

assignment-03

July 2, 2023

```
[1]: from google.colab import drive  
drive.mount('/content/drive')
```

Mounted at /content/drive

```
[2]: !unzip '/content/drive/MyDrive/test_data.zip'
```

```
Archive: /content/drive/MyDrive/test_data.zip  
  creating: test_data/  
    creating: test_data/blasti/  
  inflating: test_data/blasti/DSC_6396.jpg  
  inflating: test_data/blasti/DSC_6397.jpg  
  inflating: test_data/blasti/DSC_6398.jpg  
  inflating: test_data/blasti/DSC_6399.jpg  
  inflating: test_data/blasti/DSC_6400.jpg  
  inflating: test_data/blasti/DSC_6401.jpg  
  inflating: test_data/blasti/DSC_6402.jpg  
  inflating: test_data/blasti/DSC_6403.jpg  
  inflating: test_data/blasti/DSC_6405.jpg  
  inflating: test_data/blasti/DSC_6406.jpg  
  inflating: test_data/blasti/DSC_6407.jpg  
  inflating: test_data/blasti/DSC_6408.jpg  
  inflating: test_data/blasti/DSC_6409.jpg  
  inflating: test_data/blasti/DSC_6410.jpg  
  inflating: test_data/blasti/DSC_6411.jpg  
    creating: test_data/bonegl/  
  inflating: test_data/bonegl/DSC_4587.jpg  
  inflating: test_data/bonegl/DSC_4588.jpg  
  inflating: test_data/bonegl/DSC_4589.jpg  
  inflating: test_data/bonegl/DSC_4590.jpg  
  inflating: test_data/bonegl/DSC_4591.jpg  
  inflating: test_data/bonegl/DSC_4592.jpg  
  inflating: test_data/bonegl/DSC_4593.jpg  
    creating: test_data/brhkyt/  
  inflating: test_data/brhkyt/D72_0473.jpg  
  inflating: test_data/brhkyt/D72_0474.jpg  
  inflating: test_data/brhkyt/D72_0475.jpg  
  inflating: test_data/brhkyt/D72_0477.jpg
```

inflating: test_data/brhkyt/D72_0478.jpg
inflating: test_data/brhkyt/D72_0479.jpg
creating: test_data/cbrtsh/
inflating: test_data/cbrtsh/_D32_10310.jpg
inflating: test_data/cbrtsh/_D32_10311.jpg
inflating: test_data/cbrtsh/_D32_10312.jpg
inflating: test_data/cbrtsh/_D32_10313.jpg
inflating: test_data/cbrtsh/_D32_10314.jpg
inflating: test_data/cbrtsh/_D32_10317.jpg
inflating: test_data/cbrtsh/_D32_10318.jpg
creating: test_data/cmnmyr/
inflating: test_data/cmnmyr/DSC_2443.jpg
inflating: test_data/cmnmyr/DSC_4681.jpg
inflating: test_data/cmnmyr/DSC_5137.jpg
inflating: test_data/cmnmyr/DSC_7625.jpg
inflating: test_data/cmnmyr/P1050277.jpg
inflating: test_data/cmnmyr/_D32_12426.jpg
inflating: test_data/cmnmyr/_D32_12427.jpg
inflating: test_data/cmnmyr/_D32_12428.jpg
creating: test_data/gretit/
inflating: test_data/gretit/11620454726_31a35c26da_o.jpg
inflating: test_data/gretit/11776135285_ccf938fa2e_o.jpg
inflating: test_data/gretit/11905645146_6a5d4ff9f9_o.jpg
inflating: test_data/gretit/8537646712_0b282c4c6a_o.jpg
inflating: test_data/gretit/D72_0693.jpg
inflating: test_data/gretit/D72_0694.jpg
inflating: test_data/gretit/D72_0695.jpg
creating: test_data/hilpig/
inflating: test_data/hilpig/DSC_6359.jpg
inflating: test_data/hilpig/DSC_6362.jpg
inflating: test_data/hilpig/DSC_6364.jpg
inflating: test_data/hilpig/DSC_6368.jpg
inflating: test_data/hilpig/DSC_6403.jpg
inflating: test_data/hilpig/DSC_6404.jpg
inflating: test_data/hilpig/P1000319.jpg
inflating: test_data/hilpig/P1000323.jpg
inflating: test_data/hilpig/P1050044.jpg
inflating: test_data/hilpig/P1050045.jpg
creating: test_data/himbul/
inflating: test_data/himbul/11602064885_3826df4500_o.jpg
inflating: test_data/himbul/11619942574_42f23a7b05_o.jpg
inflating: test_data/himbul/11620097904_33fa8ee878_o.jpg
inflating: test_data/himbul/5857371972_ed4f88b275_o.jpg
inflating: test_data/himbul/6154954471_eefe6e00d1_o.jpg
inflating: test_data/himbul/D72_0688.jpg
inflating: test_data/himbul/D72_0691.jpg
inflating: test_data/himbul/DSC08357.jpg
inflating: test_data/himbul/DSC_3230.jpg

