

## Assignment -3

Assignment Date	10 October 2022
Student Name	Nivisha R
Student Roll Number	913119104064
Maximum Marks	2 Marks

### WORKSPACE INITIALISATION

```
ls
```

```
Flowers.zip  Untitled0.ipynb
```

```
cd /content/drive/MyDrive/CNN
```

```
/content/drive/MyDrive/CNN
```

```
pwd
```

```
'/content/drive/MyDrive/CNN'
```

### ZIP FILE EXTRACTION

```
!unzip Flowers.zip
```

```
Archive:  Flowers.zip
```

```
inflating: flowers/daisy/100080576_f52e8ee070_n.jpg
inflating: flowers/daisy/10140303196_b88d3d6cec.jpg
inflating: flowers/daisy/10172379554_b296050f82_n.jpg
inflating: flowers/daisy/10172567486_2748826a8b.jpg
inflating: flowers/daisy/10172636503_21bededa75_n.jpg
inflating: flowers/daisy/102841525_bd6628ae3c.jpg
inflating: flowers/daisy/10300722094_28fa978807_n.jpg
inflating: flowers/daisy/1031799732_e7f4008c03.jpg
inflating: flowers/daisy/10391248763_1d16681106_n.jpg
inflating: flowers/daisy/10437754174_22ec990b77_m.jpg
inflating: flowers/daisy/10437770546_8bb6f7bdd3_m.jpg
inflating: flowers/daisy/10437929963_bc13eebe0c.jpg
inflating: flowers/daisy/10466290366_cc72e33532.jpg
inflating: flowers/daisy/10466558316_a7198b87e2.jpg
inflating: flowers/daisy/10555749515_13a12a026e.jpg
inflating: flowers/daisy/10555815624_dc211569b0.jpg
inflating: flowers/daisy/10555826524_423eb8bf71_n.jpg
inflating: flowers/daisy/10559679065_50d2b16f6d.jpg
inflating: flowers/daisy/105806915_a9c13e2106_n.jpg
inflating: flowers/daisy/10712722853_5632165b04.jpg
inflating: flowers/daisy/107592979_aaa9cdfef8_m.jpg
inflating: flowers/daisy/10770585085_4742b9dac3_n.jpg
inflating: flowers/daisy/10841136265_af473efc60.jpg
inflating: flowers/daisy/10993710036_2033222c91.jpg
inflating: flowers/daisy/10993818044_4c19b86c82.jpg
inflating: flowers/daisy/10994032453_ac7f8d9e2e.jpg
inflating: flowers/daisy/11023214096_b5b39fab08.jpg
```

inflating: flowers/daisy/11023277956\_8980d53169\_m.jpg  
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inflating: flowers/daisy/1140299375\_3aa7024466.jpg  
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inflating: flowers/daisy/11870378973\_2ec1919f12.jpg  
inflating: flowers/daisy/11891885265\_ccfec7284\_n.jpg  
inflating: flowers/daisy/12193032636\_b50ae7db35\_n.jpg  
inflating: flowers/daisy/12348343085\_d4c396e5b5\_m.jpg  
inflating: flowers/daisy/12585131704\_0f64b17059\_m.jpg  
inflating: flowers/daisy/12601254324\_3cb62c254a\_m.jpg  
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inflating: flowers/tulip/13472393854\_b2530f7029\_n.jpg  
inflating: flowers/tulip/13509967925\_eaaeeafa396\_m.jpg  
inflating: flowers/tulip/13509973805\_bda5fa8982.jpg  
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inflating: flowers/tulip/13510068773\_c925c5517c.jpg  
inflating: flowers/tulip/13513851673\_9d813dc7b0.jpg  
inflating: flowers/tulip/13514131694\_d91da4f4fc.jpg  
inflating: flowers/tulip/13514136074\_ab1b827e4f.jpg  
inflating: flowers/tulip/13529687904\_3d60abb479\_n.jpg  
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inflating: flowers/tulip/13530786873\_0d34880300\_n.jpg  
inflating: flowers/tulip/13530796853\_e5993f57d6\_n.jpg  
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inflating: flowers/tulip/13561908485\_7e4f8d508b.jpg  
inflating: flowers/tulip/13561912705\_e5eeb41433\_z.jpg  
inflating: flowers/tulip/13562266594\_69b807f90c.jpg

Question 1:

## IMAGE AUGMENTATION

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

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

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

```
pip install split-folders[full]
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting split-folders[full]
  Downloading split-folders-0.5.1-py3-none-any.whl (8.4 kB)
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (from split-folders[full]) (4.64.1)
Installing collected packages: split-folders
Successfully installed split-folders-0.5.1
```

```
import splitfolders
```

```
input_folder = 'flowers/'
```

```
splitfolders.ratio(input_folder, output="flowers2", seed=42, ratio=(.7, .2, .1), group_prefix=None)
```

```
Copying files: 4317 files [00:49, 87.73 files/s]
```

```
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/CNN/flowers2/train", target_size=(64,64), class_mode="categorical", batch_size=24)
```

```
Found 3019 images belonging to 5 classes.
```

```
x_test=train_datagen.flow_from_directory(r"/content/drive/MyDrive/CNN/flowers2/val", target_size=(64,64), class_mode="categorical", batch_size=24)
```

```
Found 860 images belonging to 5 classes.
```

```
x_train.class_indices
```

