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The-Pragmatic-Programmer / final_project.ipynb



KhomZ Created using Colaboratory

 History

 1 contributor

1275 lines (1275 sloc) | 155 KB

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```
In [ ]: # import the Libraries as shown below

from tensorflow.keras.layers import Input, Lambda, Dense, Flatten
from tensorflow.keras.models import Model
from tensorflow.keras.applications.resnet50 import ResNet50
# from keras.applications.vgg16 import VGG16
from tensorflow.keras.applications.resnet50 import preprocess_input
from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img
from tensorflow.keras.models import Sequential
import numpy as np
from glob import glob
import matplotlib.pyplot as plt
```

```
In [ ]: # re-size all the images to this
IMAGE_SIZE = [50,50]

train_path = '/content/drive/MyDrive/Colab Notebooks/Project-major/Licensepl'
# valid_path = '/content/drive/MyDrive/Colab Notebooks/Project-major/Licensepl'
valid_path = '/content/drive/MyDrive/Colab Notebooks/Project-major/Licensepl'
```

```
In [ ]: # Import the Vgg 16 Library as shown below and add preprocessing Layer to the model
# Here we will be using imagenet weights

resnet = ResNet50(input_shape=IMAGE_SIZE + [3], weights='imagenet', include_top=False)
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/resnet/resnet50_weights_tf_dim_ordering_tf_kernels_notop.h5
94773248/94765736 [=====] - 1s 0us/step
94781440/94765736 [=====] - 1s 0us/step

```
In [ ]: for layer in resnet.layers:
    layer.trainable = False
```

```
In [ ]: # useful for getting number of output classes
folders = glob('/content/drive/MyDrive/Colab Notebooks/Project-major/Licensepl')
```

```
In [ ]: # our layers - you can add more if you want
x = Flatten()(resnet.output)
```

```
In [ ]: prediction = Dense(len(folders), activation='softmax')(x)

# create a model object
model = Model(inputs=resnet.input, outputs=prediction)
```

```
In [ ]: # view the structure of the model
model.summary()
```

```
Model: "model"
```

Layer (type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	[None, 50, 50, 3]	0	[]
conv1_pad (ZeroPadding2D)	(None, 56, 56, 3)	0	['input_1[0][0]']
conv1_conv (Conv2D)	(None, 25, 25, 64)	9472	['conv1_pad[0][0]']
conv1_bn (BatchNormalization)	(None, 25, 25, 64)	256	['conv1_conv[0][0]']
conv1_relu (Activation)	(None, 25, 25, 64)	0	['conv1_bn[0][0]']
pool1_pad (ZeroPadding2D)	(None, 27, 27, 64)	0	['conv1_relu[0][0]']
pool1_pool (MaxPooling2D)	(None, 13, 13, 64)	0	['pool1_pad[0][0]']
conv2_block1_1_conv (Conv2D)	(None, 13, 13, 64)	4160	['pool1_pool[0][0]']
conv2_block1_1_bn (BatchNormalizat	(None, 13, 13, 64)	256	['conv2_block1_1_conv[0][0]']
ion)			
conv2_block1_1_relu (Activatio	(None, 13, 13, 64)	0	['conv2_block1_1_bn[0][0]']
n)			
conv2_block1_2_conv (Conv2D)	(None, 13, 13, 64)	36928	['conv2_block1_1_relu[0][0]']
conv2_block1_2_bn (BatchNormalizat	(None, 13, 13, 64)	256	['conv2_block1_2_conv[0][0]']
ion)			
conv2_block1_2_relu (Activatio	(None, 13, 13, 64)	0	['conv2_block1_2_bn[0][0]']
n)			
conv2_block1_0_conv (Conv2D)	(None, 13, 13, 256)	16640	['conv2_block1_2_relu[0][0]']
conv2_block1_3_conv (Conv2D)	(None, 13, 13, 256)	16640	['conv2_block1_0_conv[0][0]']
conv2_block1_0_bn (BatchNormalizat	(None, 13, 13, 256)	1024	['conv2_block1_3_conv[0][0]']
ion)			
conv2_block1_3_bn (BatchNormalizat	(None, 13, 13, 256)	1024	['conv2_block1_0_bn[0][0]']
ion)			

```

k1_3_conv[0][0]']
ization)

conv2_block1_add (Add)      (None, 13, 13, 256)  0      ['conv2_bloc
k1_0_bn[0][0]',
'conv2_bloc
k1_3_bn[0][0]']

conv2_block1_out (Activation) (None, 13, 13, 256)  0      ['conv2_bloc
k1_add[0][0]']

conv2_block2_1_conv (Conv2D)   (None, 13, 13, 64)   16448    ['conv2_bloc
k1_out[0][0]']

conv2_block2_1_bn (BatchNormal (None, 13, 13, 64)   256     ['conv2_bloc
k2_1_conv[0][0]']
ization)

conv2_block2_1_relu (Activatio (None, 13, 13, 64)  0      ['conv2_bloc
k2_1_bn[0][0]']
n)

conv2_block2_2_conv (Conv2D)   (None, 13, 13, 64)   36928    ['conv2_bloc
k2_1_relu[0][0]']

conv2_block2_2_bn (BatchNormal (None, 13, 13, 64)   256     ['conv2_bloc
k2_2_conv[0][0]']
ization)

conv2_block2_2_relu (Activatio (None, 13, 13, 64)  0      ['conv2_bloc
k2_2_bn[0][0]']
n)

conv2_block2_3_conv (Conv2D)   (None, 13, 13, 256)  16640    ['conv2_bloc
k2_2_relu[0][0]']

conv2_block2_3_bn (BatchNormal (None, 13, 13, 256)  1024    ['conv2_bloc
k2_3_conv[0][0]']
ization)

conv2_block2_add (Add)       (None, 13, 13, 256)  0      ['conv2_bloc
k1_out[0][0]',

'conv2_bloc
k2_3_bn[0][0]']

conv2_block2_out (Activation) (None, 13, 13, 256)  0      ['conv2_bloc
k2_add[0][0]']

conv2_block3_1_conv (Conv2D)   (None, 13, 13, 64)   16448    ['conv2_bloc
k2_out[0][0]']

conv2_block3_1_bn (BatchNormal (None, 13, 13, 64)   256     ['conv2_bloc
k3_1_conv[0][0]']
ization)

conv2_block3_1_relu (Activatio (None, 13, 13, 64)  0      ['conv2_bloc
k3_1_bn[0][0]']
n)

conv2_block3_2_conv (Conv2D)   (None, 13, 13, 64)   36928    ['conv2_bloc

