Assignment -3

Bulid CNN model for Classification of Flower

Assignment Date	6 October 2022
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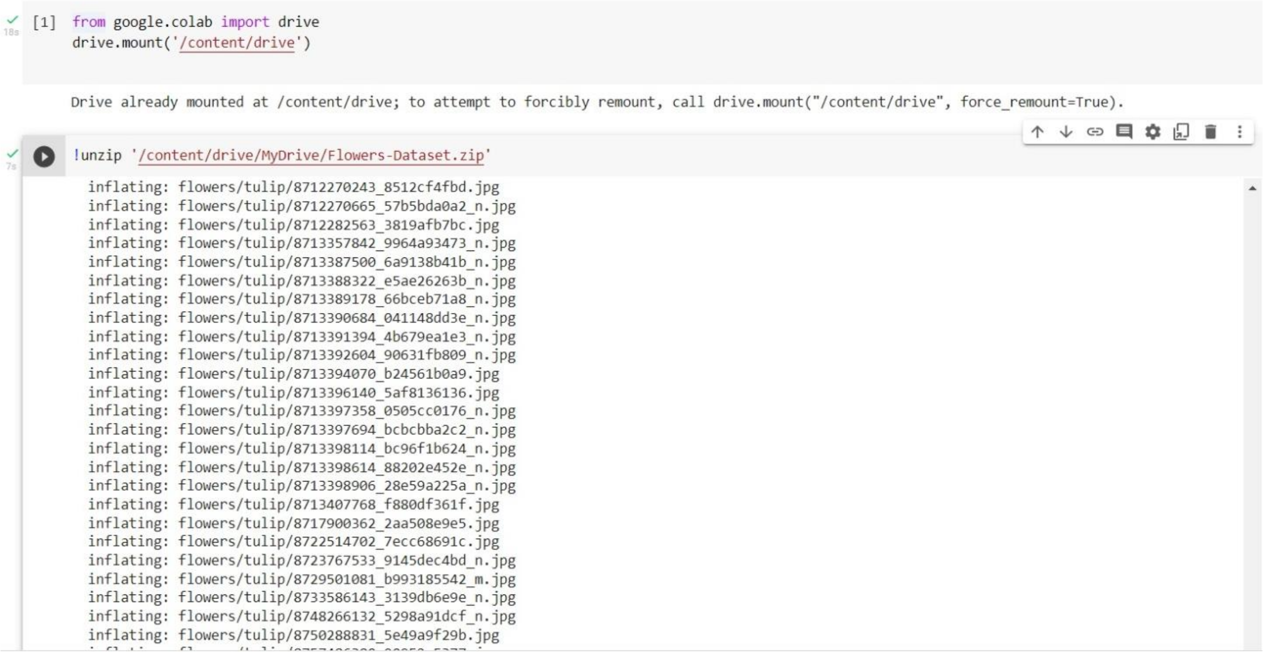
Maximum Marks	2 Marks

Load dataset from drive

Solution:

```
from google.colab import drive
drive.mount('/content/drive')
!unzip '/content/drive/MyDrive/FlowersDataset.zip'
```



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

    Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).

