Assignment -3

Python Programming

Assignment Date	19 September 2022
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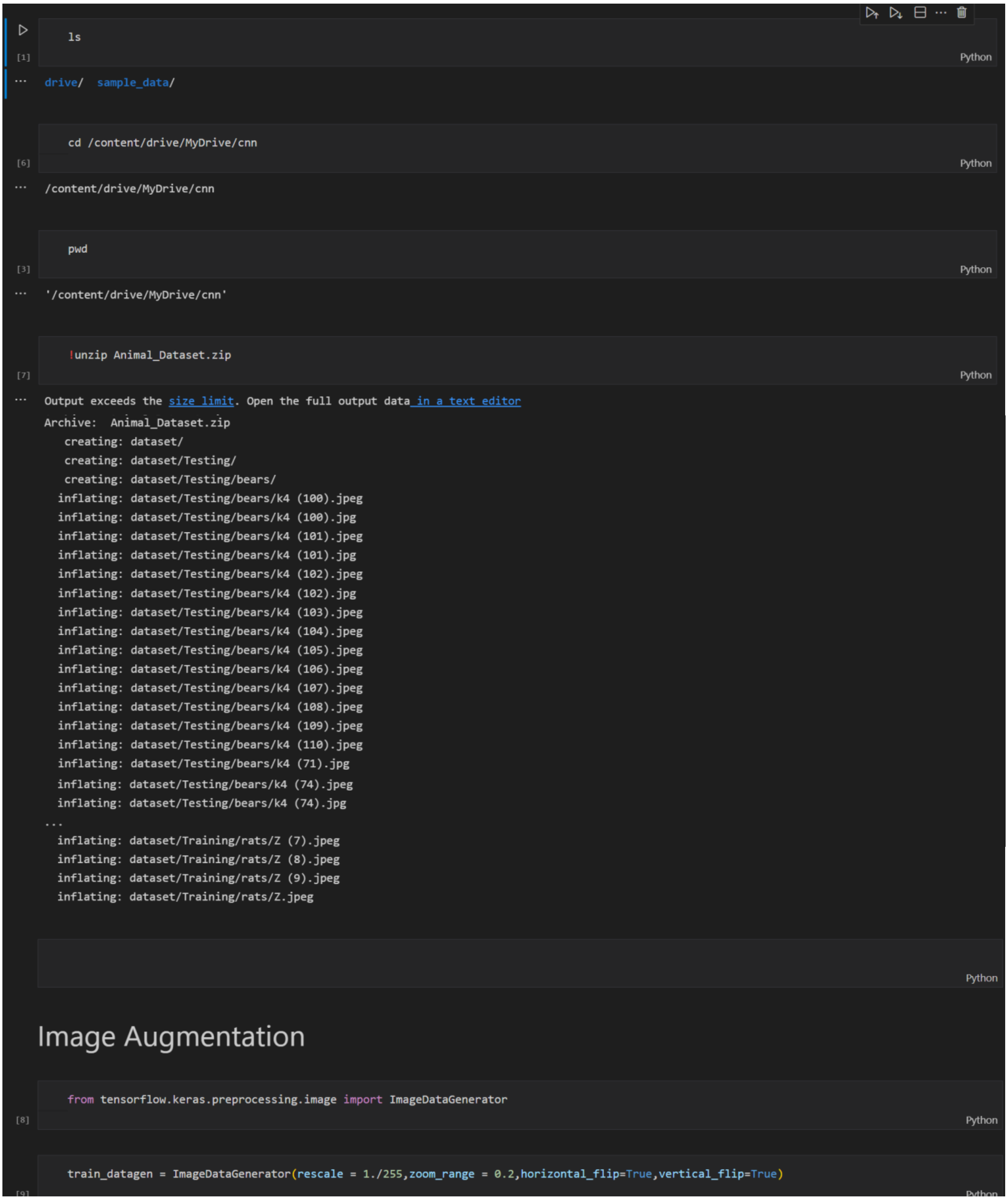
Student Roll Number	210519205016
Maximum Marks	2 Marks



```
[1]
ls
```

```
drive/  sample_data/
```

```
[6]
cd /content/drive/MyDrive/cnn
```

```
/content/drive/MyDrive/cnn
```

```
[3]
pwd
```

```
'/content/drive/MyDrive/cnn'
```