```

k3_1_relu[0][0]']			
conv2_block3_2_bn (BatchNormal (None, 13, 13, 64) 256			['conv2_bloc
k3_2_conv[0][0]']			ization)
conv2_block3_2_relu (Activation (None, 13, 13, 64) 0			['conv2_bloc
k3_2_bn[0][0]']			n)
conv2_block3_3_conv (Conv2D (None, 13, 13, 256) 16640			['conv2_bloc
k3_2_relu[0][0]']			
conv2_block3_3_bn (BatchNormal (None, 13, 13, 256) 1024			['conv2_bloc
k3_3_conv[0][0]']			ization)
conv2_block3_add (Add) (None, 13, 13, 256) 0			['conv2_bloc
k2_out[0][0]',			'conv2_bloc
k3_3_bn[0][0]']			
conv2_block3_out (Activation) (None, 13, 13, 256) 0			['conv2_bloc
k3_add[0][0]']			
conv3_block1_1_conv (Conv2D) (None, 7, 7, 128) 32896			['conv2_bloc
k3_out[0][0]']			
conv3_block1_1_bn (BatchNormal (None, 7, 7, 128) 512			['conv3_bloc
k1_1_conv[0][0]']			ization)
conv3_block1_1_relu (Activation (None, 7, 7, 128) 0			['conv3_bloc
k1_1_bn[0][0]']			n)
conv3_block1_2_conv (Conv2D) (None, 7, 7, 128) 147584			['conv3_bloc
k1_1_relu[0][0]']			
conv3_block1_2_bn (BatchNormal (None, 7, 7, 128) 512			['conv3_bloc
k1_2_conv[0][0]']			ization)
conv3_block1_2_relu (Activation (None, 7, 7, 128) 0			['conv3_bloc
k1_2_bn[0][0]']			n)
conv3_block1_0_conv (Conv2D) (None, 7, 7, 512) 131584			['conv2_bloc
k3_out[0][0]']			
conv3_block1_3_conv (Conv2D) (None, 7, 7, 512) 66048			['conv3_bloc
k1_2_relu[0][0]']			
conv3_block1_0_bn (BatchNormal (None, 7, 7, 512) 2048			['conv3_bloc
k1_0_conv[0][0]']			ization)
conv3_block1_3_bn (BatchNormal (None, 7, 7, 512) 2048			['conv3_bloc
k1_3_conv[0][0]']			ization)