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

## Question 2:

## CREATE MODEL

```
from tensorflow.keras.models import Sequential
```

```
from tensorflow.keras.layers import Dense, Convolution2D, MaxPool2D, Flatten
```

```
model=Sequential()
```

## Question 3:

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

## Convolution layer

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

## Max Pooling layer

```
model.add(MaxPool2D(pool_size=(2,2)))
```

## Flatten

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

```
model.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d_1 (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		

## Dense (Hidden) layers

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

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

## Output Layer

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

## Question 4,5:

### COMPILE THE MODEL

### FIT THE MODEL

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

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

```
Epoch 1/10
126/126 [=====] - 37s 285ms/step - loss: 1.3769 - accuracy: 0.4342 - val_loss: 1.1170 - val_accuracy: 0.5279
Epoch 2/10
126/126 [=====] - 36s 283ms/step - loss: 1.1045 - accuracy: 0.5446 - val_loss: 1.0759 - val_accuracy: 0.5465
Epoch 3/10
126/126 [=====] - 35s 277ms/step - loss: 1.0413 - accuracy: 0.5840 - val_loss: 1.1999 - val_accuracy: 0.5279
Epoch 4/10
126/126 [=====] - 35s 279ms/step - loss: 0.9741 - accuracy: 0.6260 - val_loss: 0.9568 - val_accuracy: 0.6140
Epoch 5/10
126/126 [=====] - 35s 280ms/step - loss: 0.9277 - accuracy: 0.6346 - val_loss: 0.9806 - val_accuracy: 0.5872
Epoch 6/10
126/126 [=====] - 35s 280ms/step - loss: 0.8803 - accuracy: 0.6568 - val_loss: 0.9918 - val_accuracy: 0.6209
Epoch 7/10
126/126 [=====] - 35s 280ms/step - loss: 0.8460 - accuracy: 0.6727 - val_loss: 0.8860 - val_accuracy: 0.6372
Epoch 8/10
126/126 [=====] - 35s 281ms/step - loss: 0.8211 - accuracy: 0.6837 - val_loss: 0.9205 - val_accuracy: 0.6163
Epoch 9/10
126/126 [=====] - 35s 279ms/step - loss: 0.8057 - accuracy: 0.6913 - val_loss: 0.8887 - val_accuracy: 0.6628
Epoch 10/10
126/126 [=====] - 35s 278ms/step - loss: 0.7575 - accuracy: 0.7079 - val_loss: 0.9187 - val_accuracy: 0.6419
<keras.callbacks.History at 0x7f1437da8a50>
```

## Question 6:

### SAVE THE MODEL

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

## Question 6:

### TEST THE MODEL

```
import numpy as np
```

```
from tensorflow.keras.models import load_model
```

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

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

```
img=image.load_img(r"/content/drive/MyDrive/CNN/flowers2/test/rose/11233672494_d8bf0a3dbf_n.jpg")
```

img



```
img=image.load_img(r"/content/drive/MyDrive/CNN/flowers2/test/rose/11233672494_d8bf0a3dbf_n.jpg",target_size=(64,64))
```

img



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

x

```
array([[ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       ...,
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.]],

       [[ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       ...,
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.]],

       [[ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       ...,
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.],
       [ 0.,  0.,  0.]],

       ...,

       [[ 2.,  1.,  6.],
       [ 83., 83., 81.],
       [ 92., 92., 92.],
       ...])
```



```

[[ 2.,  1.,  6.],
 [ 83., 83., 81.],
 [ 92., 92., 92.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 39., 39., 41.],
 [ 82., 82., 84.],
 [196., 196., 196.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 10.,  9., 15.],
 [ 4.,  4.,  4.],
 [ 4.,  4.,  4.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]]], dtype=float32)

```

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

x

```

array([[[[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

...,

[[ 2.,  1.,  6.],
 [ 83., 83., 81.],
 [ 92., 92., 92.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 39., 39., 41.],
 [ 82., 82., 84.],
 [196., 196., 196.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

[[ 10.,  9., 15.],
 [ 4.,  4.,  4.],
 [ 4.,  4.,  4.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]]], dtype=float32)

```

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

```
pred
```

```
array([[[[ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.]],

        [[ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.]],

        [[ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.]],

        ...,

        [[ 5.,  4., 10.],
          [ 7.,  6., 12.],
          [ 5.,  4.,  9.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.]],

        [[11., 10., 16.],
          [ 8.,  7., 13.],
          [10.,  9., 15.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.]],

        [[ 8.,  7., 13.],
          [ 4.,  3.,  9.],
          [ 7.,  6., 12.],
          ...,
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.],
          [ 0.,  0.,  0.] ]], dtype=float32)
```

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

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

```
'rose'
```