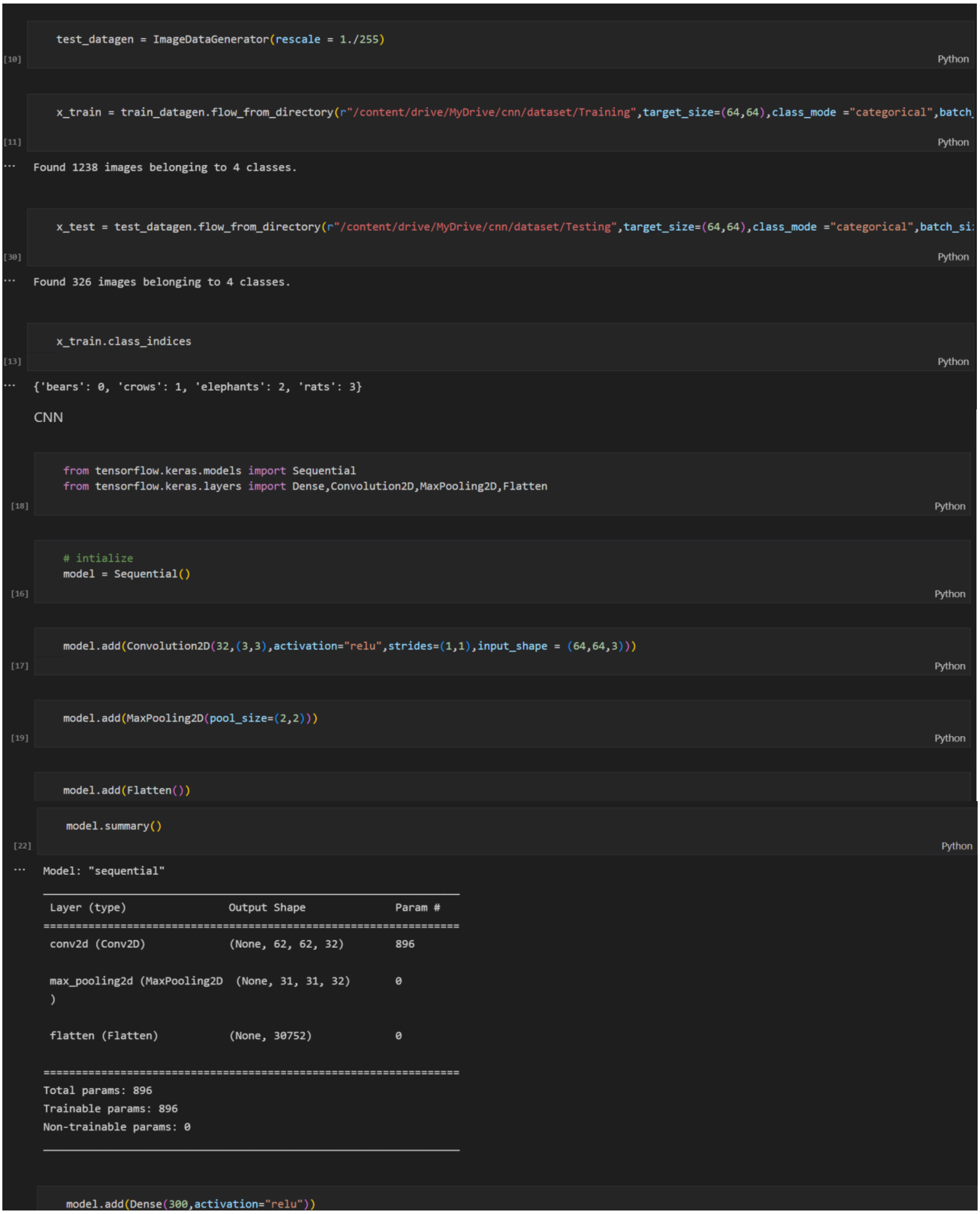
```
[7]
!unzip Animal_Dataset.zip
```

```
Output exceeds the size limit. Open the full output data in a text editor
Archive:  Animal_Dataset.zip
   creating: dataset/
   creating: dataset/Testing/
   creating: dataset/Testing/bears/
  inflating: dataset/Testing/bears/k4 (100).jpeg
  inflating: dataset/Testing/bears/k4 (100).jpg
  inflating: dataset/Testing/bears/k4 (101).jpeg
  inflating: dataset/Testing/bears/k4 (101).jpg
  inflating: dataset/Testing/bears/k4 (102).jpeg
  inflating: dataset/Testing/bears/k4 (102).jpg
  inflating: dataset/Testing/bears/k4 (103).jpeg
  inflating: dataset/Testing/bears/k4 (104).jpeg
  inflating: dataset/Testing/bears/k4 (105).jpeg
  inflating: dataset/Testing/bears/k4 (106).jpeg
  inflating: dataset/Testing/bears/k4 (107).jpeg
  inflating: dataset/Testing/bears/k4 (108).jpeg
  inflating: dataset/Testing/bears/k4 (109).jpeg
  inflating: dataset/Testing/bears/k4 (110).jpeg
  inflating: dataset/Testing/bears/k4 (71).jpg
  inflating: dataset/Testing/bears/k4 (74).jpeg
  inflating: dataset/Testing/bears/k4 (74).jpg
...
  inflating: dataset/Training/rats/Z (7).jpeg
  inflating: dataset/Training/rats/Z (8).jpeg
  inflating: dataset/Training/rats/Z (9).jpeg
  inflating: dataset/Training/rats/Z.jpeg
```

