


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

test_datagen = ImageDataGenerator(rescale=1./255)
xtrain = train_datagen.flow_from_directory('/content/flowers',
                                           target_size=(64,64),
                                           class_mode='categorical',
                                           batch_size=100)

xtrain

Found 4317 images belonging to 5 classes.
<keras.preprocessing.image.DirectoryIterator at 0x7f0656af6fd0>
```

Question-3:

CREATE MODEL

Solution

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

Question-4:

ADD LAYERS (CONVOLUTION,MAX POOLING ,FLATTEN, DENSE(HIDDEN LAYERS) ,OUTPUT)

Solution

Flatten layer

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

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

<keras.engine.sequential.Sequential at 0x7f0657db3710>
```

Dense layers

```
model.add(Dense(300,activation='relu')) # Hidden layer
model.add(Dense(150,activation='relu')) # Hidden layer
model.add(Dense(5,activation='softmax')) # Output layer
```

```
[17] model.add(Dense(300,activation='relu')) # Hidden layer
      model.add(Dense(150,activation='relu')) # Hidden layer
      model.add(Dense(5,activation='softmax')) # Output layer

<keras.engine.sequential.Sequential at 0x7f0657db3710>
```

Question-5:

COMPILE THE MODEL

Solution

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

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

Question-6:

FIT THE MODEL

Solution

```
model.fit(xtrain,  
          steps_per_epoch=len(xtrain),  
          epochs=10,  
          )
```

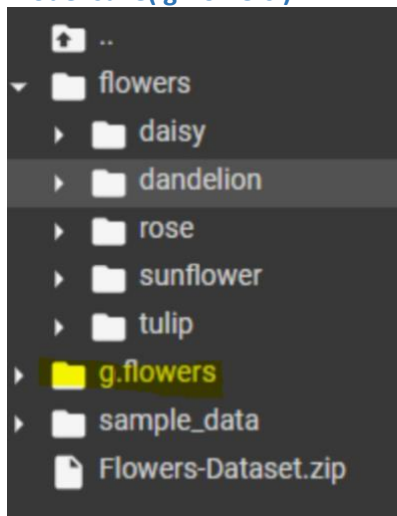
```
model.fit(xtrain,  
          steps_per_epoch=len(xtrain),  
          epochs=10,  
          )  
  
Epoch 1/10  
44/44 [=====] - 22s 292ms/step - loss: 1.6018 - accuracy: 0.2402  
Epoch 2/10  
44/44 [=====] - 13s 303ms/step - loss: 1.6017 - accuracy: 0.2402  
Epoch 3/10  
44/44 [=====] - 13s 301ms/step - loss: 1.5998 - accuracy: 0.2437  
Epoch 4/10  
44/44 [=====] - 13s 300ms/step - loss: 1.5997 - accuracy: 0.2423  
Epoch 5/10  
44/44 [=====] - 13s 304ms/step - loss: 1.6005 - accuracy: 0.2439  
Epoch 6/10  
44/44 [=====] - 13s 301ms/step - loss: 1.5993 - accuracy: 0.2349  
Epoch 7/10  
44/44 [=====] - 13s 302ms/step - loss: 1.6001 - accuracy: 0.2309  
Epoch 8/10  
44/44 [=====] - 13s 303ms/step - loss: 1.5996 - accuracy: 0.2437  
Epoch 9/10  
44/44 [=====] - 13s 298ms/step - loss: 1.5996 - accuracy: 0.2437  
Epoch 10/10  
44/44 [=====] - 13s 301ms/step - loss: 1.5996 - accuracy: 0.2437  
<keras.callbacks.History at 0x7f0640358550>
```

Question-7:

SAVE THE MODEL

Solution

```
model.save('g.flowers')
```



Question-8:

