In [2]:
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [3]:
```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,vertical_flip=False)
```

In [4]:
```
test_datagen=ImageDataGenerator(rescale=1./255)
```

In [5]:
```
x_train=train_datagen.flow_from_directory(r"C:\Users\maris_q3mm6nk\Desktop\FILES\data_for_ibm\Fertilizers_Recommendation_ System_For_Disease_ Predicti
                                          class_mode='categorical',batch_size=24)
```

```
Found 11385 images belonging to 9 classes.
```

In [6]:
```
x_test=test_datagen.flow_from_directory(r'C:\Users\maris_q3mm6nk\Desktop\FILES\data_for_ibm\Fertilizers_Recommendation_ System_For_Disease_ Prediction
                                          class_mode='categorical',batch_size=24)
```

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

In [7]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
```

In [8]:
```
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)))
```

In [11]:
```
model.add(Flatten())
```

In [12]:
```
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 [13]:
```
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

In [20]:
```
model.add(Dense(9,activation='softmax'))
```

In [21]:
```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

In [22]:
```
len(x_train)
```

Out[22]: 475

In [23]:
```
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```

Out[23]: 91.96999999999996

In [24]:
```
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=10)
```

```
Epoch 1/10
475/475 [==============================] - 237s 498ms/step - loss: 2.1787 - accuracy: 0.1331 - val_loss: 2.1362 - val_accuracy: 0.1953
Epoch 2/10
475/475 [==============================] - 224s 470ms/step - loss: 2.1077 - accuracy: 0.1868 - val_loss: 2.1022 - val_accuracy: 0.1953
Epoch 3/10
475/475 [==============================] - 242s 509ms/step - loss: 2.0872 - accuracy: 0.1868 - val_loss: 2.0911 - val_accuracy: 0.1953
Epoch 4/10
475/475 [==============================] - 244s 514ms/step - loss: 2.0795 - accuracy: 0.1868 - val_loss: 2.0859 - val_accuracy: 0.1953
Epoch 5/10
475/475 [==============================] - 249s 525ms/step - loss: 2.0761 - accuracy: 0.1868 - val_loss: 2.0846 - val_accuracy: 0.1953
Epoch 6/10
475/475 [==============================] - 249s 525ms/step - loss: 2.0745 - accuracy: 0.1868 - val_loss: 2.0837 - val_accuracy: 0.1953
Epoch 7/10
475/475 [==============================] - 250s 526ms/step - loss: 2.0738 - accuracy: 0.1868 - val_loss: 2.0830 - val_accuracy: 0.1953
Epoch 8/10
475/475 [==============================] - 248s 521ms/step - loss: 2.0735 - accuracy: 0.1868 - val_loss: 2.0842 - val_accuracy: 0.1953
Epoch 9/10
475/475 [==============================] - 221s 466ms/step - loss: 2.0734 - accuracy: 0.1868 - val_loss: 2.0844 - val_accuracy: 0.1953
Epoch 10/10
475/475 [==============================] - 221s 465ms/step - loss: 2.0734 - accuracy: 0.1868 - val_loss: 2.0836 - val_accuracy: 0.1953
```

Out[24]:

In [25]:
```
model.save('vegetabledata.h5')
```

In [26]
```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [27]:
```
model=load_model('vegetabledata.h5')
```

```
        [203., 201., 214.],
        [221., 219., 232.],
        [207., 205., 218.]],

       [[148., 146., 160.],
        [165., 163., 177.],
        [152., 150., 164.],
        ...,
        [176., 174., 187.],
        [192., 190., 203.],
        [189., 187., 200.]],

       [[162., 160., 174.],
        [155., 153., 167.],
        [141., 139., 153.],
        ...,
        [180., 178., 191.],
        [190., 188., 201.],
        [191., 189., 202.]]], dtype=float32)
```

In [47]:
```
x=np.expand_dims(x,axis=0)
```

In [48]:
```
x
```

Out[48]:
```
array([[[[135., 131., 145.],
         [134., 130., 144.],
         [133., 129., 143.],
         ...,
         [166., 164., 178.],
         [188., 186., 200.],
         [213., 211., 225.]],

        [[141., 137., 151.],
         [139., 135., 149.],
         [128., 124., 138.],
         ...,
```

In [45]:
```
x=image.img_to_array(img)
```

In [46]:
```
x
```

Out[46]:
```
array([[[135., 131., 145.],
        [134., 130., 144.],
        [133., 129., 143.],
        ...,
        [166., 164., 178.],
        [188., 186., 200.],
        [213., 211., 225.]],

       [[141., 137., 151.],
        [139., 135., 149.],
        [128., 124., 138.],
        ...,
        [201., 199., 213.],
        [157., 155., 169.],
        [172., 170., 184.]],

       [[136., 132., 146.],
        [135., 131., 145.],
        [141., 137., 151.],
        ...,
        [166., 164., 178.],
        [169., 167., 181.],
        [166., 164., 178.]],

       ...,

       [[163., 161., 175.],
        [154., 152., 166.],
        [160., 158., 172.],
        ...,
        [203., 201., 214.],
        [221., 219., 232.],
```

```
 [201., 199., 213.],
 [157., 155., 169.],
 [172., 170., 184.]],

[[136., 132., 146.],
 [135., 131., 145.],
 [141., 137., 151.],
 ...,
 [166., 164., 178.],
 [169., 167., 181.],
 [166., 164., 178.]],

...,

[[163., 161., 175.],
 [154., 152., 166.],
 [160., 158., 172.],
 ...,
 [203., 201., 214.],
 [221., 219., 232.],
 [207., 205., 218.]],

[[148., 146., 160.],
 [165., 163., 177.],
 [152., 150., 164.],
 ...,
 [176., 174., 187.],
 [192., 190., 203.],
 [189., 187., 200.]],

[[162., 160., 174.],
 [155., 153., 167.],
 [141., 139., 153.],
 ...,
 [180., 178., 191.],
 [190., 188., 201.],
 [191., 189., 202.]]]], dtype=float32)
```

In [33]:
```
img=image.load_img(r"C:\Users\maris_q3mm6nk\Desktop\FILES\data_for_ibm\Fertilizers_Recommendation_ System_For_Disease_ Prediction\Dataset Plant Diseas
```

In [34]:
```
img
```

Out[34]:

In [35]:
```
x=image.img_to_array(img)
```

In [44]:
```
img=image.load_img(r"C:\Users\maris_q3mm6nk\Desktop\FILES\data_for_ibm\Fertilizers_Recommendation_ System_For_Disease_ Prediction\Dataset Plant Diseas
img
```

Out[44]:

In [49]:
```
y=np.argmax(model.predict(x),axis=1)
```

```
1/1 [==============================] - 0s 89ms/step
```

In [50]:
```
x_train.class_indices
```

Out[50]:
```
{'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 [51]:
```
index=['Pepper,_bell___Bacterial_spot','Pepper,_bell___healthy','Potato___Early_blight','Potato___Late_blight','Potato___healthy','Tomato___Bacterial_
```

In [52]:
```
index[y[0]]
```

Out[52]:
```
'Tomato___Bacterial_spot'
```

In [53]:
```
img=image.load_img(r"C:\Users\maris_q3mm6nk\Desktop\FILES\data_for_ibm\Fertilizers_Recommendation_ System_For_Disease_ Prediction\Dataset Plant Diseas
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___Early_blight','Potato___Late_blight','Potato___healthy','Tomato___Bacterial_
index[y[0]]
```

```
1/1 [==============================] - 0s 38ms/step
```

Out[53]:
```
'Tomato___Bacterial_spot'
```