

Assignment -3

Build cnn model for classification of flowers

Assignment Date	12 November 2022
Student Name	Mr.S.Joshua
Student Roll Number	E1194020
Maximum Marks	2 Marks

```

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).

[38] from zipfile import ZipFile

[39] with ZipFile('/content/drive/MyDrive/Flowers-Dataset.zip','r') as zipObj:
    zipObj.extractall('/drive/MyDrive/Flower')

Data Augmentation

[40] from glob import glob
from PIL import Image
from numpy import asarray
import numpy as np

[41] frompath='/content/drive/MyDrive/Flower/flowers/rose'
topath='/content/drive/MyDrive/Flower'
folder='rose'
topath=topath+'/'+folder+'/'

[42] images=glob(frompath+'/*')
c=0
for path in images:
    img=Image.open(path)
    img=img.resize((224,224))

```

```

[42] 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

Image Augmentation

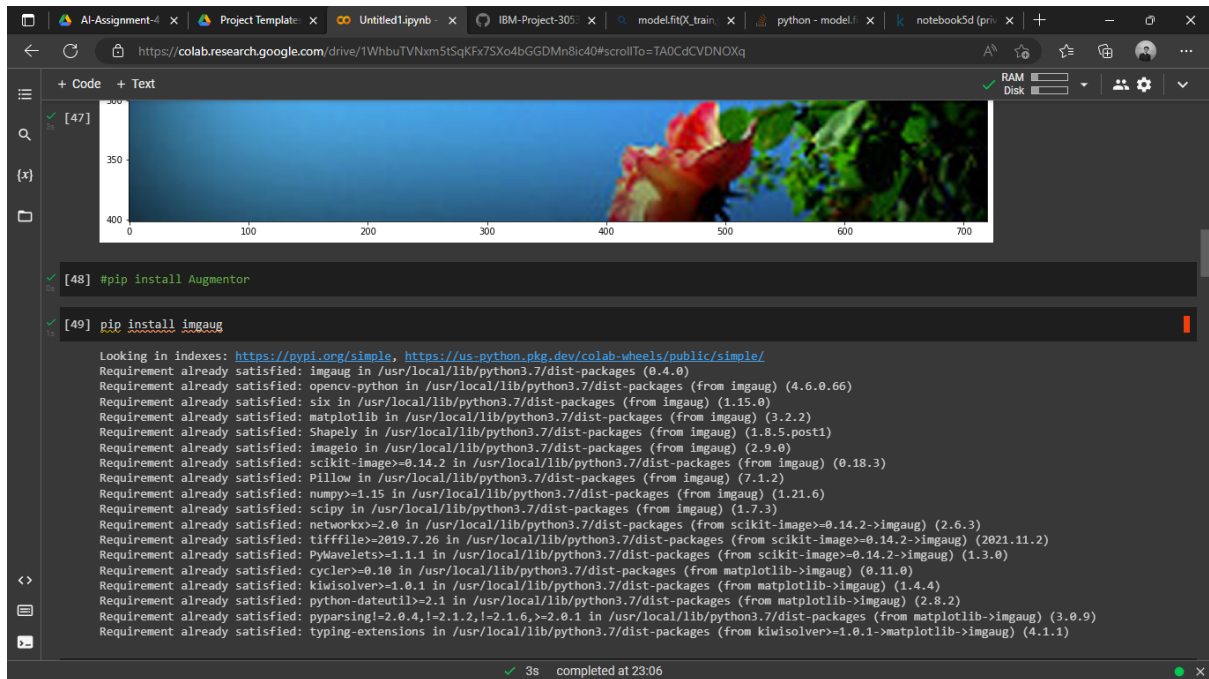
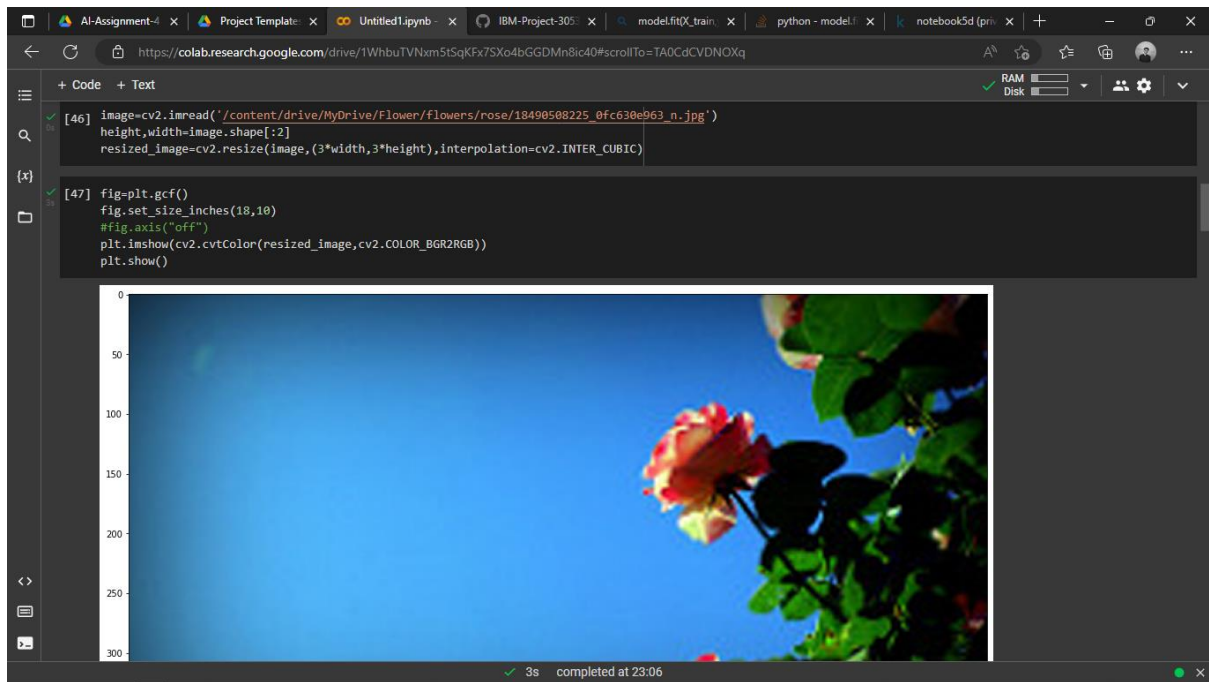
[43] import cv2

[44] import matplotlib.pyplot as plt
import numpy as np

[45] %matplotlib inline

[46] image=cv2.imread('/content/drive/MyDrive/Flower/Flowers/rose/18490588225_0fc630e953_n.jpg')