!unzip '/content/drive/MyDrive/Flowers-Dataset.zip'
      inflating: flowers/tulip/8712270243_8512cf4fbd.jpg
      inflating: flowers/tulip/8712270665_57b5bda0a2_n.jpg
      inflating: flowers/tulip/8712282563_3819afb7bc.jpg
      inflating: flowers/tulip/8713357842_9964a93473_n.jpg
      inflating: flowers/tulip/8713387500_6a9138b41b_n.jpg
      inflating: flowers/tulip/8713388322_e5ae26263b_n.jpg
      inflating: flowers/tulip/8713389178_66bceb71a8_n.jpg
      inflating: flowers/tulip/8713390684_041148dd3e_n.jpg
      inflating: flowers/tulip/8713391394_4b679ea1e3_n.jpg
      inflating: flowers/tulip/8713392604_90631fb809_n.jpg
      inflating: flowers/tulip/8713394070_b24561b0a9.jpg
      inflating: flowers/tulip/8713396140_5af8136136.jpg
      inflating: flowers/tulip/8713397358_0505cc0176_n.jpg
      inflating: flowers/tulip/8713397694_bcbcbba2c2_n.jpg
      inflating: flowers/tulip/8713398114_bc96f1b624_n.jpg
      inflating: flowers/tulip/8713398614_88202e452e_n.jpg
      inflating: flowers/tulip/8713398906_28e59a225a_n.jpg
      inflating: flowers/tulip/8713407768_f880df361f.jpg
      inflating: flowers/tulip/8717900362_2aa508e9e5.jpg
      inflating: flowers/tulip/8722514702_7ecc68691c.jpg
      inflating: flowers/tulip/8723767533_9145dec4bd_n.jpg
      inflating: flowers/tulip/8729501081_b993185542_m.jpg
      inflating: flowers/tulip/8733586143_3139db6e9e_n.jpg
      inflating: flowers/tulip/8748266132_5298a91dcf_n.jpg
      inflating: flowers/tulip/8750288831_5e49a9f29b.jpg
```

Question-1:

Image Augmentation

Solution:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_data = ImageDataGenerator(rescale= 1./255,
                                horizontal_flip =True,
                                vertical_flip = True,
                                zoom_range = 0.2)

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

```
Flower_train = train_data.flow_from_directory('/content/flowers',
                                               target_size = (64,64),
                                               class_mode ="categorical",
                                               batch_size = 28)


Flower_test = test_data.flow_from_directory('/content/flowers',
                                             target_size = (64,64),
                                             class_mode = "categorical",
                                             batch_size = 28)
```

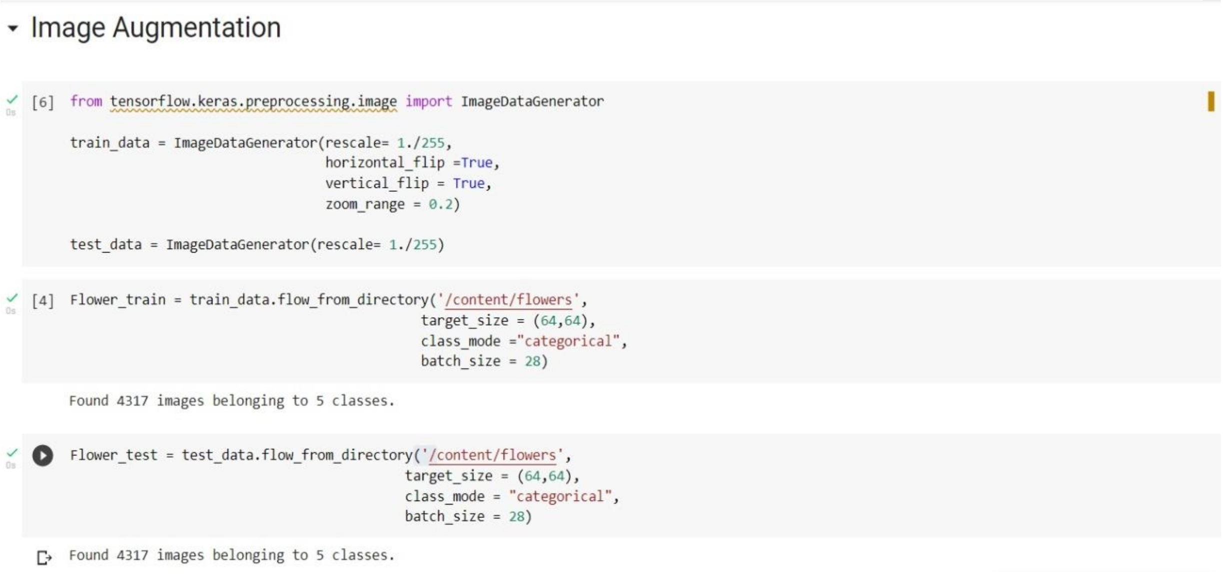


Image Augmentation

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

    train_data = ImageDataGenerator(rescale= 1./255,
                                    horizontal_flip =True,
                                    vertical_flip = True,
                                    zoom_range = 0.2)

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

