

### Assignment -3

Problem Statement :- Build CNN Model for Classification Of Flowers

Assignment Date	7 OCTOBER 2022
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Student Roll Number	912619104007
Maximum Marks	2 Marks

#### Question-1:

Download the Dataset : Dataset

#### Solution:

```
Files
[x] drive
    sample_data
    Flowers-Dataset.zip

+ Code + Text
[1] from google.colab import drive
    drive.mount("/content/drive")
Mounted at /content/drive

[2] from zipfile import ZipFile

[ ] !unzip Animal_Dataset.zip
unzip: cannot find or open Animal_Dataset.zip, Animal_Dataset.zip.zip or Animal_Dataset.zip.ZIP.

[25] with ZipFile('drive/MyDrive/dataset/Flowers-Dataset.zip','r') as zipObj:
    zipObj.extractall('drive/MyDrive/Flower1')

Data Augmentation

+ Code + Text
frompath='/content/drive/Flower1/flowers/rose'
topath='/content/drive/Flower1'
folder='rose'
topath=topath+'/'+folder+'/'

[6] images=glob(frompath+'/*')
    c=0
    for path in images:
        img=Image.open(path)
        img=img.resize((224,224))
        img.save(topath+str(c)+'.jpg')
        c+=1
        mirroring=img.transpose(Image.FLIP_LEFT_RIGHT)
        mirroring.save(topath+str(c)+'.jpg')
        c+=1
        rotating=img.rotate(90,Image.NEAREST,expand = 1)
        rotating.save(topath+str(c)+'.jpg')
        c+=1
        mirroring=rotating.transpose(Image.FLIP_LEFT_RIGHT)
        mirroring.save(topath+str(c)+'.jpg')
        c+=1
```

#### Question-2:

Image Augmentation

## Solution:

### Image Augmentation

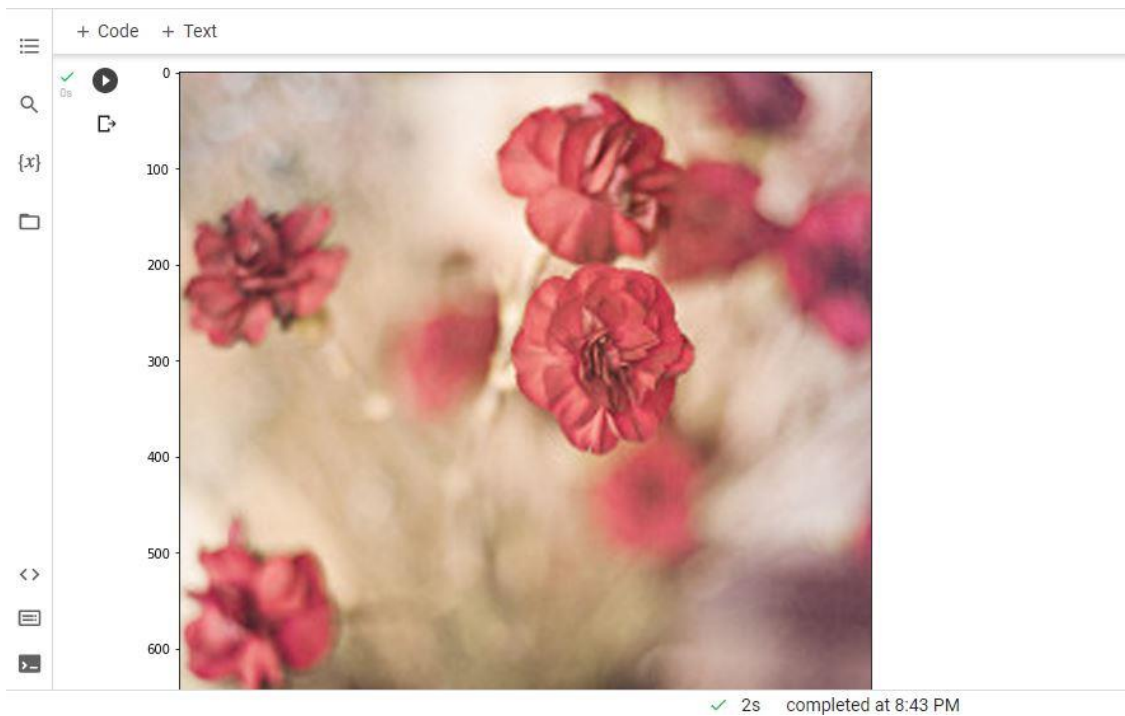
```
✓ [7] import cv2
```

```
✓ [8] import matplotlib.pyplot as plt  
import numpy as np
```

```
✓ [9] %matplotlib inline
```

```
✓ [51] image = cv2.imread('/content/drive/MyDrive/Flower1/flowers/rose/5234278003_d827fcd73b_m.jpg')  
height,width = image.shape[:2]  
resized_image=cv2.resize(image, (3*width,3*height),interpolation=cv2.INTER_CUBIC)
```

```
✓ [52] fig= plt.gcf()  
  
fig.set_size_inches(18,10)  
#fig.axis("off")  
plt.imshow(cv2.cvtColor(resized_image, cv2.COLOR_BGR2RGB))  
plt.show()
```



```

[12] #pip install Augmentor
[13] pip install imgaug
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: imgaug in /usr/local/lib/python3.7/dist-packages (0.4.0)
Requirement already satisfied: Pillow in /usr/local/lib/python3.7/dist-packages (from imgaug) (7.1.2)
Requirement already satisfied: Shapely in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.8.4)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.15.0)
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (from imgaug) (4.6.0.66)
Requirement already satisfied: numpy>=1.15 in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.21.6)
Requirement already satisfied: scipy in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.7.3)
Requirement already satisfied: scikit-image>=0.14.2 in /usr/local/lib/python3.7/dist-packages (from imgaug) (0.18.3)
Requirement already satisfied: imageio in /usr/local/lib/python3.7/dist-packages (from imgaug) (2.9.0)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (from imgaug) (3.2.2)
Requirement already satisfied: PyWavelets>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (1.3.0)
Requirement already satisfied: tifffile>=2019.7.26 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (2021.11.2)
Requirement already satisfied: networkx>=2.0 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (2.6.3)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (1.4.4)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (3.0.8)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (0.11.0)
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (2.8.2)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packages (from kiwisolver>=1.0.1->matplotlib->imgaug) (4.1.1)

[14] pip install ipyplot
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting ipyplot
  Downloading ipyplot-1.1.1-py3-none-any.whl (13 kB)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from ipyplot) (1.21.6)
Collecting shortuuid
  Downloading shortuuid-1.0.9-py3-none-any.whl (9.4 kB)
Requirement already satisfied: IPython in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.9.0)
Requirement already satisfied: pillow in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.1.2)
Requirement already satisfied: traitlets>=4.2 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (5.1.1)
Requirement already satisfied: pygments in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.6.1)
Requirement already satisfied: setuptools>=18.5 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (57.4.0)
Requirement already satisfied: decorator in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.4.2)
Requirement already satisfied: backcall in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.2.0)
Requirement already satisfied: pexpect in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.8.0)
Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.7.5)
Collecting jedi>=0.10
  Downloading jedi-0.18.1-py2.py3-none-any.whl (1.6 MB)
    | 1.6 MB 14.3 MB/s
Requirement already satisfied: prompt-toolkit<2.1.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.0.10)
Requirement already satisfied: parso<0.9.0,>=0.8.0 in /usr/local/lib/python3.7/dist-packages (from jedi>=0.10->IPython->ipyplot) (0.8.3)
Requirement already satisfied: six>=1.9.0 in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot) (1.15.0)
Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot) (0.2.0)
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packages (from pexpect->IPython->ipyplot) (0.7.0)
Installing collected packages: jedi, shortuuid, ipyplot
Successfully installed ipyplot-1.1.1 jedi-0.18.1 shortuuid-1.0.9