conv3_block1_add (Add) k1_0_bn[0][0]', k1_3_bn[0][0]'	(None, 7, 7, 512)	0	['conv3_bloc 'conv3_bloc k1_3_bn[0][0]']
conv3_block1_out (Activation) k1_add[0][0]'	(None, 7, 7, 512)	0	['conv3_bloc k1_add[0][0]']
conv3_block2_1_conv (Conv2D) k1_out[0][0]'	(None, 7, 7, 128)	65664	['conv3_bloc k1_out[0][0]']
conv3_block2_1_bn (BatchNormal k2_1_conv[0][0]' ization)	(None, 7, 7, 128)	512	['conv3_bloc k2_1_conv[0][0]'] ization)
conv3_block2_1_relu (Activatio k2_1_bn[0][0]' n)	(None, 7, 7, 128)	0	['conv3_bloc k2_1_bn[0][0]'] n)
conv3_block2_2_conv (Conv2D) k2_1_relu[0][0]'	(None, 7, 7, 128)	147584	['conv3_bloc k2_1_relu[0][0]']
conv3_block2_2_bn (BatchNormal k2_2_conv[0][0]' ization)	(None, 7, 7, 128)	512	['conv3_bloc k2_2_conv[0][0]'] ization)
conv3_block2_2_relu (Activatio k2_2_bn[0][0]' n)	(None, 7, 7, 128)	0	['conv3_bloc k2_2_bn[0][0]'] n)
conv3_block2_3_conv (Conv2D) k2_2_relu[0][0]'	(None, 7, 7, 512)	66048	['conv3_bloc k2_2_relu[0][0]']
conv3_block2_3_bn (BatchNormal k2_3_conv[0][0]' ization)	(None, 7, 7, 512)	2048	['conv3_bloc k2_3_conv[0][0]'] ization)
conv3_block2_add (Add) k1_out[0][0]', k2_3_bn[0][0]'	(None, 7, 7, 512)	0	['conv3_bloc 'conv3_bloc k2_3_bn[0][0]']
conv3_block2_out (Activation) k2_add[0][0]'	(None, 7, 7, 512)	0	['conv3_bloc k2_add[0][0]']
conv3_block3_1_conv (Conv2D) k2_out[0][0]'	(None, 7, 7, 128)	65664	['conv3_bloc k2_out[0][0]']
conv3_block3_1_bn (BatchNormal k3_1_conv[0][0]' ization)	(None, 7, 7, 128)	512	['conv3_bloc k3_1_conv[0][0]'] ization)
conv3_block3_1_relu (Activatio k3_1_bn[0][0]' n)	(None, 7, 7, 128)	0	['conv3_bloc k3_1_bn[0][0]'] n)
conv3_block3_2_conv (Conv2D) k3_1_relu[0][0]'	(None, 7, 7, 128)	147584	['conv3_bloc k3_1_relu[0][0]']
conv3_block3_2_bn (BatchNormal k3_2_conv[0][0]'	(None, 7, 7, 128)	512	['conv3_bloc k3_2_conv[0][0]']