Image Augmentation

```
[8]
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
[9]
train_datagen = ImageDataGenerator(rescale = 1./255,zoom_range = 0.2,horizontal_flip=True,vertical_flip=True)
```



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

```
x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/cnn/dataset/Training",target_size=(64,64),class_mode ="categorical",batch_
```

```
Found 1238 images belonging to 4 classes.
```

```
x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/cnn/dataset/Testing",target_size=(64,64),class_mode ="categorical",batch_si
```

```
Found 326 images belonging to 4 classes.
```

```
x_train.class_indices
```

```
{'bears': 0, 'crows': 1, 'elephants': 2, 'rats': 3}
```

CNN

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

```
# intialize
model = Sequential()
```

```
model.add(Convolution2D(32,(3,3),activation="relu",strides=(1,1),input_shape = (64,64,3)))
```

```
model.add(MaxPooling2D(pool_size=(2,2)))
```

```
model.add(Flatten())
```

```
model.summary()
```

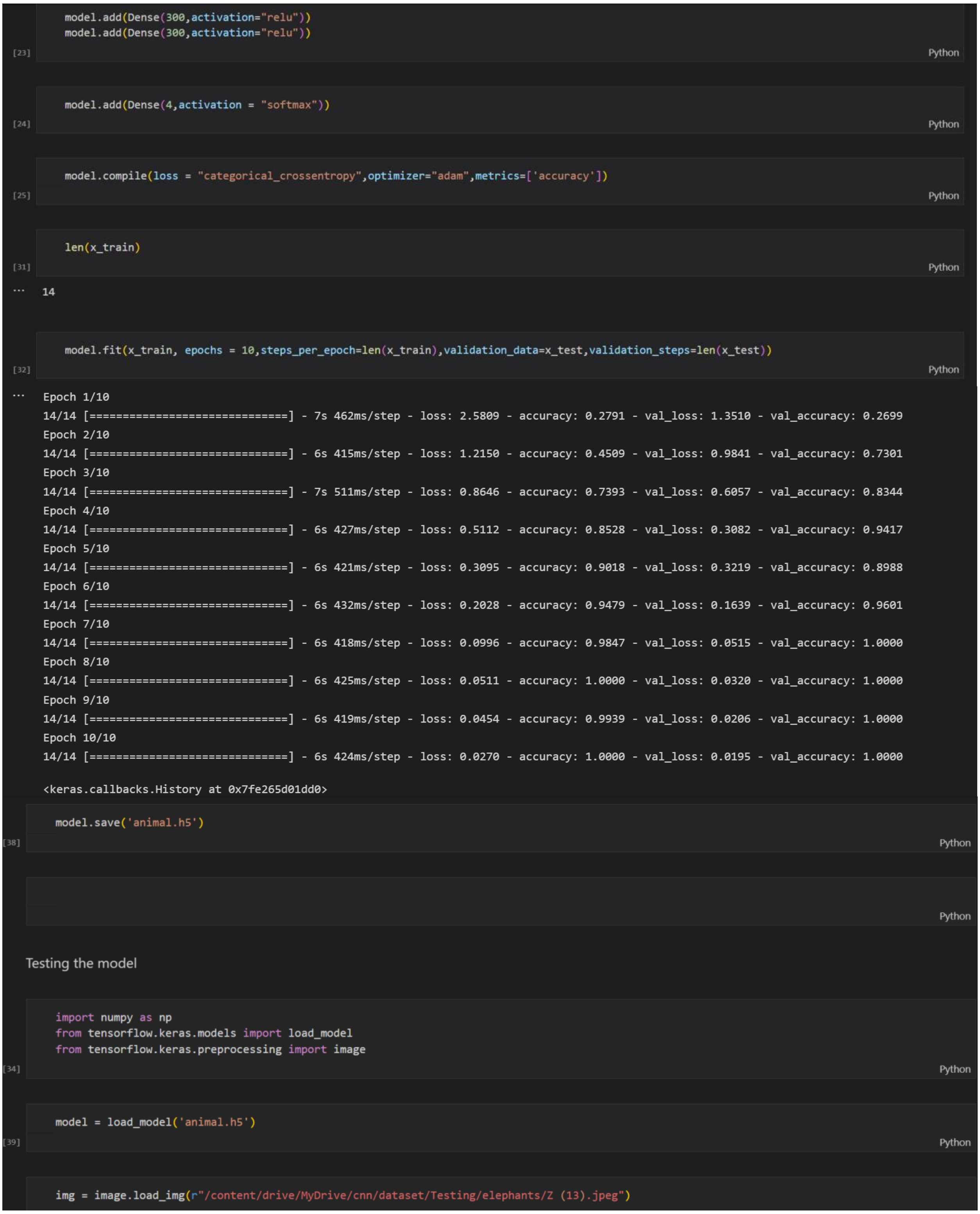
```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 flatten (Flatten)           (None, 30752)             0

=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
_________________________________________________________________
```

```
model.add(Dense(300,activation="relu"))
```



```
model.add(Dense(300,activation="relu"))
model.add(Dense(300,activation="relu"))
```

```
model.add(Dense(4,activation = "softmax"))
```