```
[4] Flower_train = train_data.flow_from_directory('/content/flowers',
                                                  target_size = (64,64),
                                                  class_mode ="categorical",
                                                  batch_size = 28)

    Found 4317 images belonging to 5 classes.
```

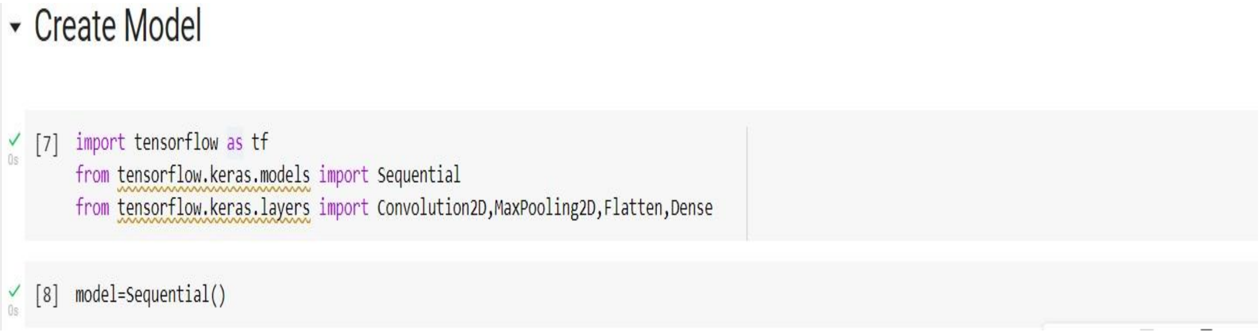
```
    Flower_test = test_data.flow_from_directory('/content/flowers',
                                                target_size = (64,64),
                                                class_mode = "categorical",
                                                batch_size = 28)

    Found 4317 images belonging to 5 classes.
```

Question-2:

Create Model

Solution:

```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense
model=Sequential()
```



Create Model

```
[7] import tensorflow as tf
    from tensorflow.keras.models import Sequential
    from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense
```

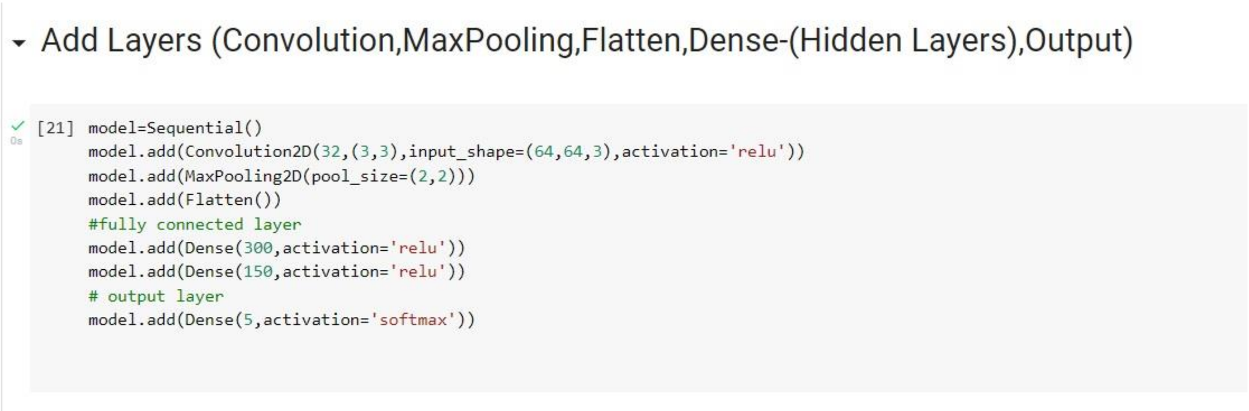
```
[8] model=Sequential()
```

Question-3:

Add Layers (Convolution,MaxPooling,Flatten,Dense-(Hidden Layers),Output)

Solution:

```
model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())

#fully connected layer

model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))

