

Assignment -3

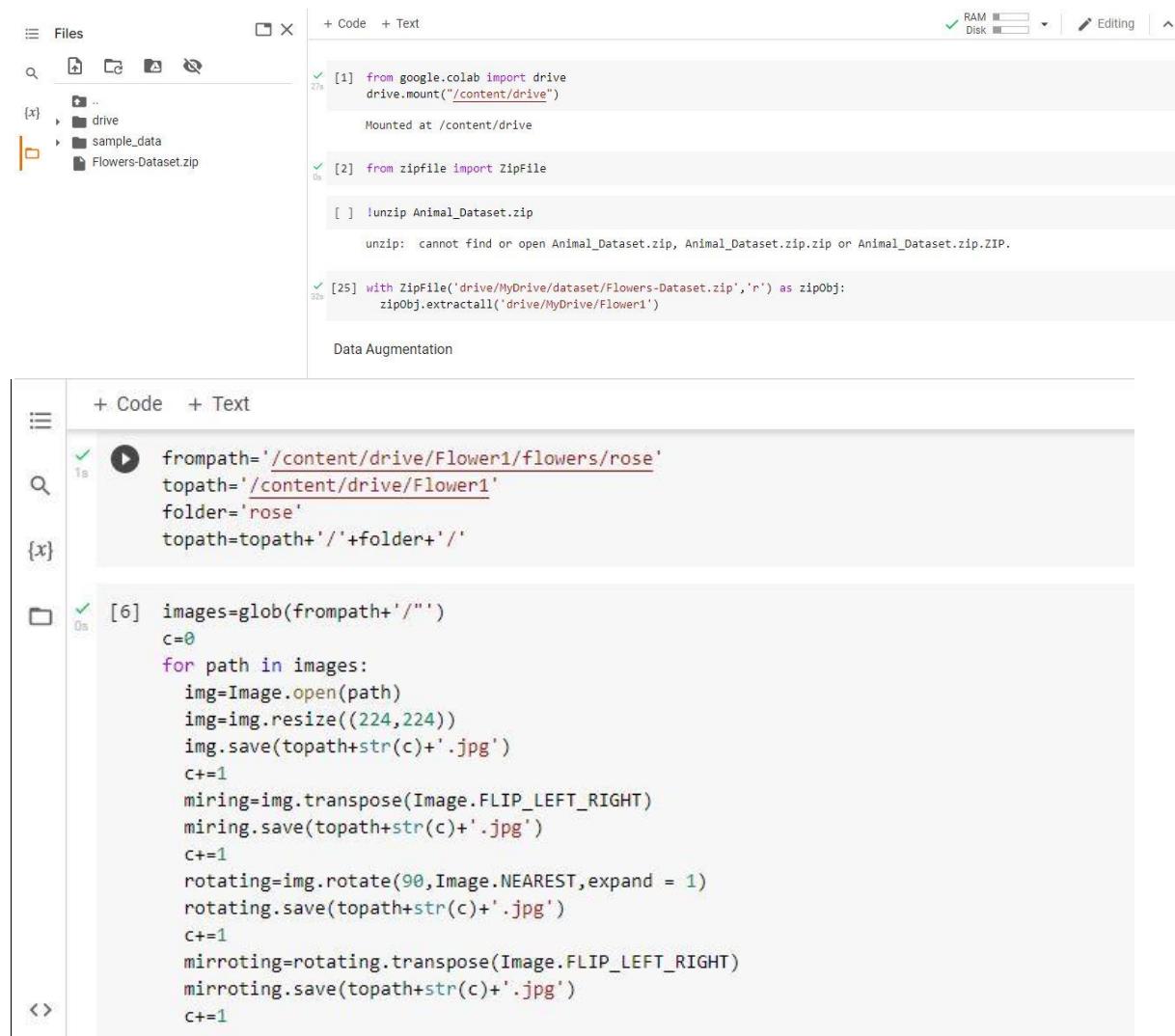
Problem Statement :- Build CNN Model for Classification Of Flowers

Assignment Date	7 OCTOBER 2022
Student Name	M.Annapoorani
Student Roll Number	912619104001
Maximum Marks	2 Marks

Question-1:

Download the Dataset : Dataset

Solution:



The screenshot shows two panels of a Google Colab notebook. The top panel displays a code cell with the following content:

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

[2] from zipfile import ZipFile
[ ] !unzip Flowers-Dataset.zip
unzip: cannot find or open Flowers-Dataset.zip, Flowers-Dataset.zip.zip or Flowers-Dataset.ZIP.