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

```
len(x_train)
```

```
14
```

```
model.fit(x_train, epochs = 10,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test))
```

```
Epoch 1/10
14/14 [==============================] - 7s 462ms/step - loss: 2.5809 - accuracy: 0.2791 - val_loss: 1.3510 - val_accuracy: 0.2699
Epoch 2/10
14/14 [==============================] - 6s 415ms/step - loss: 1.2150 - accuracy: 0.4509 - val_loss: 0.9841 - val_accuracy: 0.7301
Epoch 3/10
14/14 [==============================] - 7s 511ms/step - loss: 0.8646 - accuracy: 0.7393 - val_loss: 0.6057 - val_accuracy: 0.8344
Epoch 4/10
14/14 [==============================] - 6s 427ms/step - loss: 0.5112 - accuracy: 0.8528 - val_loss: 0.3082 - val_accuracy: 0.9417
Epoch 5/10
14/14 [==============================] - 6s 421ms/step - loss: 0.3095 - accuracy: 0.9018 - val_loss: 0.3219 - val_accuracy: 0.8988
Epoch 6/10
14/14 [==============================] - 6s 432ms/step - loss: 0.2028 - accuracy: 0.9479 - val_loss: 0.1639 - val_accuracy: 0.9601
Epoch 7/10
14/14 [==============================] - 6s 418ms/step - loss: 0.0996 - accuracy: 0.9847 - val_loss: 0.0515 - val_accuracy: 1.0000
Epoch 8/10
14/14 [==============================] - 6s 425ms/step - loss: 0.0511 - accuracy: 1.0000 - val_loss: 0.0320 - val_accuracy: 1.0000
Epoch 9/10
14/14 [==============================] - 6s 419ms/step - loss: 0.0454 - accuracy: 0.9939 - val_loss: 0.0206 - val_accuracy: 1.0000
Epoch 10/10
14/14 [==============================] - 6s 424ms/step - loss: 0.0270 - accuracy: 1.0000 - val_loss: 0.0195 - val_accuracy: 1.0000

<keras.callbacks.History at 0x7fe265d01dd0>
```