# output layer

model.add(Dense(5,activation='softmax'))
```



Add Layers (Convolution,MaxPooling,Flatten,Dense-(Hidden Layers),Output)

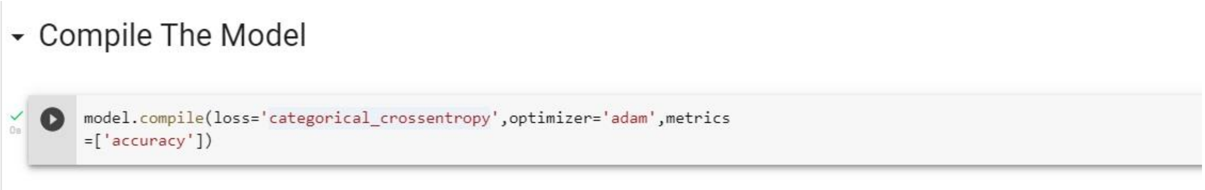
```
[21] model=Sequential()
     model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
     model.add(MaxPooling2D(pool_size=(2,2)))
     model.add(Flatten())
     #fully connected layer
     model.add(Dense(300,activation='relu'))
     model.add(Dense(150,activation='relu'))
     # output layer
     model.add(Dense(5,activation='softmax'))
```

Question-4:

Compile The Model

Solution:

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



Compile The Model

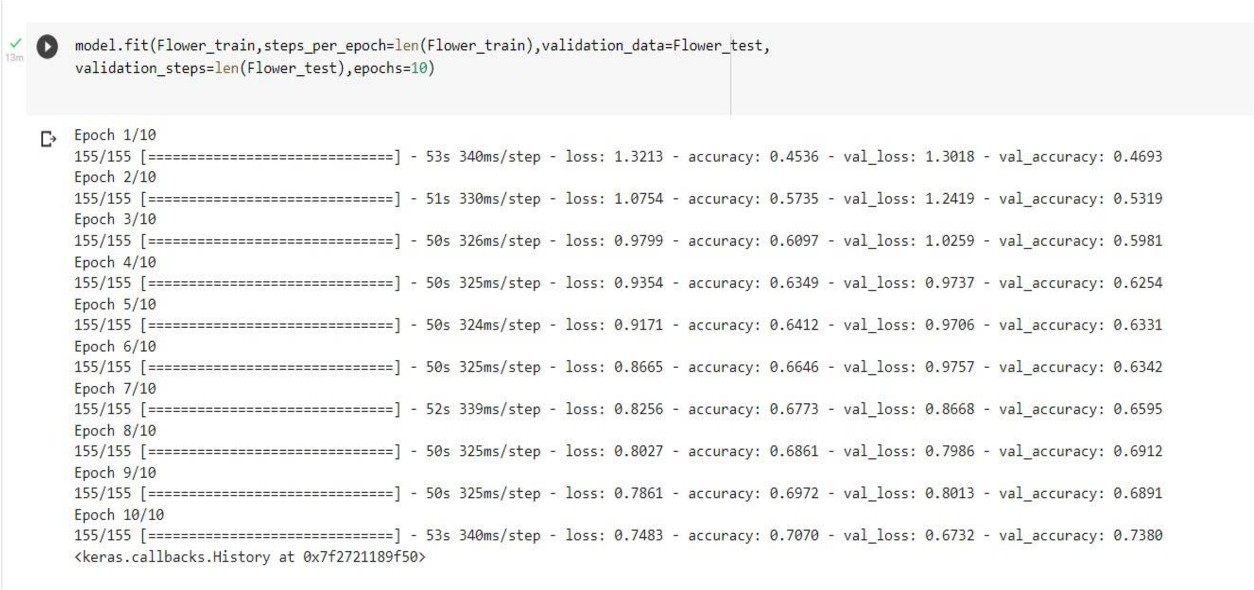
```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics
=['accuracy'])
```

Question-5:

Fit The Model

Solution:

model.fit(Flower_train,steps_per_epoch=len(Flower_train),validation_data=Flower_test,validation_steps=len(Flower_test),epochs=10)