inflating: test_data/himbul/DSC_7439.jpg
inflating: test_data/himbul/DSC_7602.jpg
inflating: test_data/himbul/P1060368.jpg
inflating: test_data/himbul/P1060369.jpg
inflating: test_data/himbul/_D32_10242.jpg
inflating: test_data/himbul/_D32_10245.jpg
inflating: test_data/himbul/_D32_10251.jpg
inflating: test_data/himbul/_D32_10319.jpg
inflating: test_data/himbul/_D32_10320.jpg
inflating: test_data/himbul/_DSC9446.jpg
creating: test_data/himgri/
inflating: test_data/himgri/IMG_5384.JPG
inflating: test_data/himgri/IMG_5385.JPG
inflating: test_data/himgri/IMG_5386.JPG
inflating: test_data/himgri/IMG_5387.JPG
inflating: test_data/himgri/IMG_5459.JPG
inflating: test_data/himgri/IMG_5460.JPG
inflating: test_data/himgri/IMG_5487.JPG
inflating: test_data/himgri/IMG_5488.JPG
inflating: test_data/himgri/IMG_5489.JPG
inflating: test_data/himgri/IMG_5490.JPG
inflating: test_data/himgri/IMG_5491.JPG
inflating: test_data/himgri/IMG_5492.JPG
inflating: test_data/himgri/P1020742.jpg
inflating: test_data/himgri/P1020743.jpg
inflating: test_data/himgri/P1020746.jpg
inflating: test_data/himgri/P1020748.jpg
inflating: test_data/himgri/P1030055.jpg
inflating: test_data/himgri/P1060776.jpg
inflating: test_data/himgri/P1060777.jpg
inflating: test_data/himgri/P1060778.jpg
creating: test_data/hsparo/
inflating: test_data/hsparo/100_5573.JPG
inflating: test_data/hsparo/100_5585.JPG
inflating: test_data/hsparo/100_5586.JPG
inflating: test_data/hsparo/100_5742.JPG
inflating: test_data/hsparo/12265273154_48e0fef42_o.jpg
inflating: test_data/hsparo/DSC_4521.jpg
inflating: test_data/hsparo/DSC_7619.jpg
inflating: test_data/hsparo/_DSC_11244.jpg
inflating: test_data/hsparo/_DSC_11246.jpg
creating: test_data/indvul/
inflating: test_data/indvul/DSC_1263.jpg
inflating: test_data/indvul/DSC_1273.jpg
inflating: test_data/indvul/DSC_1274.jpg
inflating: test_data/indvul/DSC_1275.jpg
inflating: test_data/indvul/DSC_1277.jpg
inflating: test_data/indvul/_DSC8754.jpg