k3_2_conv[0][0]'	conv3_block3_2_relu (Activation) (None, 7, 7, 128)	0	['conv3_bloc
k3_2_bn[0][0]'	conv3_block3_2_bn (BatchNormal (None, 7, 7, 128))	2048	['conv3_bloc
k3_2_relu[0][0]'	conv3_block3_3_conv (Conv2D) (None, 7, 7, 512)	66048	['conv3_bloc
k3_3_conv[0][0]'	conv3_block3_3_bn (BatchNormal (None, 7, 7, 512))	2048	['conv3_bloc
k3_3_relu[0][0]'	conv3_block3_3_relu (Activation) (None, 7, 7, 512)	0	['conv3_bloc
k3_add[0][0]'	conv3_block3_out (Activation) (None, 7, 7, 512)	0	['conv3_bloc
k3_out[0][0]'	conv3_block4_1_conv (Conv2D) (None, 7, 7, 128)	65664	['conv3_bloc
k4_1_conv[0][0]'	conv3_block4_1_bn (BatchNormal (None, 7, 7, 128))	512	['conv3_bloc
k4_1_relu[0][0]'	conv3_block4_1_relu (Activation) (None, 7, 7, 128)	0	['conv3_bloc
k4_1_bn[0][0]'	conv3_block4_2_conv (Conv2D) (None, 7, 7, 128)	147584	['conv3_bloc
k4_1_relu[0][0]'	conv3_block4_2_bn (BatchNormal (None, 7, 7, 128))	512	['conv3_bloc
k4_2_conv[0][0]'	conv3_block4_2_relu (Activation) (None, 7, 7, 128)	0	['conv3_bloc
k4_2_bn[0][0]'	conv3_block4_3_conv (Conv2D) (None, 7, 7, 512)	66048	['conv3_bloc
k4_2_relu[0][0]'	conv3_block4_3_bn (BatchNormal (None, 7, 7, 512))	2048	['conv3_bloc
k4_3_conv[0][0]'	conv3_block4_3_relu (Activation) (None, 7, 7, 512)	0	['conv3_bloc
k4_3_bn[0][0]'	conv3_block4_add (Add) (None, 7, 7, 512)	0	['conv3_bloc
k3_out[0][0]'	conv3_block4_out (Activation) (None, 7, 7, 512)	0	['conv3_bloc
k4_add[0][0]'	conv4_block1_1_conv (Conv2D) (None, 4, 4, 256)	131328	['conv3_bloc

```
k4_out[0][0]']

    conv4_block1_1_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k1_1_conv[0][0]']
    ization)

    conv4_block1_1_relu (Activatio (None, 4, 4, 256) 0 ['conv4_bloc
k1_1_bn[0][0]']
    n)

    conv4_block1_2_conv (Conv2D) (None, 4, 4, 256) 590080 ['conv4_bloc
k1_1_relu[0][0]']

    conv4_block1_2_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k1_2_conv[0][0]']
    ization)

    conv4_block1_2_relu (Activatio (None, 4, 4, 256) 0 ['conv4_bloc
k1_2_bn[0][0]']
    n)

    conv4_block1_0_conv (Conv2D) (None, 4, 4, 1024) 525312 ['conv3_bloc
k4_out[0][0]']

    conv4_block1_3_conv (Conv2D) (None, 4, 4, 1024) 263168 ['conv4_bloc
k1_2_relu[0][0]']

    conv4_block1_0_bn (BatchNormal (None, 4, 4, 1024) 4096 ['conv4_bloc
k1_0_conv[0][0]']
    ization)

    conv4_block1_3_bn (BatchNormal (None, 4, 4, 1024) 4096 ['conv4_bloc
k1_3_conv[0][0]']
    ization)

    conv4_block1_add (Add) (None, 4, 4, 1024) 0 ['conv4_bloc
k1_0_bn[0][0]', 'conv4_bloc
k1_3_bn[0][0]']

    conv4_block1_out (Activation) (None, 4, 4, 1024) 0 ['conv4_bloc
k1_add[0][0]']

    conv4_block2_1_conv (Conv2D) (None, 4, 4, 256) 262400 ['conv4_bloc
k1_out[0][0]']

    conv4_block2_1_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k2_1_conv[0][0]']
    ization)

    conv4_block2_1_relu (Activatio (None, 4, 4, 256) 0 ['conv4_bloc
k2_1_bn[0][0]']
    n)

    conv4_block2_2_conv (Conv2D) (None, 4, 4, 256) 590080 ['conv4_bloc
k2_1_relu[0][0]']

    conv4_block2_2_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k2_2_conv[0][0]']
    ization)
```

