a8m6qumhn

May 19, 2023

1 Load Dataset

[9]:
```
#from google.colab import drive
#drive.mount('/content/drive')
!pip install tensorflow
```

```
Requirement already satisfied: tensorflow in c:\programdata\anaconda3\lib\site-
packages (2.12.0)
Requirement already satisfied: tensorflow-intel==2.12.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow) (2.12.0)
Requirement already satisfied: flatbuffers>=2.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (23.5.8)
Requirement already satisfied: google-pasta>=0.1.1 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (0.2.0)
Requirement already satisfied: termcolor>=1.1.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (2.3.0)
Requirement already satisfied:
protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.20.3
in c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (4.23.0)
Requirement already satisfied: libclang>=13.0.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (16.0.0)
Requirement already satisfied: packaging in c:\programdata\anaconda3\lib\site-
packages (from tensorflow-intel==2.12.0->tensorflow) (21.3)
Requirement already satisfied: gast<=0.4.0,>=0.2.1 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (0.4.0)
Requirement already satisfied: setuptools in c:\programdata\anaconda3\lib\site-
packages (from tensorflow-intel==2.12.0->tensorflow) (63.4.1)
Requirement already satisfied: jax>=0.3.15 in c:\programdata\anaconda3\lib\site-
packages (from tensorflow-intel==2.12.0->tensorflow) (0.4.8)
Requirement already satisfied: numpy<1.24,>=1.22 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (1.23.5)
```

```
Requirement already satisfied: absl-py>=1.0.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (1.4.0)
Requirement already satisfied: opt-einsum>=2.3.2 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (3.3.0)
Requirement already satisfied: keras<2.13,>=2.12.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (2.12.0)
Requirement already satisfied: h5py>=2.9.0 in c:\programdata\anaconda3\lib\site-
packages (from tensorflow-intel==2.12.0->tensorflow) (3.7.0)
Requirement already satisfied: six>=1.12.0 in c:\programdata\anaconda3\lib\site-
packages (from tensorflow-intel==2.12.0->tensorflow) (1.16.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (1.54.0)
Requirement already satisfied: tensorboard<2.13,>=2.12 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (2.12.3)
Requirement already satisfied: tensorflow-estimator<2.13,>=2.12.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (2.12.0)
Requirement already satisfied: wrapt<1.15,>=1.11.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (1.14.1)
Requirement already satisfied: astunparse>=1.6.0 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (1.6.3)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (0.31.0)
Requirement already satisfied: typing-extensions>=3.6.6 in
c:\programdata\anaconda3\lib\site-packages (from tensorflow-
intel==2.12.0->tensorflow) (4.3.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in
c:\programdata\anaconda3\lib\site-packages (from astunparse>=1.6.0->tensorflow-
intel==2.12.0->tensorflow) (0.37.1)
Requirement already satisfied: ml-dtypes>=0.0.3 in
c:\programdata\anaconda3\lib\site-packages (from jax>=0.3.15->tensorflow-
intel==2.12.0->tensorflow) (0.1.0)
Requirement already satisfied: scipy>=1.7 in c:\programdata\anaconda3\lib\site-
packages (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow) (1.9.1)
Requirement already satisfied: markdown>=2.6.8 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (3.3.4)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (0.7.0)
```

```
Requirement already satisfied: werkzeug>=1.0.1 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (2.0.3)
Requirement already satisfied: google-auth<3,>=1.6.3 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (2.17.3)
Requirement already satisfied: requests<3,>=2.21.0 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (2.28.1)
Requirement already satisfied: google-auth-oauthlib<1.1,>=0.5 in
c:\programdata\anaconda3\lib\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (1.0.0)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in
c:\programdata\anaconda3\lib\site-packages (from packaging->tensorflow-
intel==2.12.0->tensorflow) (3.0.9)
Requirement already satisfied: rsa<5,>=3.1.4 in
c:\programdata\anaconda3\lib\site-packages (from google-
auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(4.9)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in
c:\programdata\anaconda3\lib\site-packages (from google-
auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(5.3.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in
c:\programdata\anaconda3\lib\site-packages (from google-
auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(0.2.8)
Requirement already satisfied: requests-oauthlib>=0.7.0 in
c:\programdata\anaconda3\lib\site-packages (from google-auth-
oauthlib<1.1,>=0.5->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (1.3.1)
Requirement already satisfied: charset-normalizer<3,>=2 in
c:\programdata\anaconda3\lib\site-packages (from
requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (2.0.4)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in
c:\programdata\anaconda3\lib\site-packages (from
requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (1.26.11)
Requirement already satisfied: idna<4,>=2.5 in
c:\programdata\anaconda3\lib\site-packages (from
requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (3.3)
Requirement already satisfied: certifi>=2017.4.17 in
c:\programdata\anaconda3\lib\site-packages (from
requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (2022.9.14)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in
```

```
c:\programdata\anaconda3\lib\site-packages (from pyasn1-modules>=0.2.1->google-
auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in
c:\programdata\anaconda3\lib\site-packages (from requests-
oauthlib>=0.7.0->google-auth-
oauthlib<1.1,>=0.5->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (3.2.2)
```