```
model.fit(Flower_train,steps_per_epoch=len(Flower_train),validation_data=Flower_test,
validation_steps=len(Flower_test),epochs=10)
```

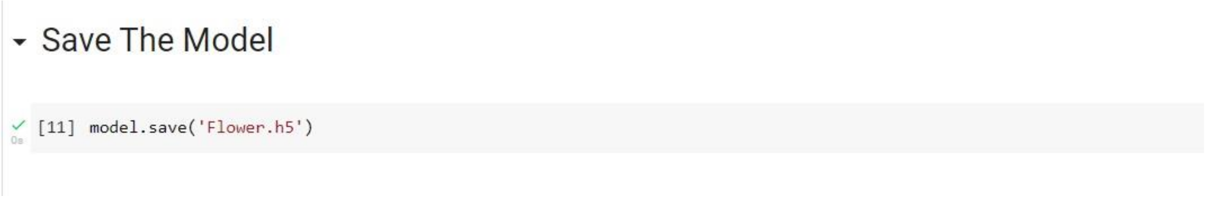
```
Epoch 1/10
155/155 [==============================] - 53s 340ms/step - loss: 1.3213 - accuracy: 0.4536 - val_loss: 1.3018 - val_accuracy: 0.4693
Epoch 2/10
155/155 [==============================] - 51s 330ms/step - loss: 1.0754 - accuracy: 0.5735 - val_loss: 1.2419 - val_accuracy: 0.5319
Epoch 3/10
155/155 [==============================] - 50s 326ms/step - loss: 0.9799 - accuracy: 0.6097 - val_loss: 1.0259 - val_accuracy: 0.5981
Epoch 4/10
155/155 [==============================] - 50s 325ms/step - loss: 0.9354 - accuracy: 0.6349 - val_loss: 0.9737 - val_accuracy: 0.6254
Epoch 5/10
155/155 [==============================] - 50s 324ms/step - loss: 0.9171 - accuracy: 0.6412 - val_loss: 0.9706 - val_accuracy: 0.6331
Epoch 6/10
155/155 [==============================] - 50s 325ms/step - loss: 0.8665 - accuracy: 0.6646 - val_loss: 0.9757 - val_accuracy: 0.6342
Epoch 7/10
155/155 [==============================] - 52s 339ms/step - loss: 0.8256 - accuracy: 0.6773 - val_loss: 0.8668 - val_accuracy: 0.6595
Epoch 8/10
155/155 [==============================] - 50s 325ms/step - loss: 0.8027 - accuracy: 0.6861 - val_loss: 0.7986 - val_accuracy: 0.6912
Epoch 9/10
155/155 [==============================] - 50s 325ms/step - loss: 0.7861 - accuracy: 0.6972 - val_loss: 0.8013 - val_accuracy: 0.6891
Epoch 10/10
155/155 [==============================] - 53s 340ms/step - loss: 0.7483 - accuracy: 0.7070 - val_loss: 0.6732 - val_accuracy: 0.7380
<keras.callbacks.History at 0x7f2721189f50>
```

Question-6:

Save The Model

Solution:

model.save('Flower.h5')



Save The Model

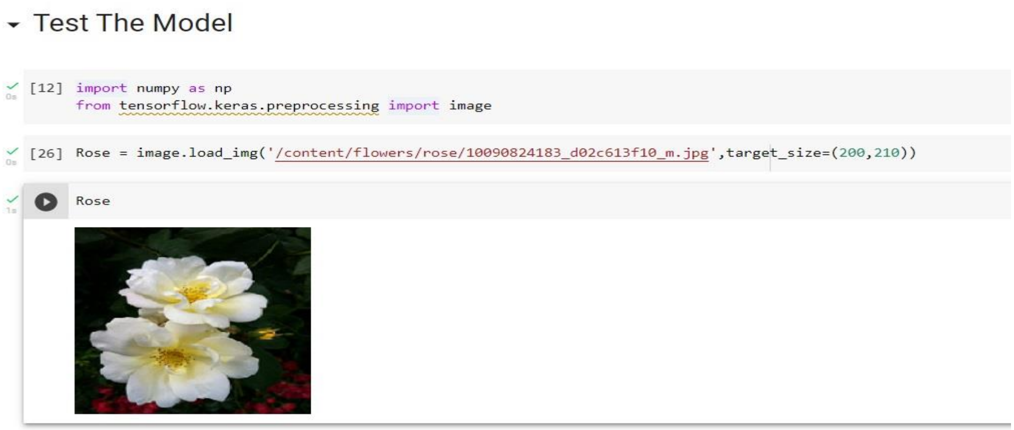
```
[11] model.save('Flower.h5')
```

Question-7:

Test The Model

Solution:

```
import numpy as np
from tensorflow.keras.preprocessing import image
Rose = image.load_img('/content/flowers/rose/10090824183_d02c613f10_m.jpg',
target_size=(200,210))
print(Rose)
```



Test The Model

```
[12] import numpy as np
     from tensorflow.keras.preprocessing import image
```

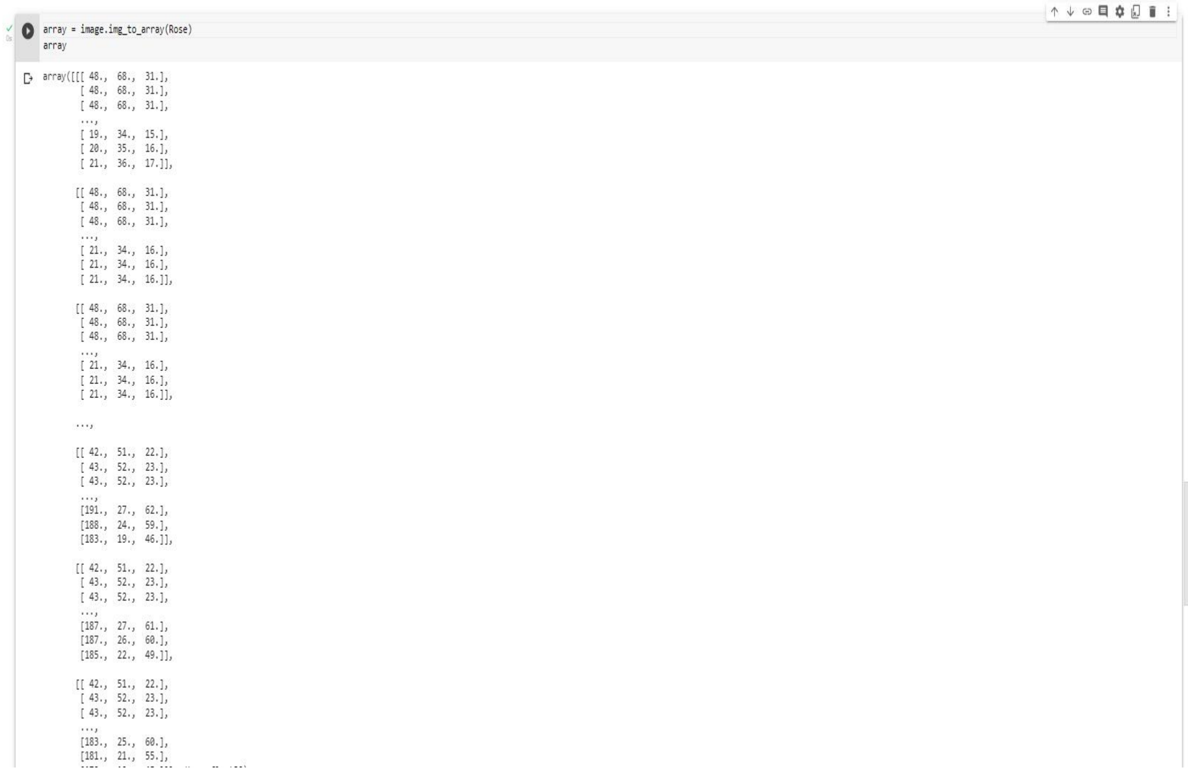
```
[26] Rose = image.load_img('/content/flowers/rose/10090824183_d02c613f10_m.jpg',target_size=(200,210))
```