conv4_block2_2_relu (Activation) (None, 4, 4, 256)	0	['conv4_bloc k2_2_bn[0][0]'] n)
conv4_block2_3_conv (Conv2D) (None, 4, 4, 1024)	263168	['conv4_bloc k2_2_relu[0][0]']
conv4_block2_3_bn (BatchNormal (None, 4, 4, 1024)	4096	['conv4_bloc k2_3_conv[0][0]'] ization)
conv4_block2_add (Add) (None, 4, 4, 1024)	0	['conv4_bloc k1_out[0][0]', 'conv4_bloc k2_3_bn[0][0]']
conv4_block2_out (Activation) (None, 4, 4, 1024)	0	['conv4_bloc k2_add[0][0]']
conv4_block3_1_conv (Conv2D) (None, 4, 4, 256)	262400	['conv4_bloc k2_out[0][0]']
conv4_block3_1_bn (BatchNormal (None, 4, 4, 256)	1024	['conv4_bloc k3_1_conv[0][0]'] ization)
conv4_block3_1_relu (Activation) (None, 4, 4, 256)	0	['conv4_bloc k3_1_bn[0][0]'] n)
conv4_block3_2_conv (Conv2D) (None, 4, 4, 256)	590080	['conv4_bloc k3_1_relu[0][0]']
conv4_block3_2_bn (BatchNormal (None, 4, 4, 256)	1024	['conv4_bloc k3_2_conv[0][0]'] ization)
conv4_block3_2_relu (Activation) (None, 4, 4, 256)	0	['conv4_bloc k3_2_bn[0][0]'] n)
conv4_block3_3_conv (Conv2D) (None, 4, 4, 1024)	263168	['conv4_bloc k3_2_relu[0][0]']
conv4_block3_3_bn (BatchNormal (None, 4, 4, 1024)	4096	['conv4_bloc k3_3_conv[0][0]'] ization)
conv4_block3_add (Add) (None, 4, 4, 1024)	0	['conv4_bloc k2_out[0][0]', 'conv4_bloc k3_3_bn[0][0]']
conv4_block3_out (Activation) (None, 4, 4, 1024)	0	['conv4_bloc k3_add[0][0]']
conv4_block4_1_conv (Conv2D) (None, 4, 4, 256)	262400	['conv4_bloc k3_out[0][0]']
conv4_block4_1_bn (BatchNormal (None, 4, 4, 256)	1024	['conv4_bloc k3_out[0][0]']

```

k4_1_conv[0][0]']
ization)

conv4_block4_1_relu (Activation) (None, 4, 4, 256) 0 ['conv4_bloc
k4_1_bn[0][0]']
n)

conv4_block4_2_conv (Conv2D) (None, 4, 4, 256) 590080 ['conv4_bloc
k4_1_relu[0][0]']

conv4_block4_2_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k4_2_conv[0][0]']
ization)

conv4_block4_2_relu (Activation) (None, 4, 4, 256) 0 ['conv4_bloc
k4_2_bn[0][0]']
n)

conv4_block4_3_conv (Conv2D) (None, 4, 4, 1024) 263168 ['conv4_bloc
k4_2_relu[0][0]']

conv4_block4_3_bn (BatchNormal (None, 4, 4, 1024) 4096 ['conv4_bloc
k4_3_conv[0][0]']
ization)

conv4_block4_add (Add) (None, 4, 4, 1024) 0 ['conv4_bloc
k3_out[0][0]', 'conv4_bloc
k4_3_bn[0][0]']

conv4_block4_out (Activation) (None, 4, 4, 1024) 0 ['conv4_bloc
k4_add[0][0]']

conv4_block5_1_conv (Conv2D) (None, 4, 4, 256) 262400 ['conv4_bloc
k4_out[0][0]']

conv4_block5_1_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k5_1_conv[0][0]']
ization)

conv4_block5_1_relu (Activation) (None, 4, 4, 256) 0 ['conv4_bloc
k5_1_bn[0][0]']
n)

conv4_block5_2_conv (Conv2D) (None, 4, 4, 256) 590080 ['conv4_bloc
k5_1_relu[0][0]']

conv4_block5_2_bn (BatchNormal (None, 4, 4, 256) 1024 ['conv4_bloc
k5_2_conv[0][0]']
ization)

conv4_block5_2_relu (Activation) (None, 4, 4, 256) 0 ['conv4_bloc
k5_2_bn[0][0]']
n)

conv4_block5_3_conv (Conv2D) (None, 4, 4, 1024) 263168 ['conv4_bloc
k5_2_relu[0][0]']

conv4_block5_3_bn (BatchNormal (None, 4, 4, 1024) 4096 ['conv4_bloc
k5_3_conv[0][0]']

```

conv4_block5_add (Add)	(None, 4, 4, 1024)	0	['conv4_bloc k4_out[0][0]', 'conv4_bloc k5_3_bn[0][0]']
conv4_block5_out (Activation)	(None, 4, 4, 1024)	0	['conv4_bloc k5_add[0][0]']
conv4_block6_1_conv (Conv2D)	(None, 4, 4, 256)	262400	['conv4_bloc k5_out[0][0]']
conv4_block6_1_bn (BatchNormal)	(None, 4, 4, 256)	1024	['conv4_bloc k6_1_conv[0][0]', 'ization)
conv4_block6_1_relu (Activatio n)	(None, 4, 4, 256)	0	['conv4_bloc k6_1_bn[0][0]']
conv4_block6_2_conv (Conv2D)	(None, 4, 4, 256)	590080	['conv4_bloc k6_1_relu[0][0]']
conv4_block6_2_bn (BatchNormal)	(None, 4, 4, 256)	1024	['conv4_bloc k6_2_conv[0][0]', 'ization)
conv4_block6_2_relu (Activatio n)	(None, 4, 4, 256)	0	['conv4_bloc k6_2_bn[0][0]', 'n)
conv4_block6_3_conv (Conv2D)	(None, 4, 4, 1024)	263168	['conv4_bloc k6_2_relu[0][0]']
conv4_block6_3_bn (BatchNormal)	(None, 4, 4, 1024)	4096	['conv4_bloc k6_3_conv[0][0]', 'ization)
conv4_block6_add (Add)	(None, 4, 4, 1024)	0	['conv4_bloc k5_out[0][0]', 'conv4_bloc k6_3_bn[0][0]']
conv4_block6_out (Activation)	(None, 4, 4, 1024)	0	['conv4_bloc k6_add[0][0]']
conv5_block1_1_conv (Conv2D)	(None, 2, 2, 512)	524800	['conv4_bloc k6_out[0][0]']
conv5_block1_1_bn (BatchNormal)	(None, 2, 2, 512)	2048	['conv5_bloc k1_1_conv[0][0]', 'ization)
conv5_block1_1_relu (Activatio n)	(None, 2, 2, 512)	0	['conv5_bloc k1_1_bn[0][0]', 'n)
conv5_block1_2_conv (Conv2D)	(None, 2, 2, 512)	2359808	['conv5_bloc k1_1_relu[0][0]']