inflating: test_data/indvul/_DSC9520.jpg
inflating: test_data/indvul/_DSC9521.jpg
inflating: test_data/indvul/_DSC9523.jpg
creating: test_data/jglowl/
inflating: test_data/jglowl/_D32_10584.jpg
inflating: test_data/jglowl/_D32_10587.jpg
inflating: test_data/jglowl/_D32_10593.jpg
inflating: test_data/jglowl/_D32_13515.jpg
inflating: test_data/jglowl/_D32_13516.jpg
inflating: test_data/jglowl/_D32_13517.jpg
creating: test_data/lbicrw/
inflating: test_data/lbicrw/100_4917.JPG
inflating: test_data/lbicrw/IMG_5538.JPG
inflating: test_data/lbicrw/IMG_5541.JPG
inflating: test_data/lbicrw/IMG_5543.JPG
inflating: test_data/lbicrw/IMG_5544.JPG
inflating: test_data/lbicrw/P1030030.jpg
creating: test_data/mgprob/
inflating: test_data/mgprob/100_5811.JPG
inflating: test_data/mgprob/100_5812.JPG
inflating: test_data/mgprob/100_5813.JPG
inflating: test_data/mgprob/DSC_3233.jpg
inflating: test_data/mgprob/_DSC0085.jpg
inflating: test_data/mgprob/_DSC0133.jpg
inflating: test_data/mgprob/_DSC0135.jpg
creating: test_data/rebing/
inflating: test_data/rebing/100_5756.JPG
inflating: test_data/rebing/100_5757.JPG
inflating: test_data/rebing/100_5758.JPG
inflating: test_data/rebing/100_5759.JPG
inflating: test_data/rebing/100_5760.JPG
inflating: test_data/rebing/13009302395_5d88a9d62b_o.jpg
inflating: test_data/rebing/13009315305_f1cbfb6767_o.jpg
inflating: test_data/rebing/13009451823_8eb502581f_o.jpg
inflating: test_data/rebing/DSC_7148.jpg
inflating: test_data/rebing/IMG_5251.JPG
inflating: test_data/rebing/IMG_5252.JPG
creating: test_data/wcrsrt/
inflating: test_data/wcrsrt/100_4462.JPG
inflating: test_data/wcrsrt/100_4463.JPG
inflating: test_data/wcrsrt/100_4464.JPG
inflating: test_data/wcrsrt/100_4466.JPG
inflating: test_data/wcrsrt/100_4467.JPG
inflating: test_data/wcrsrt/100_4468.JPG
inflating: test_data/wcrsrt/100_5103.JPG
inflating: test_data/wcrsrt/100_5105.JPG
inflating: test_data/wcrsrt/11382677585_ef6570a041_o.jpg
inflating: test_data/wcrsrt/11382746854_7ce73793b3_o.jpg

```
[3]: !unzip '/content/drive/MyDrive/train_data.zip'
```

```
Archive: /content/drive/MyDrive/train_data.zip
  creating: train_data/
  creating: train_data/blasti/
  inflating: train_data/blasti/DSC_6382.jpg
  inflating: train_data/blasti/DSC_6383.jpg
  inflating: train_data/blasti/DSC_6384-2.jpg
  inflating: train_data/blasti/DSC_6384.jpg
  inflating: train_data/blasti/DSC_6385.jpg
  inflating: train_data/blasti/DSC_6386.jpg
  inflating: train_data/blasti/DSC_6387.jpg
  inflating: train_data/blasti/DSC_6388.jpg
  inflating: train_data/blasti/DSC_6389.jpg
  inflating: train_data/blasti/DSC_6390.jpg
  inflating: train_data/blasti/DSC_6391.jpg
  inflating: train_data/blasti/DSC_6392.jpg
  inflating: train_data/blasti/DSC_6393.jpg
  inflating: train_data/blasti/DSC_6394.jpg
  inflating: train_data/blasti/DSC_6395.jpg
  creating: train_data/bonegl/
  inflating: train_data/bonegl/DSC_4570.jpg
  inflating: train_data/bonegl/DSC_4571.jpg
  inflating: train_data/bonegl/DSC_4583.jpg
  inflating: train_data/bonegl/DSC_4584.jpg
  inflating: train_data/bonegl/DSC_4585.jpg
  inflating: train_data/bonegl/DSC_4586.jpg
  creating: train_data/brhkyt/
  inflating: train_data/brhkyt/D72_0400.jpg
  inflating: train_data/brhkyt/D72_0401.jpg
  inflating: train_data/brhkyt/D72_0470.jpg
  inflating: train_data/brhkyt/D72_0471.jpg
  inflating: train_data/brhkyt/D72_0472.jpg
  creating: train_data/cbrtsh/
  inflating: train_data/cbrtsh/100_5097.JPG
  inflating: train_data/cbrtsh/_D32_10303.jpg
  inflating: train_data/cbrtsh/_D32_10305.jpg
  inflating: train_data/cbrtsh/_D32_10306.jpg
  inflating: train_data/cbrtsh/_D32_10307.jpg
  inflating: train_data/cbrtsh/_D32_10308.jpg
  inflating: train_data/cbrtsh/_D32_10309.jpg
  creating: train_data/cmnmyn/
  inflating: train_data/cmnmyn/100_5763.JPG
  inflating: train_data/cmnmyn/5866682091_870ccc946c_o.jpg
  inflating: train_data/cmnmyn/6154956165_64266b8b53_o.jpg
  inflating: train_data/cmnmyn/DSCN5784.jpg
  inflating: train_data/cmnmyn/DSCN5787.jpg
```

