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```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
!unzip '/content/drive/MyDrive/Colab Notebooks/birds_dataset.zip'
```

```
  inflating: train_data/train_data/himgri/12266086526_82cd337667_o.jpg
  inflating: train_data/train_data/himgri/IMG_5463.JPG
  inflating: train_data/train_data/hsparo/100_4757.JPG
  inflating: train_data/train_data/hsparo/100_4758.JPG
  inflating: train_data/train_data/hsparo/100_5039.JPG
  inflating: train_data/train_data/hsparo/100_5040.JPG
  inflating: train_data/train_data/hsparo/100_5041.JPG
  inflating: train_data/train_data/hsparo/100_5048.JPG
  inflating: train_data/train_data/hsparo/100_5049.JPG
  inflating: train_data/train_data/hsparo/100_5050.JPG
  inflating: train_data/train_data/hsparo/100_5572.JPG
  inflating: train_data/train_data/indvul/DSC_0502.jpg
  inflating: train_data/train_data/indvul/DSC_0571e.jpg
  inflating: train_data/train_data/indvul/DSC_0572.jpg
  inflating: train_data/train_data/indvul/DSC_0576e.jpg
  inflating: train_data/train_data/indvul/DSC_0582.jpg
  inflating: train_data/train_data/indvul/DSC_0583e.jpg
  inflating: train_data/train_data/indvul/DSC_0584.jpg
  inflating: train_data/train_data/indvul/DSC_0616c.jpg
  inflating: train_data/train_data/indvul/DSC_0617.jpg
  inflating: train_data/train_data/jglowl/12152151476_7a1524aabb_o.jpg
  inflating: train_data/train_data/jglowl/DSC01335.jpg
  inflating: train_data/train_data/jglowl/DSC01336.jpg
  inflating: train_data/train_data/jglowl/_D32_10285.jpg
  inflating: train_data/train_data/jglowl/_D32_10578.jpg
  inflating: train_data/train_data/jglowl/_D32_10583.jpg
  inflating: train_data/train_data/lbicrw/100_4037.JPG
  inflating: train_data/train_data/lbicrw/100_4912.JPG
  inflating: train_data/train_data/lbicrw/100_4913.JPG
  inflating: train_data/train_data/lbicrw/100_4914.JPG
  inflating: train_data/train_data/lbicrw/100_4915.JPG
  inflating: train_data/train_data/lbicrw/100_4916.JPG
  inflating: train_data/train_data/mgprob/100_5587.JPG
  inflating: train_data/train_data/mgprob/100_5588.JPG
  inflating: train_data/train_data/mgprob/100_5589.JPG
  inflating: train_data/train_data/mgprob/100_5590.JPG
  inflating: train_data/train_data/mgprob/100_5592.JPG
  inflating: train_data/train_data/mgprob/100_5762.JPG
  inflating: train_data/train_data/rebimg/100_5744.JPG
  inflating: train_data/train_data/rebimg/100_5745.JPG
  inflating: train_data/train_data/rebimg/100_5746.JPG
  inflating: train_data/train_data/rebimg/100_5748.JPG
  inflating: train_data/train_data/rebimg/100_5749.JPG
  inflating: train_data/train_data/rebimg/100_5750.JPG
  inflating: train_data/train_data/rebimg/100_5751.JPG
  inflating: train_data/train_data/rebimg/100_5752.JPG
  inflating: train_data/train_data/rebimg/100_5754.JPG
  inflating: train_data/train_data/rebimg/100_5755.JPG
  inflating: train_data/train_data/wcrsrt/100_4452.JPG
  inflating: train_data/train_data/wcrsrt/100_4453.JPG
  inflating: train_data/train_data/wcrsrt/100_4454.JPG
  inflating: train_data/train_data/wcrsrt/100_4455.JPG
  inflating: train_data/train_data/wcrsrt/100_4456.JPG
  inflating: train_data/train_data/wcrsrt/100_4457.JPG
  inflating: train_data/train_data/wcrsrt/100_4458.JPG
  inflating: train_data/train_data/wcrsrt/100_4459.JPG
  inflating: train_data/train_data/wcrsrt/100_4460.JPG
  inflating: train_data/train_data/wcrsrt/100_4461.JPG
```

```
import tensorflow as tf
tf.keras.backend.clear_session()
```

```
# Data Augmentation
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense
from tensorflow.keras.models import Sequential
import cv2 as cv
```

```
train_gen = ImageDataGenerator(rescale=(1./255),horizontal_flip=True,shear_range=0.2)
test_gen = ImageDataGenerator(rescale=(1./255))
```

```
train = train_gen.flow_from_directory('/content/train_data/train_data',
target_size=(120, 120),
class_mode='categorical',
batch_size=8)
test = test_gen.flow_from_directory('/content/test_data/test_data',
target_size=(120, 120),
class_mode='categorical',
batch_size=8)
```

```
Found 150 images belonging to 16 classes.
Found 157 images belonging to 16 classes.
```

```
train.class_indices
```

```
{'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,
 'rebimg': 14,
 'wcrsrt': 15}
```

```
test.class_indices
```

```
{'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,
 'rebimg': 14,
 'wcrsrt': 15}
```

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

```
model = Sequential([
Convolution2D(20,(3,3),activation = 'relu',input_shape=(120,120,3)),
MaxPooling2D(2,2),
Flatten(),
Dense(45,activation = 'relu'),
Dense(16,activation = 'softmax')
])
```

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

```
model_fit = model.fit(train,epochs =20,validation_data = test ,batch_size=5)
```