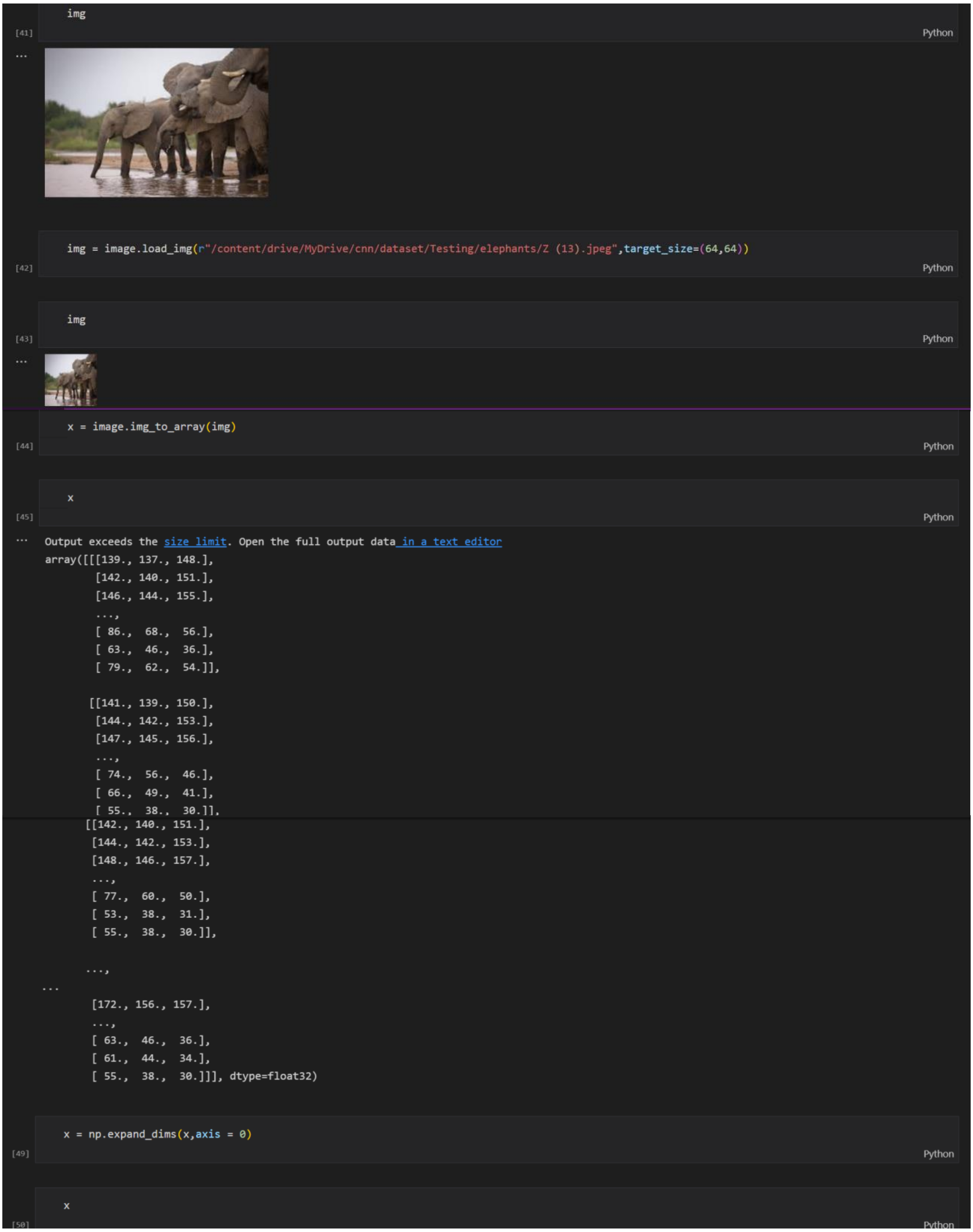
```
model.save('animal.h5')
```

Testing the model

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

```
model = load_model('animal.h5')
```

```
img = image.load_img(r"/content/drive/MyDrive/cnn/dataset/Testing/elephants/Z (13).jpeg")
```



```
img
```

```
img = image.load_img(r"/content/drive/MyDrive/cnn/dataset/Testing/elephants/Z (13).jpeg",target_size=(64,64))
```

```
img
```

```
x = image.img_to_array(img)
```

```
x
```