inflating: train_data/cmmyn/DSCN5790.jpg
inflating: train_data/cmmyn/DSCN5791.jpg
creating: train_data/gretit/
inflating: train_data/gretit/100_5042.JPG
inflating: train_data/gretit/100_5043.JPG
inflating: train_data/gretit/100_5044.JPG
inflating: train_data/gretit/100_5045.JPG
inflating: train_data/gretit/100_5046.JPG
inflating: train_data/gretit/100_5047.JPG
creating: train_data/hilpig/
inflating: train_data/hilpig/DSC_6272.jpg
inflating: train_data/hilpig/DSC_6273.jpg
inflating: train_data/hilpig/DSC_6274.jpg
inflating: train_data/hilpig/DSC_6275.jpg
inflating: train_data/hilpig/DSC_6350.jpg
inflating: train_data/hilpig/DSC_6351.jpg
inflating: train_data/hilpig/DSC_6352.jpg
inflating: train_data/hilpig/DSC_6353.jpg
inflating: train_data/hilpig/DSC_6354.jpg
inflating: train_data/hilpig/DSC_6358.jpg
creating: train_data/himbul/
inflating: train_data/himbul/100_5028.JPG
inflating: train_data/himbul/100_5029.JPG
inflating: train_data/himbul/100_5096.JPG
inflating: train_data/himbul/100_5099.JPG
inflating: train_data/himbul/100_5100.JPG
inflating: train_data/himbul/100_5102.JPG
inflating: train_data/himbul/100_5110.JPG
inflating: train_data/himbul/100_5112.JPG
inflating: train_data/himbul/100_5113.JPG
inflating: train_data/himbul/100_5159.JPG
inflating: train_data/himbul/100_5160.JPG
inflating: train_data/himbul/100_5161.JPG
inflating: train_data/himbul/100_5162.JPG
inflating: train_data/himbul/10774570945_9bc537c255_o.jpg
inflating: train_data/himbul/11383838134_96e891a316_o.jpg
inflating: train_data/himbul/11383857084_cdd7514746_o.jpg
inflating: train_data/himbul/11387473723_464965720a_o.jpg
inflating: train_data/himbul/9007817678_24db19fc63_o.jpg
creating: train_data/himgri/
inflating: train_data/himgri/12029790563_2fe54a68aa_o.jpg
inflating: train_data/himgri/12029822653_1185544e7b_o.jpg
inflating: train_data/himgri/12029933015_802428e277_o.jpg
inflating: train_data/himgri/12029987304_031b7a2d53_o.jpg
inflating: train_data/himgri/12030165813_f5341e8ed0_o.jpg
inflating: train_data/himgri/12030221124_1baaf905d1_o.jpg
inflating: train_data/himgri/12030269234_1c3f5a8e8c_o.jpg
inflating: train_data/himgri/12152037683_13e1556c41_o.jpg