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

Data Augmentation
```

The bottom panel shows another code cell with the following content:

```
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
    mirring=img.transpose(Image.FLIP_LEFT_RIGHT)
    mirring.save(topath+str(c)+'.jpg')
    c+=1
    rotating=img.rotate(90,Image.NEAREST,expand = 1)
    rotating.save(topath+str(c)+'.jpg')
    c+=1
    mirrotting=rotating.transpose(Image.FLIP_LEFT_RIGHT)
    mirrotting.save(topath+str(c)+'.jpg')
    c+=1
```

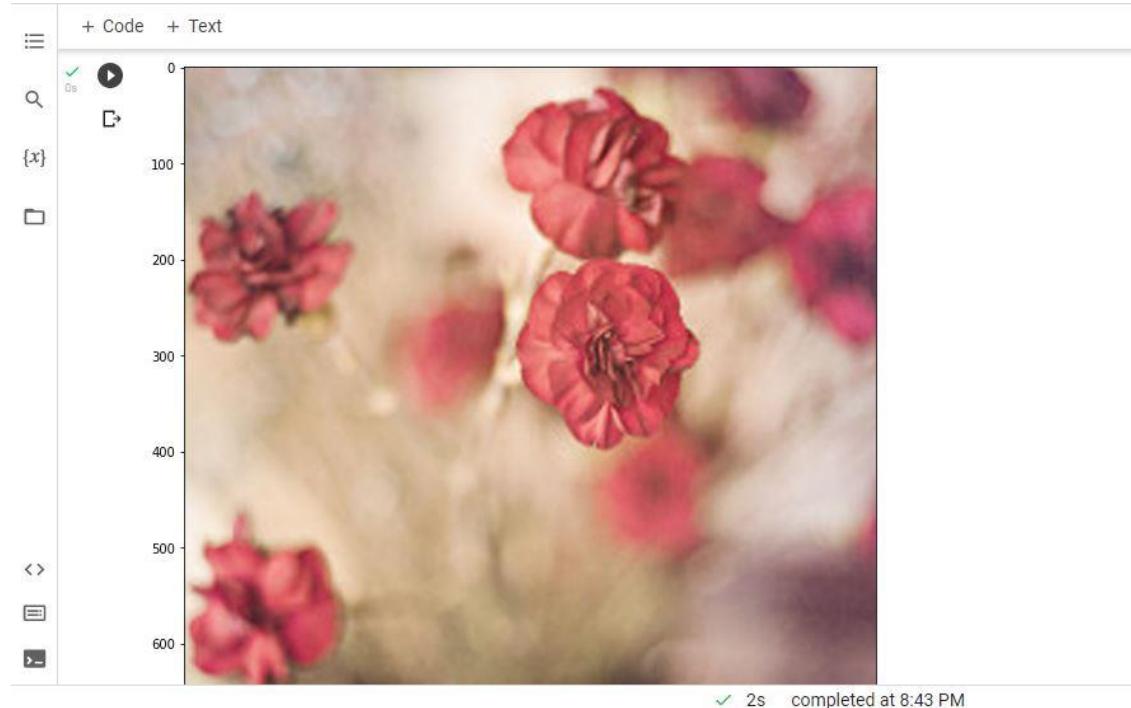
Question-2:

Image Augmentation

Solution:

Image Augmentation

```
✓ [7] import cv2  
Ds  
✓ [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()  
Ds  
      fig.set_size_inches(18,10)  
      #fig.axis("off")  
      plt.imshow(cv2.cvtColor(resized_image, cv2.COLOR_BGR2RGB))  
      plt.show()
```



```

✓ [12] #pip install Augmentor
0s

✓ [13] pip install imgaug
4s
  □ 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: Requirements 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) (3.0.1)
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
5s
  □ 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)
  □ Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot) (0.1)
  □ 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)

```

```
✓  [55] images_list=[input_img, input_nr, input_vt]
      labels = ['Original', 'Horizontally flipped', 'Vertically flipped']
      ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

⌚ show html



```
✓  [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



```
✓  [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



```
✓  [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)
```



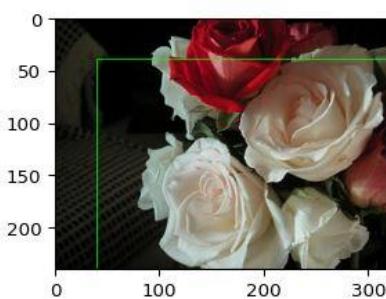
```
✓ [59] shear = iaa.Affine(shear=(-40,40))
input_shear=shear.augment_image(input_img)
images_list=[input_img, input_shear]
labels = ['Original', 'Image Shearing']
ipyplot.plot_images(images_list,labels=img_width=180)
```



```
✓ [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=img_width=180)
```



```
✓ [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] 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

```
[47] 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]
```