conv5_block1_2_bn (BatchNormal (None, 2, 2, 512) 2048	['conv5_bloc k1_2_conv[0][0]'] ization)		
conv5_block1_2_relu (Activation (None, 2, 2, 512) 0	['conv5_bloc k1_2_bn[0][0]'] n)		
conv5_block1_0_conv (Conv2D (None, 2, 2, 2048) 2099200	['conv4_bloc k6_out[0][0]']		
conv5_block1_3_conv (Conv2D (None, 2, 2, 2048) 1050624	['conv5_bloc k1_2_relu[0][0]']		
conv5_block1_0_bn (BatchNormal (None, 2, 2, 2048) 8192	['conv5_bloc k1_0_conv[0][0]'] ization)		
conv5_block1_3_bn (BatchNormal (None, 2, 2, 2048) 8192	['conv5_bloc k1_3_conv[0][0]'] ization)		
conv5_block1_add (Add) (None, 2, 2, 2048) 0	['conv5_bloc k1_0_bn[0][0]', 'conv5_bloc k1_3_bn[0][0]']		
conv5_block1_out (Activation) (None, 2, 2, 2048) 0	['conv5_bloc k1_add[0][0]']		
conv5_block2_1_conv (Conv2D (None, 2, 2, 512) 1049088	['conv5_bloc k1_out[0][0]']		
conv5_block2_1_bn (BatchNormal (None, 2, 2, 512) 2048	['conv5_bloc k2_1_conv[0][0]'] ization)		
conv5_block2_1_relu (Activation (None, 2, 2, 512) 0	['conv5_bloc k2_1_bn[0][0]'] n)		
conv5_block2_2_conv (Conv2D (None, 2, 2, 512) 2359808	['conv5_bloc k2_1_relu[0][0]']		
conv5_block2_2_bn (BatchNormal (None, 2, 2, 512) 2048	['conv5_bloc k2_2_conv[0][0]'] ization)		
conv5_block2_2_relu (Activation (None, 2, 2, 512) 0	['conv5_bloc k2_2_bn[0][0]'] n)		
conv5_block2_3_conv (Conv2D (None, 2, 2, 2048) 1050624	['conv5_bloc k2_2_relu[0][0]']		
conv5_block2_3_bn (BatchNormal (None, 2, 2, 2048) 8192	['conv5_bloc k2_3_conv[0][0]'] ization)		
conv5_block2_add (Add) (None, 2, 2, 2048) 0	['conv5_bloc k2_3_bn[0][0]']		

```

k1_out[0][0]',
                           'conv5_bloc
k2_3_bn[0][0]']

conv5_block2_out (Activation) (None, 2, 2, 2048) 0 ['conv5_bloc
k2_add[0][0]']

conv5_block3_1_conv (Conv2D) (None, 2, 2, 512) 1049088 ['conv5_bloc
k2_out[0][0]']

conv5_block3_1_bn (BatchNormal (None, 2, 2, 512) 2048 ['conv5_bloc
k3_1_conv[0][0]']
ization)

conv5_block3_1_relu (Activatio (None, 2, 2, 512) 0 ['conv5_bloc
k3_1_bn[0][0]']
n)

conv5_block3_2_conv (Conv2D) (None, 2, 2, 512) 2359808 ['conv5_bloc
k3_1_relu[0][0]']

conv5_block3_2_bn (BatchNormal (None, 2, 2, 512) 2048 ['conv5_bloc
k3_2_conv[0][0]']
ization)

conv5_block3_2_relu (Activatio (None, 2, 2, 512) 0 ['conv5_bloc
k3_2_bn[0][0]']
n)

conv5_block3_3_conv (Conv2D) (None, 2, 2, 2048) 1050624 ['conv5_bloc
k3_2_relu[0][0]']

conv5_block3_3_bn (BatchNormal (None, 2, 2, 2048) 8192 ['conv5_bloc
k3_3_conv[0][0]']
ization)

conv5_block3_add (Add) (None, 2, 2, 2048) 0 ['conv5_bloc
k2_out[0][0]', 'conv5_bloc
k3_3_bn[0][0]']

conv5_block3_out (Activation) (None, 2, 2, 2048) 0 ['conv5_bloc
k3_add[0][0]']

flatten (Flatten) (None, 8192) 0 ['conv5_bloc
k3_out[0][0]']

dense (Dense) (None, 12) 98316 ['flatten[0]
[0]']

=====
=====

Total params: 23,686,028
Trainable params: 98,316
Non-trainable params: 23,587,712