inflating: train_data/himgri/12152178844_dc29e3126f_o.jpg
inflating: train_data/himgri/12152510436_23b62fed3b_o.jpg
inflating: train_data/himgri/12265055185_138e3c7c70_o.jpg
inflating: train_data/himgri/12265498144_d2e80faa3b_o.jpg
inflating: train_data/himgri/12265561764_4814951031_o.jpg
inflating: train_data/himgri/12265582724_61cb64e73a_o.jpg
inflating: train_data/himgri/12265738206_2b9b25cc8a_o.jpg
inflating: train_data/himgri/12265747116_d4b4fa3741_o.jpg
inflating: train_data/himgri/12266053036_fcab92d8e8_o.jpg
inflating: train_data/himgri/12266077576_1d7143aaf7_o.jpg
inflating: train_data/himgri/12266086526_82cd337667_o.jpg
inflating: train_data/himgri/IMG_5463.JPG
creating: train_data/hsparo/
inflating: train_data/hsparo/100_4757.JPG
inflating: train_data/hsparo/100_4758.JPG
inflating: train_data/hsparo/100_5039.JPG
inflating: train_data/hsparo/100_5040.JPG
inflating: train_data/hsparo/100_5041.JPG
inflating: train_data/hsparo/100_5048.JPG
inflating: train_data/hsparo/100_5049.JPG
inflating: train_data/hsparo/100_5050.JPG
inflating: train_data/hsparo/100_5572.JPG
creating: train_data/indvul/
inflating: train_data/indvul/DSC_0502.jpg
inflating: train_data/indvul/DSC_0571e.jpg
inflating: train_data/indvul/DSC_0572.jpg
inflating: train_data/indvul/DSC_0576e.jpg
inflating: train_data/indvul/DSC_0582.jpg
inflating: train_data/indvul/DSC_0583e.jpg
inflating: train_data/indvul/DSC_0584.jpg
inflating: train_data/indvul/DSC_0616c.jpg
inflating: train_data/indvul/DSC_0617.jpg
creating: train_data/jglowl/
inflating: train_data/jglowl/12152151476_7a1524aabb_o.jpg
inflating: train_data/jglowl/DSC01335.jpg
inflating: train_data/jglowl/DSC01336.jpg
inflating: train_data/jglowl/_D32_10285.jpg
inflating: train_data/jglowl/_D32_10578.jpg
inflating: train_data/jglowl/_D32_10583.jpg
creating: train_data/lbicrw/
inflating: train_data/lbicrw/100_4037.JPG
inflating: train_data/lbicrw/100_4912.JPG
inflating: train_data/lbicrw/100_4913.JPG
inflating: train_data/lbicrw/100_4914.JPG
inflating: train_data/lbicrw/100_4915.JPG
inflating: train_data/lbicrw/100_4916.JPG
creating: train_data/mgprob/
inflating: train_data/mgprob/100_5587.JPG

```

inflating: train_data/mgprob/100_5588.JPG
inflating: train_data/mgprob/100_5589.JPG
inflating: train_data/mgprob/100_5590.JPG
inflating: train_data/mgprob/100_5592.JPG
inflating: train_data/mgprob/100_5762.JPG
  creating: train_data/rebing/
inflating: train_data/rebing/100_5744.JPG
inflating: train_data/rebing/100_5745.JPG
inflating: train_data/rebing/100_5746.JPG
inflating: train_data/rebing/100_5748.JPG
inflating: train_data/rebing/100_5749.JPG
inflating: train_data/rebing/100_5750.JPG
inflating: train_data/rebing/100_5751.JPG
inflating: train_data/rebing/100_5752.JPG
inflating: train_data/rebing/100_5754.JPG
inflating: train_data/rebing/100_5755.JPG
  creating: train_data/wcrsrt/
inflating: train_data/wcrsrt/100_4452.JPG
inflating: train_data/wcrsrt/100_4453.JPG
inflating: train_data/wcrsrt/100_4454.JPG
inflating: train_data/wcrsrt/100_4455.JPG
inflating: train_data/wcrsrt/100_4456.JPG
inflating: train_data/wcrsrt/100_4457.JPG
inflating: train_data/wcrsrt/100_4458.JPG
inflating: train_data/wcrsrt/100_4459.JPG
inflating: train_data/wcrsrt/100_4460.JPG
inflating: train_data/wcrsrt/100_4461.JPG