```
Epoch 1/20
19/19 [==============================] - 110s 5s/step - loss: 5.3586 - accuracy: 0.1067 - val_loss: 2.7906 - val_accuracy: 0.0637
Epoch 2/20
19/19 [==============================] - 123s 7s/step - loss: 2.6327 - accuracy: 0.0800 - val_loss: 2.7191 - val_accuracy: 0.1656
Epoch 3/20
19/19 [==============================] - 95s 5s/step - loss: 2.5451 - accuracy: 0.1733 - val_loss: 2.7309 - val_accuracy: 0.1529
Epoch 4/20
19/19 [==============================] - 97s 5s/step - loss: 2.4848 - accuracy: 0.1867 - val_loss: 2.7206 - val_accuracy: 0.1465
Epoch 5/20
19/19 [==============================] - 99s 5s/step - loss: 2.4361 - accuracy: 0.1867 - val_loss: 2.7928 - val_accuracy: 0.1720
Epoch 6/20
19/19 [==============================] - 95s 5s/step - loss: 2.3783 - accuracy: 0.2067 - val_loss: 2.7305 - val_accuracy: 0.1975
Epoch 7/20
19/19 [==============================] - 98s 5s/step - loss: 2.3398 - accuracy: 0.1933 - val_loss: 2.7568 - val_accuracy: 0.1210
Epoch 8/20
19/19 [==============================] - 99s 5s/step - loss: 2.1923 - accuracy: 0.2133 - val_loss: 2.7188 - val_accuracy: 0.1720
```

```
Epoch 9/20
19/19 [==============================] - 97s 5s/step - loss: 2.1509 - accuracy: 0.2133 - val_loss: 2.6836 - val_accuracy: 0.1465
Epoch 10/20
19/19 [==============================] - 95s 5s/step - loss: 2.0665 - accuracy: 0.2200 - val_loss: 2.6553 - val_accuracy: 0.1720
Epoch 11/20
19/19 [==============================] - 98s 5s/step - loss: 2.0372 - accuracy: 0.2400 - val_loss: 2.7004 - val_accuracy: 0.2038
Epoch 12/20
19/19 [==============================] - 97s 5s/step - loss: 2.0185 - accuracy: 0.2867 - val_loss: 2.7717 - val_accuracy: 0.1465
Epoch 13/20
19/19 [==============================] - 123s 7s/step - loss: 1.8779 - accuracy: 0.3333 - val_loss: 3.0255 - val_accuracy: 0.2166
Epoch 14/20
19/19 [==============================] - 97s 5s/step - loss: 1.9291 - accuracy: 0.3000 - val_loss: 2.7166 - val_accuracy: 0.2166
Epoch 15/20
19/19 [==============================] - 124s 7s/step - loss: 1.8133 - accuracy: 0.3600 - val_loss: 2.7453 - val_accuracy: 0.1975
Epoch 16/20
19/19 [==============================] - 95s 5s/step - loss: 1.7718 - accuracy: 0.4000 - val_loss: 2.7271 - val_accuracy: 0.2229
Epoch 17/20
19/19 [==============================] - 97s 5s/step - loss: 1.7368 - accuracy: 0.4600 - val_loss: 2.7153 - val_accuracy: 0.2293
Epoch 18/20
19/19 [==============================] - 99s 5s/step - loss: 1.6960 - accuracy: 0.4400 - val_loss: 2.8202 - val_accuracy: 0.2420
Epoch 19/20
19/19 [==============================] - 96s 5s/step - loss: 1.6723 - accuracy: 0.3933 - val_loss: 2.9039 - val_accuracy: 0.2166
Epoch 20/20
19/19 [==============================] - 95s 5s/step - loss: 1.6448 - accuracy: 0.4533 - val_loss: 2.7912 - val_accuracy: 0.2357
```

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

```
model_new = tf.keras.models.load_model('/content/birds.h5')
```

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

```
output = ['rebimg','wcrsrt','jglowl','ibicrw','mgprob','hsparo',
'indvul','himgri','himbul','gretit','hilpig','cbrtsh',
'cmnmyn','bonegl','brhkyt','blasti']
output
```

```
['rebimg',
 'wcrsrt',
 'jglowl',
 'ibicrw',
 'mgprob',
 'hsparo',
 'indvul',
 'himgri',
 'himbul',
 'gretit',
 'hilpig',
 'cbrtsh',
 'cmnmyn',
 'bonegl',
 'brhkyt',
 'blasti']
```

```
img1 = image.load_img("/content/train_data/train_data/mgprob/100_5590.JPG",target_size=(120,120))
img1 = image.img_to_array(img1)
img1 = np.expand_dims(img1,axis=0)
pred = np.argmax(model.predict(img1))
print(pred)
print(output[pred])
```

```
1/1 [==============================] - 0s 132ms/step
15
blasti
```

```
img1 = image.load_img("/content/train_data/train_data/cmnmyn/100_5763.JPG",target_size=(120,120))
img1 = image.img_to_array(img1)
img1 = np.expand_dims(img1,axis=0)
pred = np.argmax(model.predict(img1))
print(pred)
print(output[pred])
```

```
1/1 [==============================] - 0s 22ms/step
8
himbul
```

```
img1 = image.load_img("/content/train_data/train_data/gretit/100_5043.JPG",target_size=(120,120))
img1 = image.img_to_array(img1)
img1 = np.expand_dims(img1,axis=0)
pred = np.argmax(model.predict(img1))
```

```
print(pred)
print(output[pred])
```

```
1/1 [==============================] - 0s 26ms/step
15
blasti
```

```
img1 = image.load_img("/content/train data/train data/himbul/100 5029.JPG",target_size=(120,120))
img1 = image.img_to_array(img1)
img1 = np.expand_dims(img1,axis=0)
pred = np.argmax(model.predict(img1))
print(pred)
print(output[pred])
```

```
1/1 [==============================] - 0s 21ms/step
15
blasti
```

0s completed at 1:20 PM