```

### Question-3:

### Create Model

### Solution:

```

Create Model

[15] import imageio
import ipyplot
import imgaug as ia
import imgaug.augmenters as iaa

WARNING! Google Colab Environment detected!
You might encounter issues while running in Google Colab environment.
If images are not displaying properly please try setting `force_b64` param to `True`.

[53] input_img = imageio.imread('/content/drive/MyDrive/Flower1/flowers/rose/102501987_3cdb8e5394_n.jpg')

[54] hflip= iaa.Fliplr(p=1.0)
input_hf= hflip.augment_image(input_img)

[55] vflip= iaa.Flipud(p=1.0)
input_vf= vflip.augment_image(input_img)

```

```

3s ✓ [55] images_list=[input_img, input_hr, input_vr]
      labels = ['Original', 'Horizontally flipped', 'Vertically flipped']
      ipyplot.plot_images(images_list, labels=labels, img_width=180)

```

[show html](#)

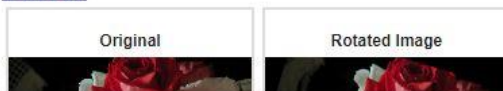


```

2s ✓ [56] rot1 = iaa.Affine(rotate=(-30,30))
      input_rot1 = rot1.augment_image(input_img)
      images_list=[input_img, input_rot1]
      labels = ['Original', 'Rotated Image']
      ipyplot.plot_images(images_list, labels=labels, img_width=180)

```

[show html](#)



```

2s ✓ [57] crop1 = iaa.Crop(percent=(0, 0.3))
      input_crop1 = crop1.augment_image(input_img)
      images_list=[input_img, input_crop1]
      labels = ['Original', 'Cropped Image']
      ipyplot.plot_images(images_list, labels=labels, img_width=180)

```

[show html](#)





```

0s ✓ [58] noise=iaa.AdditiveGaussianNoise(10,40)
      input_noise=noise.augment_image(input_img)
      images_list=[input_img, input_noise]
      labels = ['Original', 'Gaussian Noise Image']
      ipyplot.plot_images(images_list, labels=labels, img_width=180)