```

```
[4]: # Data Augmentation
```

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

```
[5]: train_path = "/content/train_data"
test_path = "/content/test_data"
```

```
[6]: train_gen = ImageDataGenerator(rescale=1./255,
                                   shear_range=0.2,
                                   zoom_range=0.2,
                                   horizontal_flip=True)

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

```
[7]: train = train_gen.flow_from_directory(train_path,
                                           target_size=(224,224),
                                           batch_size=22,
                                           class_mode='categorical')
```



```
test = test_gen.flow_from_directory(test_path,
                                    target_size=(224,224),
                                    batch_size=22,
                                    class_mode='categorical')
```

Found 150 images belonging to 16 classes.

Found 157 images belonging to 16 classes.

```
[8]: train.class_indices
```

```
[8]: {'blasti': 0,
      'bonegl': 1,
      'brhkyt': 2,
      'cbrtsh': 3,
      'cmnmyn': 4,
      'gretit': 5,
      'hilpig': 6,
      'himbul': 7,
      'himgri': 8,
      'hsparo': 9,
      'indvul': 10,
      'jglowl': 11,
      'lbicrw': 12,
      'mgprob': 13,
      'rebing': 14,
      'wcrsrt': 15}
```

```
[9]: from tensorflow.keras.layers import Dense, Flatten, Input
      from tensorflow.keras.models import Model
      from tensorflow.keras.preprocessing import image
      from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img
      import numpy as np
      from keras.layers import Input, Dense, Flatten, Dropout
      from tensorflow.keras.layers import BatchNormalization, Dropout
```

```
[10]: from tensorflow.keras.applications.vgg16 import VGG16, preprocess_input
```

```
[11]: # Adding the preprocessing layer to the front of vgg

vgg = VGG16(include_top=False, weights='imagenet', input_shape=(224, 224, 3))
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/vgg16/vgg16_weights_tf_dim_ordering_tf_kernels_notop.h5
58889256/58889256 [=====] - 0s 0us/step

```
[12]: for layer in vgg.layers:
      print(layer)
```

```

<keras.engine.input_layer.InputLayer object at 0x7f12297f01f0>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119f1f66e0>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119f1f5b40>
<keras.layers.pooling.max_pooling2d.MaxPooling2D object at 0x7f119f1f7010>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119f1f7b50>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c8309a0>
<keras.layers.pooling.max_pooling2d.MaxPooling2D object at 0x7f119f1f7280>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119f1f7d00>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c830100>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c8332e0>
<keras.layers.pooling.max_pooling2d.MaxPooling2D object at 0x7f119c8325c0>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c8337c0>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c8324a0>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c18a170>
<keras.layers.pooling.max_pooling2d.MaxPooling2D object at 0x7f119c18a950>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c18b490>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c18b700>
<keras.layers.convolutional.conv2d.Conv2D object at 0x7f119c18a320>
<keras.layers.pooling.max_pooling2d.MaxPooling2D object at 0x7f119c1992d0>