```
Rose
```

Solution:

array = image.img_to_array(Rose)

array



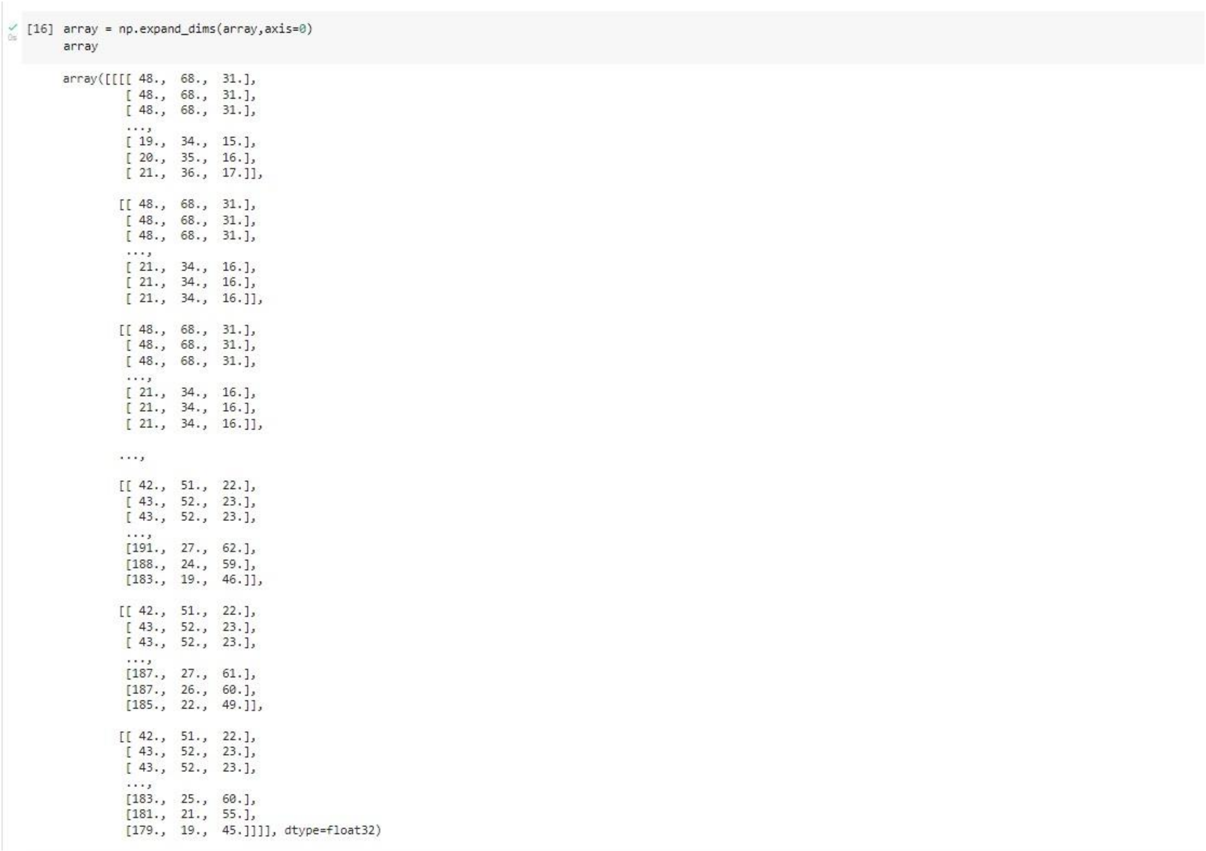
```
array = image.img_to_array(Rose)
array
```

```
array([[[ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        ...,
        [ 19.,  34.,  15.],
        [ 20.,  35.,  16.],
        [ 21.,  36.,  17.]],

       [[ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        ...,
        [ 21.,  34.,  16.],
        [ 21.,  34.,  16.],
        [ 21.,  34.,  16.]],

       [[ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        [ 48.,  68.,  31.],
        ...,
        [ 21.,  34.,  16.],
        [ 21.,  34.,  16.],
        [ 21.,  34.,  16.]],

       ...,

       [[ 42.,  51.,  22.],
        [ 43.,  52.,  23.],
        [ 43.,  52.,  23.],
        ...,
        [191.,  27.,  62.],
        [188.,  24.,  59.],
        [183.,  19.,  46.]],