```

```
# tell the model what cost and optimization method to use
model.compile(
    loss='categorical_crossentropy',
    optimizer='adam',
    metrics=['accuracy']
)
```

In []:

```
# Use the Image Data Generator to import the images from the dataset
from tensorflow.keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)

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

In []:

```
# Make sure you provide the same target size as initialized for the image size
training_set = train_datagen.flow_from_directory('/content/drive/MyDrive/Colab Notebooks/Plant Disease Prediction',
                                                target_size = (50, 50),
                                                batch_size = 32,
                                                class_mode = 'categorical')
```

Found 2033 images belonging to 12 classes.

In []:

```
training_set.class_indices
```

Out[]:

```
{'0': 0,
 '1': 1,
 '2': 2,
 '3': 3,
 '4': 4,
 '5': 5,
 '6': 6,
 '7': 7,
 '8': 8,
 '9': 9,
 'BA': 10,
 'PA': 11}
```

In []:

```
# test_set = test_datagen.flow_from_directory('/content/drive/MyDrive/Colab Notebooks/Plant Disease Prediction',
                                              target_size = (50, 50),
                                              batch_size = 32,
                                              class_mode = 'categorical')

test_set = test_datagen.flow_from_directory('/content/drive/MyDrive/Colab Notebooks/Plant Disease Prediction',
                                            target_size = (50, 50),
                                            batch_size = 32,
                                            class_mode = 'categorical')
```

Found 413 images belonging to 12 classes.

In []:

```
# fit the model
# Run the cell. It will take some time to execute
```

```
# r = model.fit_generator(  
#     training_set,  
#     validation_data=test_set,  
#     epochs=10,  
#     steps_per_epoch=len(training_set),  
#     validation_steps=len(test_set)  
# )  
  
r = model.fit(training_set,  
               epochs = 50,  
               steps_per_epoch=len(training_set),  
               validation_data = test_set,  
               validation_steps=len(test_set)  
)
```

```
Epoch 1/50  
64/64 [=====] - 537s 8s/step - loss: 2.4639 - accuracy: 0.1220 - val_loss: 2.4056 - val_accuracy: 0.1332  
Epoch 2/50  
64/64 [=====] - 37s 586ms/step - loss: 2.3651 - accuracy: 0.1771 - val_loss: 2.3159 - val_accuracy: 0.2373  
Epoch 3/50  
64/64 [=====] - 38s 589ms/step - loss: 2.2934 - accuracy: 0.2130 - val_loss: 2.2522 - val_accuracy: 0.2131  
Epoch 4/50  
64/64 [=====] - 37s 584ms/step - loss: 2.2263 - accuracy: 0.2528 - val_loss: 2.2404 - val_accuracy: 0.2228  
Epoch 5/50  
64/64 [=====] - 38s 587ms/step - loss: 2.1821 - accuracy: 0.2700 - val_loss: 2.1647 - val_accuracy: 0.2663  
Epoch 6/50  
64/64 [=====] - 38s 589ms/step - loss: 2.1270 - accuracy: 0.3148 - val_loss: 2.1122 - val_accuracy: 0.3293  
Epoch 7/50  
64/64 [=====] - 38s 588ms/step - loss: 2.0806 - accuracy: 0.3379 - val_loss: 2.1104 - val_accuracy: 0.3390  
Epoch 8/50  
64/64 [=====] - 37s 579ms/step - loss: 2.0450 - accuracy: 0.3360 - val_loss: 2.0344 - val_accuracy: 0.3753  
Epoch 9/50  
64/64 [=====] - 37s 577ms/step - loss: 2.0175 - accuracy: 0.3463 - val_loss: 2.0383 - val_accuracy: 0.3002  
Epoch 10/50  
64/64 [=====] - 37s 570ms/step - loss: 1.9927 - accuracy: 0.3709 - val_loss: 1.9966 - val_accuracy: 0.3632  
Epoch 11/50  
64/64 [=====] - 37s 571ms/step - loss: 1.9471 - accuracy: 0.3743 - val_loss: 1.9844 - val_accuracy: 0.3341  
Epoch 12/50  
64/64 [=====] - 37s 574ms/step - loss: 1.9289 - accuracy: 0.3876 - val_loss: 1.9802 - val_accuracy: 0.4116  
Epoch 13/50  
64/64 [=====] - 37s 577ms/step - loss: 1.9090 - accuracy: 0.4053 - val_loss: 1.9256 - val_accuracy: 0.4213  
Epoch 14/50  
64/64 [=====] - 37s 582ms/step - loss: 1.8792 - accuracy: 0.4137 - val_loss: 1.8970 - val_accuracy: 0.3898  
Epoch 15/50  
64/64 [=====] - 37s 579ms/step - loss: 1.8519 - accuracy: 0.4142 - val_loss: 1.8804 - val_accuracy: 0.4140  
Epoch 16/50
```