```

```
[13]: # Train model with existing weights
```

```

for layer in vgg.layers:
    layer.trainable=False

```

```
[14]: x = Flatten()(vgg.output)
```

```

[15]: # output layer
prediction = Dense(16,activation='softmax')(x)

```

```

[16]: # Create Vgg16 model

model = Model(inputs=vgg.input,outputs=prediction)

```

```
[17]: model.summary()
```

Model: "model"

Layer (type)	Output Shape	Param #
input_1 (InputLayer)	[(None, 224, 224, 3)]	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0

block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0
flatten (Flatten)	(None, 25088)	0
dense (Dense)	(None, 16)	401424

```
=====
Total params: 15,116,112
Trainable params: 401,424
Non-trainable params: 14,714,688
-----
```

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

```
[19]: len(train), len(test)
```

```
[19]: (7, 8)
```

```
[20]: model.  
      ↪fit_generator(train,validation_data=test,epochs=10,steps_per_epoch=len(train),  
                    validation_steps=len(test))
```

<ipython-input-20-240d737b1fe6>:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.

```
model.fit_generator(train,validation_data=test,epochs=10,steps_per_epoch=len(t  
rain),
```

Epoch 1/10

```
7/7 [=====] - 105s 14s/step - loss: 3.1300 - accuracy:  
0.1867 - val_loss: 2.9165 - val_accuracy: 0.2675
```

Epoch 2/10

```
7/7 [=====] - 88s 14s/step - loss: 1.3713 - accuracy:  
0.6067 - val_loss: 2.5544 - val_accuracy: 0.2994
```

Epoch 3/10

```
7/7 [=====] - 87s 14s/step - loss: 0.8488 - accuracy:  
0.7533 - val_loss: 2.6097 - val_accuracy: 0.3885
```

Epoch 4/10

```
7/7 [=====] - 86s 14s/step - loss: 0.4821 - accuracy:  
0.8600 - val_loss: 2.9371 - val_accuracy: 0.2994
```

Epoch 5/10

```
7/7 [=====] - 121s 19s/step - loss: 0.3144 - accuracy:  
0.9000 - val_loss: 3.0235 - val_accuracy: 0.3885
```

Epoch 6/10

```
7/7 [=====] - 89s 14s/step - loss: 0.2435 - accuracy:  
0.9333 - val_loss: 3.0369 - val_accuracy: 0.3376
```

Epoch 7/10

```
7/7 [=====] - 87s 13s/step - loss: 0.1802 - accuracy:  
0.9467 - val_loss: 2.8329 - val_accuracy: 0.3885
```

Epoch 8/10

```
7/7 [=====] - 86s 13s/step - loss: 0.1098 - accuracy:  
0.9800 - val_loss: 2.9476 - val_accuracy: 0.3694
```

Epoch 9/10

```
7/7 [=====] - 120s 19s/step - loss: 0.0787 - accuracy:  
0.9867 - val_loss: 2.9759 - val_accuracy: 0.3694
```

Epoch 10/10

```
7/7 [=====] - 120s 19s/step - loss: 0.0697 - accuracy:  
0.9867 - val_loss: 3.0283 - val_accuracy: 0.4076
```

```
[20]: <keras.callbacks.History at 0x7f119c09c4c0>
```

```
[21]: img1 = image.load_img('/content/bird_samp.jpg',target_size=(224,224))  
img1 = image.img_to_array(img1)  
img1 = np.expand_dims(img1,axis=0)  
pred = np.argmax(model.predict(img1))  
print(pred)
```

```
output = ['blasti', 'bonegl', 'brhkyt', 'cbrtsh', 'cmnmyn', 'gretit', 'hilpig',  
↪ 'himbul', 'himgri', 'hsparo', 'indvul', 'jglowl', 'lbicrw', 'mgprob',  
↪ 'rebimg', 'wcrsrt']  
print(output[pred])
```

1/1 [=====] - 1s 862ms/step

4

cmnmyn

[]:

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