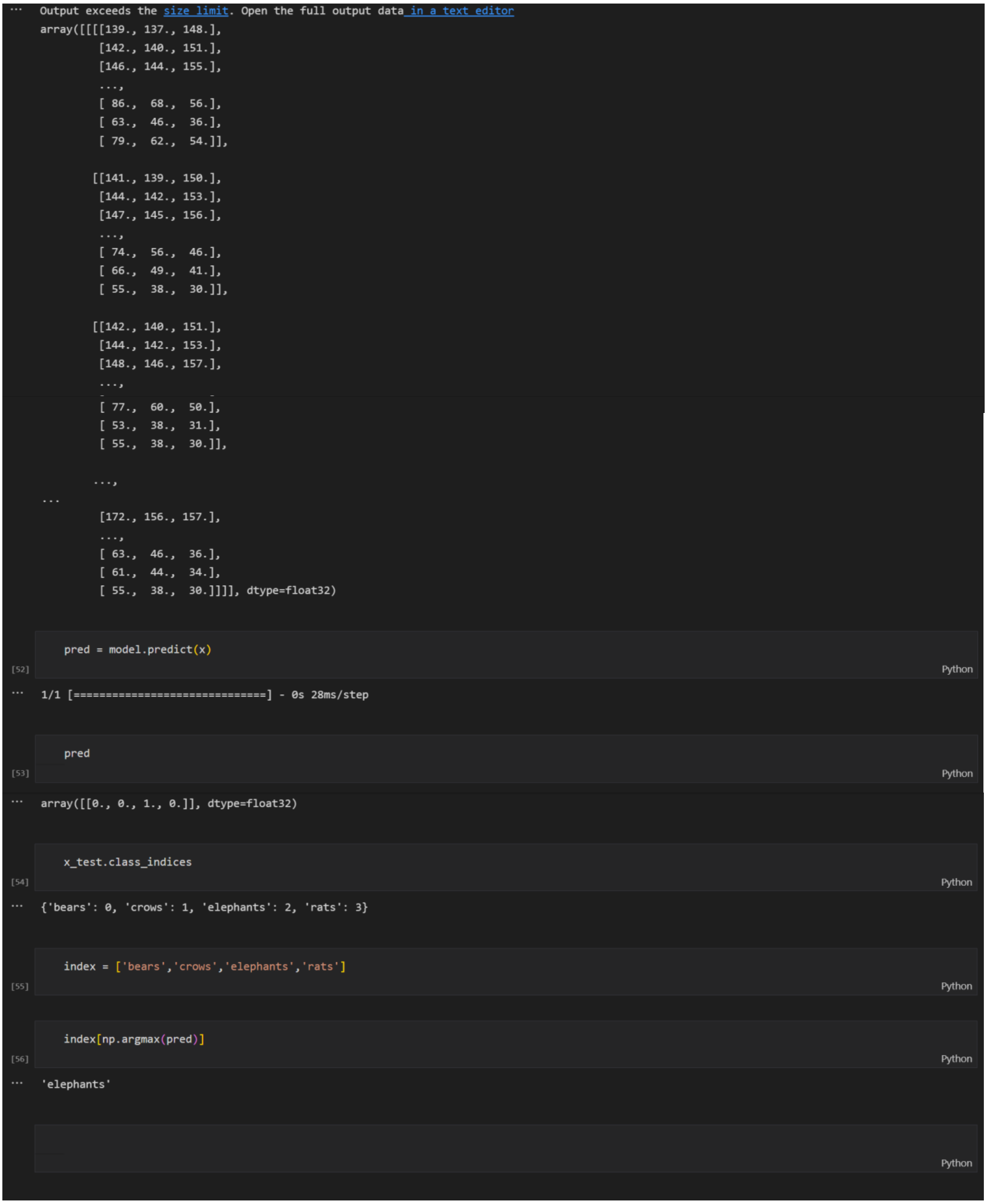
```
Output exceeds the size limit. Open the full output data in a text editor
array([[[139., 137., 148.],
        [142., 140., 151.],
        [146., 144., 155.],
        ...,
        [ 86.,  68.,  56.],
        [ 63.,  46.,  36.],
        [ 79.,  62.,  54.]],

       [[141., 139., 150.],
        [144., 142., 153.],
        [147., 145., 156.],
        ...,
        [ 74.,  56.,  46.],
        [ 66.,  49.,  41.],
        [ 55.,  38.,  30.]],
       [[142., 140., 151.],
        [144., 142., 153.],
        [148., 146., 157.],
        ...,
        [ 77.,  60.,  50.],
        [ 53.,  38.,  31.],
        [ 55.,  38.,  30.]],

       ...,
...
        [172., 156., 157.],
        ...,
        [ 63.,  46.,  36.],
        [ 61.,  44.,  34.],
        [ 55.,  38.,  30.]]], dtype=float32)
```

```
x = np.expand_dims(x,axis = 0)
```

```
x
```



```
Output exceeds the size limit. Open the full output data in a text editor
array([[[[139., 137., 148.],
         [142., 140., 151.],
         [146., 144., 155.],
         ...,
         [ 86.,  68.,  56.],
         [ 63.,  46.,  36.],
         [ 79.,  62.,  54.]],

        [[141., 139., 150.],
         [144., 142., 153.],
         [147., 145., 156.],
         ...,
         [ 74.,  56.,  46.],
         [ 66.,  49.,  41.],
         [ 55.,  38.,  30.]],

        [[142., 140., 151.],
         [144., 142., 153.],
         [148., 146., 157.],
         ...,
         [ 77.,  60.,  50.],
         [ 53.,  38.,  31.],
         [ 55.,  38.,  30.]],

        ...,
...
         [172., 156., 157.],
         ...,
         [ 63.,  46.,  36.],
         [ 61.,  44.,  34.],
         [ 55.,  38.,  30.]]]], dtype=float32)
```

```
pred = model.predict(x)
```

```
1/1 [==============================] - 0s 28ms/step
```

```
pred
```

```
array([[0., 0., 1., 0.]], dtype=float32)
```

```
x_test.class_indices
```

```
{'bears': 0, 'crows': 1, 'elephants': 2, 'rats': 3}
```

```
index = ['bears','crows','elephants','rats']
```

```
index[np.argmax(pred)]
```

```
'elephants'
```