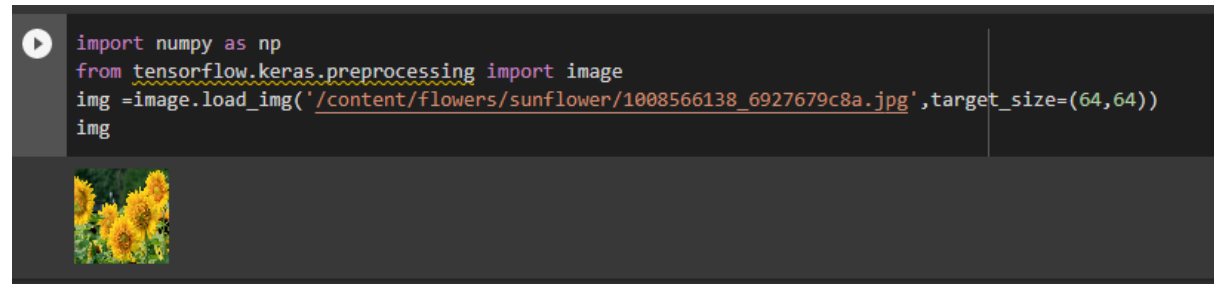
TEST THE MODEL

Solution

```
import numpy as np
```

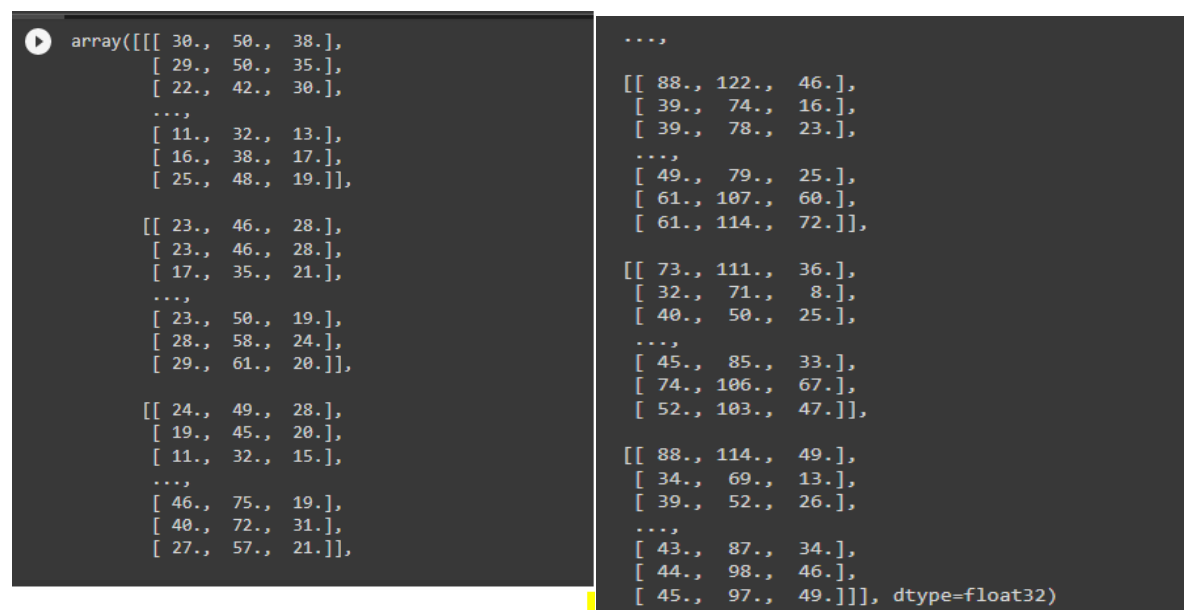
```
from tensorflow.keras.preprocessing import image
```

```
img=image.load_img('/content/flowers/sunflower/1008566138_6927679c8a.jpg',target_size=(64,64))  
img
```



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

X



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

X

```
array([[[[ 30., 50., 38.],
         [ 29., 50., 35.],
         [ 22., 42., 30.],
         ...,
         [ 11., 32., 13.],
         [ 16., 38., 17.],
         [ 25., 48., 19.]],

        [[ 23., 46., 28.],
         [ 23., 46., 28.],
         [ 17., 35., 21.],
         ...,
         [ 23., 50., 19.],
         [ 28., 58., 24.],
         [ 29., 61., 20.]],

        [[ 24., 49., 28.],
         [ 19., 45., 20.],
         [ 11., 32., 15.],
         ...,
         [ 46., 75., 19.],
         [ 40., 72., 31.],
         [ 27., 57., 21.]],

        ...,

        [[ 88., 122., 46.],
         [ 39., 74., 16.],
         [ 39., 78., 23.],
         ...,
         [ 49., 79., 25.],
         [ 61., 107., 60.],
         [ 61., 114., 72.]],

        [[ 73., 111., 36.],
         [ 32., 71., 8.],
         [ 40., 50., 25.],
         ...,
         [ 45., 85., 33.],
         [ 74., 106., 67.],
         [ 52., 103., 47.]],

        [[ 88., 114., 49.],
         [ 34., 69., 13.],
         [ 39., 52., 26.],
         ...,
         [ 43., 87., 34.],
         [ 44., 98., 46.],
         [ 45., 97., 49.]]], dtype=float32)
```

`model.predict(x)`

```
model.predict(x)
array([[0.18503182, 0.2433684 , 0.17955   , 0.16087793, 0.23117186]],
      dtype=float32)
```

`xtrain.class_indices`

```
xtrain.class_indices
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
```

`op = ['daisy','dandelion','rose','sunflower','tulip']`

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

`op[pred]`

```
'dandelion'
```

`img=image.load_img('/content/flowers/sunflower/1022552002_2b93faf9e7_n.jpg',target_size=(500,500))`

`Img`