2 Unzipping

[ ]:
```
!unzip "/content/drive/MyDrive/Animals_assignment_dataset.zip"
```

[10]:
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

3 Data Augmentation

[149]:
```
train_datagen = ImageDataGenerator(rescale=1/255,
    rotation_range=10,
    width_shift_range=0.1,
    height_shift_range=0.1,
    zoom_range=0.1,
    horizontal_flip=True,
    vertical_flip=False,
    brightness_range=(0.8, 1.2)
)
```

[11]:
```
train_datagen=ImageDataGenerator(rescale=1/255,zoom_range=0.
↪2,horizontal_flip=True,vertical_flip=False)
```

[12]:
```
test_datagen=ImageDataGenerator(rescale=1/255)
```

[14]:
```
x_train=train_datagen.flow_from_directory(r"D:\Naan mudhalvan␣
↪AI\animal_dataset\Training",target_size=(90,90),
                                          class_mode='categorical',batch_size=60)
```

```
Found 5400 images belonging to 90 classes.
```

[15]:
```
x_test=test_datagen.flow_from_directory(r"D:\Naan mudhalvan␣
↪AI\animal_dataset\Testing",target_size=(90,90),
                                          class_mode='categorical',batch_size=60)
```

```
Found 4523 images belonging to 90 classes.
```

[16]:
```
x_train.class_indices
```

```
[16]: {'antelope': 0,
       'badger': 1,
       'bat': 2,
       'bear': 3,
       'bee': 4,
       'beetle': 5,
       'bison': 6,
       'boar': 7,
       'butterfly': 8,
       'cat': 9,
       'caterpillar': 10,
       'chimpanzee': 11,
       'cockroach': 12,
       'cow': 13,
       'coyote': 14,
       'crab': 15,
       'crow': 16,
       'deer': 17,
       'dog': 18,
       'dolphin': 19,
       'donkey': 20,
       'dragonfly': 21,
       'duck': 22,
       'eagle': 23,
       'elephant': 24,
       'flamingo': 25,
       'fly': 26,
       'fox': 27,
       'goat': 28,
       'goldfish': 29,
       'goose': 30,
       'gorilla': 31,
       'grasshopper': 32,
       'hamster': 33,
       'hare': 34,
       'hedgehog': 35,
       'hippopotamus': 36,
       'hornbill': 37,
       'horse': 38,
       'hummingbird': 39,
       'hyena': 40,
       'jellyfish': 41,
       'kangaroo': 42,
       'koala': 43,
       'ladybugs': 44,
       'leopard': 45,
       'lion': 46,
```

```
'lizard': 47,
'lobster': 48,
'mosquito': 49,
'moth': 50,
'mouse': 51,
'octopus': 52,
'okapi': 53,
'orangutan': 54,
'otter': 55,
'owl': 56,
'ox': 57,
'oyster': 58,
'panda': 59,
'parrot': 60,
'pelecaniformes': 61,
'penguin': 62,
'pig': 63,
'pigeon': 64,
'porcupine': 65,
'possum': 66,
'raccoon': 67,
'rat': 68,
'reindeer': 69,
'rhinoceros': 70,
'sandpiper': 71,
'seahorse': 72,
'seal': 73,
'shark': 74,
'sheep': 75,
'snake': 76,
'sparrow': 77,
'squid': 78,
'squirrel': 79,
'starfish': 80,
'swan': 81,
'tiger': 82,
'turkey': 83,
'turtle': 84,
'whale': 85,
'wolf': 86,
'wombat': 87,
'woodpecker': 88,
'zebra': 89}
```

4 CNN model

[17]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense
```

5 Input Layer

[18]:
```
model=Sequential()
```

6 Convolution Layer

[19]:
```
model.add(Convolution2D(45,(3,3),activation='relu',input_shape=(90,90,3)))
#put 32 in place of 45 if suppose getting error
```

7 Maxpooling

[20]:
```
model.add(MaxPooling2D(pool_size=(2,2)))
```

8 Flattening

[21]:
```
model.add(Flatten())
```

9 Hidden Layer-1

[22]:
```
model.add(Dense(300,activation='relu'))
```

10 Hidden Layer-2

[23]:
```
model.add(Dense(150,activation='relu'))
```

11 Output Layer

[24]:
```
model.add(Dense(90,activation='softmax'))
```

[25]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
```

```
conv2d (Conv2D)              (None, 88, 88, 45)        1260

max_pooling2d (MaxPooling2D  (None, 44, 44, 45)        0
)

flatten (Flatten)            (None, 87120)             0

dense (Dense)                (None, 300)               26136300

dense_1 (Dense)              (None, 150)               45150

dense_2 (Dense)              (None, 90)                13590

=================================================================
Total params: 26,196,300
Trainable params: 26,196,300
Non-trainable params: 0
_________________________________________________________________
```