```
Epoch 10/50
64/64 [=====] - 37s 579ms/step - loss: 1.8359 - accuracy: 0.4132 - val_loss: 1.8623 - val_accuracy: 0.4334
Epoch 11/50
64/64 [=====] - 38s 585ms/step - loss: 1.8180 - accuracy: 0.4304 - val_loss: 1.8442 - val_accuracy: 0.4262
Epoch 12/50
64/64 [=====] - 37s 574ms/step - loss: 1.8008 - accuracy: 0.4284 - val_loss: 1.8057 - val_accuracy: 0.4407
Epoch 13/50
64/64 [=====] - 37s 577ms/step - loss: 1.7942 - accuracy: 0.4407 - val_loss: 1.8015 - val_accuracy: 0.4697
Epoch 14/50
64/64 [=====] - 37s 578ms/step - loss: 1.8025 - accuracy: 0.4284 - val_loss: 1.7755 - val_accuracy: 0.4770
Epoch 15/50
64/64 [=====] - 40s 629ms/step - loss: 1.7609 - accuracy: 0.4550 - val_loss: 1.7747 - val_accuracy: 0.4455
Epoch 16/50
64/64 [=====] - 45s 694ms/step - loss: 1.7264 - accuracy: 0.4565 - val_loss: 1.7693 - val_accuracy: 0.4455
Epoch 17/50
64/64 [=====] - 36s 559ms/step - loss: 1.7343 - accuracy: 0.4742 - val_loss: 1.7708 - val_accuracy: 0.4237
Epoch 18/50
64/64 [=====] - 36s 555ms/step - loss: 1.7155 - accuracy: 0.4624 - val_loss: 1.7554 - val_accuracy: 0.4334
Epoch 19/50
64/64 [=====] - 43s 665ms/step - loss: 1.6833 - accuracy: 0.4801 - val_loss: 1.7027 - val_accuracy: 0.4988
Epoch 20/50
64/64 [=====] - 35s 548ms/step - loss: 1.6863 - accuracy: 0.4722 - val_loss: 1.7135 - val_accuracy: 0.4673
Epoch 21/50
64/64 [=====] - 35s 545ms/step - loss: 1.6789 - accuracy: 0.4806 - val_loss: 1.7109 - val_accuracy: 0.5085
Epoch 22/50
64/64 [=====] - 35s 543ms/step - loss: 1.6678 - accuracy: 0.4943 - val_loss: 1.7207 - val_accuracy: 0.4552
Epoch 23/50
64/64 [=====] - 35s 542ms/step - loss: 1.6522 - accuracy: 0.4943 - val_loss: 1.6872 - val_accuracy: 0.4722
Epoch 24/50
64/64 [=====] - 35s 540ms/step - loss: 1.6513 - accuracy: 0.4697 - val_loss: 1.6668 - val_accuracy: 0.5012
Epoch 25/50
64/64 [=====] - 35s 545ms/step - loss: 1.6031 - accuracy: 0.5012 - val_loss: 1.6496 - val_accuracy: 0.4867
Epoch 26/50
64/64 [=====] - 35s 543ms/step - loss: 1.6154 - accuracy: 0.4993 - val_loss: 1.6443 - val_accuracy: 0.4939
Epoch 27/50
```