       [[ 42.,  51.,  22.],
        [ 43.,  52.,  23.],
        [ 43.,  52.,  23.],
        ...,
        [187.,  27.,  61.],
        [187.,  26.,  60.],
        [185.,  22.,  49.]],

       [[ 42.,  51.,  22.],
        [ 43.,  52.,  23.],
        [ 43.,  52.,  23.],
        ...,
        [183.,  25.,  60.],
        [181.,  21.,  55.],
```

Solution:

array = np.expand_dims(array,axis=0)

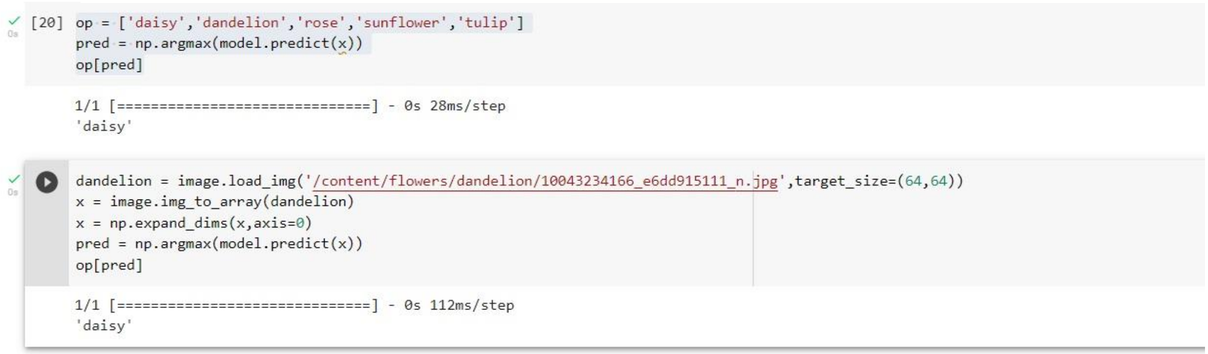
array



```
[16] array = np.expand_dims(array,axis=0)
     array

     array([[[[ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              ...,
              [ 19.,  34.,  15.],
              [ 20.,  35.,  16.],
              [ 21.,  36.,  17.]],

             [[ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              ...,
              [ 21.,  34.,  16.],
              [ 21.,  34.,  16.],
              [ 21.,  34.,  16.]],

             [[ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              [ 48.,  68.,  31.],
              ...,
              [ 21.,  34.,  16.],
              [ 21.,  34.,  16.],
              [ 21.,  34.,  16.]],

             ...,

             [[ 42.,  51.,  22.],
              [ 43.,  52.,  23.],
              [ 43.,  52.,  23.],
              ...,
              [191.,  27.,  62.],
              [188.,  24.,  59.],
              [183.,  19.,  46.]],

             [[ 42.,  51.,  22.],
              [ 43.,  52.,  23.],
              [ 43.,  52.,  23.],
              ...,
              [187.,  27.,  61.],
              [187.,  26.,  60.],
              [185.,  22.,  49.]],

             [[ 42.,  51.,  22.],
              [ 43.,  52.,  23.],
              [ 43.,  52.,  23.],
              ...,
              [183.,  25.,  60.],
              [181.,  21.,  55.],
              [179.,  19.,  45.]]]], dtype=float32)
```

Solution:

```
Flower_train.class_indices

op = ['daisy','dandelion','rose','sunflower','tulip']
pred = np.argmax(model.predict(x))
op[pred]

dandelion = image.load_img('/content/flowers/dandelion/10043234166_e6dd915111_n.jpg',target_size=(64,64))
x = image.img_to_array(dandelion)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op[pred]
```



```
[20] op = ['daisy','dandelion','rose','sunflower','tulip']
     pred = np.argmax(model.predict(x))
     op[pred]

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

```
dandelion = image.load_img('/content/flowers/dandelion/10043234166_e6dd915111_n.jpg',target_size=(64,64))
x = image.img_to_array(dandelion)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op[pred]

1/1 [==============================] - 0s 112ms/step
'daisy'
```