```



0s [show html](#)






```

[59] shear = iaa.Affine(shear=(-40,40))
input_shear=shear.augment_image(input_img)
images_list=[input_img, input_shear]
labels = ['Original', 'Image Shearing']
ipyplot.plot_images(images_list,labels=labels,img_width=180)

```

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```

[60] contrast=iaa.GammaContrast((0.5, 2.0))
contrast_sig = iaa.SigmoidContrast(gain=(5, 10), cutoff=(0.4, 0.6))
contrast_lin = iaa.LinearContrast((0.6, 0.4))
input_contrast = contrast.augment_image(input_img)
sigmoid_contrast = contrast_sig.augment_image(input_img)
linear_contrast = contrast_lin.augment_image(input_img)
images_list=[input_img, input_contrast,sigmoid_contrast,linear_contrast]
labels = ['Original', 'Gamma Contrast','SigmoidContrast','LinearContrast']
ipyplot.plot_images(images_list,labels=labels,img_width=180)

```

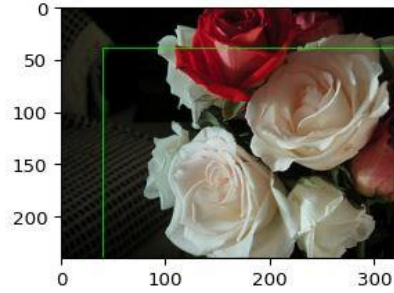
[show html](#)

```

[61] from imgaug.augmentables.bbs import BoundingBox, BoundingBoxesOnImage
bbs = BoundingBoxesOnImage([
    BoundingBox(x1=40, x2=550, y1=40, y2=780)
], shape=input_img.shape)
ia.imshow(bbs.draw_on_image(input_img))

```



Question-4:

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

### Solution:

```
Add layers(Convolution,Maxpooling,Flatten,Dense-(hidden layer),output)

[62] from tensorflow.keras.datasets import mnist
     from tensorflow.keras.models import Sequential
     from tensorflow.keras.layers import Conv2D
     from tensorflow.keras.layers import MaxPool2D
     from tensorflow.keras.layers import Flatten
     from tensorflow.keras.layers import Dropout
     from tensorflow.keras.layers import Dense

[38] (X_train,y_train) , (X_test,y_test)=mnist.load_data()

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11493376/11490434 [=====] - 0s 0us/step
11501568/11490434 [=====] - 0s 0us/step

[39] X_train = X_train.reshape((X_train.shape[0], X_train.shape[1], X_train.shape[2], 1))
     X_test = X_test.reshape((X_test.shape[0],X_test.shape[1],X_test.shape[2],1))

[40] print(X_train.shape)
     print(X_test.shape)

(60000, 28, 28, 1)
(10000, 28, 28, 1)

[41] print(X_train.shape)
     print(X_test.shape)

(60000, 28, 28, 1)
(10000, 28, 28, 1)

[41] X_train=X_train/255
     X_test=X_test/255

[42] model=Sequential()

[43] model.add(Conv2D(32,(3,3),activation='relu',input_shape=(28,28,1)))

[44] model.add(MaxPool2D(2,2))

[45] model.add(Flatten())
     model.add(Dense(100,activation='relu'))

[46] model.add(Dense(10,activation='softmax'))
```

### Question-5:

#### Compile The Model

### Solution:

```
Compile The Model

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

### Question-6:

## Fit The Model

### Solution:

```
Fit The Model

+ Code + Text

[48] model.fit(X_train,y_train,epochs=10)

Epoch 1/10
1875/1875 [=====] - 36s 19ms/step - loss: 0.1610 - accuracy: 0.9523
Epoch 2/10
1875/1875 [=====] - 35s 19ms/step - loss: 0.0557 - accuracy: 0.9826
Epoch 3/10
1875/1875 [=====] - 35s 19ms/step - loss: 0.0381 - accuracy: 0.9877
Epoch 4/10
1875/1875 [=====] - 35s 19ms/step - loss: 0.0264 - accuracy: 0.9915
Epoch 5/10
1875/1875 [=====] - 38s 20ms/step - loss: 0.0181 - accuracy: 0.9939
Epoch 6/10
1875/1875 [=====] - 36s 19ms/step - loss: 0.0131 - accuracy: 0.9956
Epoch 7/10
1875/1875 [=====] - 34s 18ms/step - loss: 0.0096 - accuracy: 0.9968
Epoch 8/10
1875/1875 [=====] - 34s 18ms/step - loss: 0.0081 - accuracy: 0.9973
Epoch 9/10
1875/1875 [=====] - 34s 18ms/step - loss: 0.0054 - accuracy: 0.9982
Epoch 10/10
1875/1875 [=====] - 34s 18ms/step - loss: 0.0063 - accuracy: 0.9980
<keras.callbacks.History at 0x7f376ba058d0>
```

## Question-7:

### Save The Model

- Test The Model

### Solution:

```
Save The Model Test The Model

[63] model.evaluate(X_test,y_test)

313/313 [=====] - 2s 6ms/step - loss: 0.0648 - accuracy: 0.9841
[0.06480585038661957, 0.9840999841690063]
```