12 Compile the model

[26]:
```
model.
↪compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

[27]:
```
print(len(x_train))
```

```
90
```

[28]:
```
5400/60
```

[28]: 90.0

[29]:
```
len(x_test)
```

[29]: 76

[30]:
```
model.
↪fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,validation_data=x_test,validat
```

```
C:\Users\india\AppData\Local\Temp\ipykernel_16556\234118701.py: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(x_train,steps_per_epoch=len(x_train),epochs=10,validation_
data=x_test,validation_steps=len(x_test))

Epoch 1/10
90/90 [==============================] - 160s 2s/step - loss: 4.5607 - accuracy:
0.0257 - val_loss: 4.3038 - val_accuracy: 0.0305
```

```
Epoch 2/10
90/90 [==============================] - 162s 2s/step - loss: 4.1633 - accuracy:
0.0581 - val_loss: 4.0013 - val_accuracy: 0.0750
Epoch 3/10
90/90 [==============================] - 158s 2s/step - loss: 3.8617 - accuracy:
0.1002 - val_loss: 3.6477 - val_accuracy: 0.1428
Epoch 4/10
90/90 [==============================] - 159s 2s/step - loss: 3.5831 - accuracy:
0.1500 - val_loss: 3.3907 - val_accuracy: 0.1899
Epoch 5/10
90/90 [==============================] - 153s 2s/step - loss: 3.3185 - accuracy:
0.1996 - val_loss: 3.2612 - val_accuracy: 0.2136
Epoch 6/10
90/90 [==============================] - 155s 2s/step - loss: 3.1307 - accuracy:
0.2387 - val_loss: 3.0690 - val_accuracy: 0.2691
Epoch 7/10
90/90 [==============================] - 178s 2s/step - loss: 2.9291 - accuracy:
0.2767 - val_loss: 2.9279 - val_accuracy: 0.2947
Epoch 8/10
90/90 [==============================] - 166s 2s/step - loss: 2.7219 - accuracy:
0.3252 - val_loss: 2.5707 - val_accuracy: 0.3626
Epoch 9/10
90/90 [==============================] - 169s 2s/step - loss: 2.5942 - accuracy:
0.3489 - val_loss: 2.3478 - val_accuracy: 0.4112
Epoch 10/10
90/90 [==============================] - 160s 2s/step - loss: 2.3970 - accuracy:
0.4020 - val_loss: 2.3233 - val_accuracy: 0.4272
```

[30]:
```
<keras.callbacks.History at 0x1f21d18acd0>
```

13 Save the model

[32]:
```
model.save('animal_assignment.h5')
```

14 Test the model

[33]:
```
!pip install numpy
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

```
Requirement already satisfied: numpy in c:\programdata\anaconda3\lib\site-
packages (1.23.5)
```

[35]:
```
model=load_model('animal_assignment.h5')
```

```
img=image.load_img(r"D:\Naan mudhalvan␣
↪AI\animal_dataset\Testing\butterfly\4dc0e11cdd.jpg",target_size=(90,90))
```

[36]:
```
img
```

[36]:

[37]:
```
x=image.img_to_array(img)
```

[38]:
```
x
```

[38]:
```
array([[[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       …,

       [[255., 255., 255.],
        [255., 255., 255.],
```

```
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        …,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]]], dtype=float32)
```

[39]:
```
x.ndim
```

[39]:
```
3
```

[40]:
```
x=np.expand_dims(x,axis=0)
```

[41]:
```
x
```

[41]:
```
array([[[[255., 255., 255.],
         [255., 255., 255.],
         [255., 255., 255.],
         …,
         [255., 255., 255.],
         [255., 255., 255.],
         [255., 255., 255.]],

        [[255., 255., 255.],
         [255., 255., 255.],
         [255., 255., 255.],
         …,
         [255., 255., 255.],
         [255., 255., 255.],
         [255., 255., 255.]],

        [[255., 255., 255.],
```

```
        [255., 255., 255.],
        [255., 255., 255.],
        ...,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       ...,

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        ...,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        ...,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]],

       [[255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.],
        ...,
        [255., 255., 255.],
        [255., 255., 255.],
        [255., 255., 255.]]], dtype=float32)
```

[42]:
```
x.ndim
```

[42]: 4

[43]:
```
#pred=model.predict_classes(x)
```

[44]:
```
pred=np.argmax(model.predict(x),axis=1)
```

```
1/1 [==============================] - 0s 126ms/step
```

[46]:
```
pred
```

[46]: array([8], dtype=int64)

[47]:
```
index=['antelope','badger','bat','bear','bee','beetle','bison','boar','butterfly','cat','cater
print(index[pred[0]])
```

```
butterfly
```

15 Another input image