=1)
```

```
1/1 [==============================] - 0s 208ms/step
```

In [32]:

```
x_train.class_indices
```

Out[32]:

```
{'Pepper,_bell___Bacterial_spot': 0,
 'Pepper,_bell___healthy': 1,
 'Potato___Early_blight': 2,
 'Potato___Late_blight': 3,
 'Potato___healthy': 4,
 'Tomato___Bacterial_spot': 5,
 'Tomato___Late_blight': 6,
 'Tomato___Leaf_Mold': 7,
 'Tomato___Septoria_leaf_spot': 8}
```

In [35]:

```
index=['Pepper,_bell___Bacterial_spot','Pepper,_bell___healthy','Potato___E
arly_blight','Potato___Late_blight','Potato___healthy','Tomato___Bacterial_
spot','Tomato___Late_blight','Tomato___Leaf_Mold','Tomato___Septoria_leaf_s
pot']
```

In [36]:

```
index[y[0]]
```

Out[36]:

```
'Potato___Early_blight'
```

In [37]:

```
img=image.load_img(r"/content/drive/MyDrive/Dataset Plant Disease/Veg-
dataset/Veg-dataset/test_set/Potato___Early_blight/b7883606-5157-4dc1-b965-
fc10f8fe1796___RS_Early.B 7598.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=['Pepper,_bell___Bacterial_spot','Pepper,_bell___healthy','Potato___E
arly_blight','Potato___Late_blight','Potato___healthy','Tomato___Bacterial_
spot','Tomato___Leaf_Mold','Tomato___Septoria_leaf_spot']
index[y[0]]
```

```
1/1 [==============================] - 0s 60ms/step
```

Out[37]:

```
'Potato___Early_blight'
```