```



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+ Code + Text
[50] pip install ipyplot
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: ipyplot in /usr/local/lib/python3.7/dist-packages (1.1.1)
Requirement already satisfied: shortuuid in /usr/local/lib/python3.7/dist-packages (from ipyplot) (1.0.10)
Requirement already satisfied: pillow in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.1.2)
Requirement already satisfied: IPython in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.9.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from ipyplot) (1.21.6)
Requirement already satisfied: setuptools>=18.5 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (57.4.0)
Requirement already satisfied: jedi>=0.10 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.18.1)
Requirement already satisfied: pexpect in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.8.0)
Requirement already satisfied: traitlets>=4.2 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (5.1.1)
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: pygments in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.6.1)
Requirement already satisfied: backcall in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.2.0)
Requirement already satisfied: decorator in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.4.2)
Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.7.5)
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: wcwidth in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot) (0.2.5)
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: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packages (from pexpect->IPython->ipyplot) (0.7.0)

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

[52] input_img=imageio.imread('/content/drive/MyDrive/Flower/flowers/rose/20409866779_ac473f55e0_w.jpg')

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

```
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+ Code + Text
[54] vflip=iaa.Flipud(p=1.0)
input_vf=vflip.augment_image(input_img)
image_list=[input_img,input_hf,input_vf]
labels=['Original','Horizontally flipped','Vertically flipped']
ipyplot.plot_images(image_list,labels=labels,img_width=180)
Show HTML
Original Horizontally flipped Vertically flipped
[55] rot1=iaa.Affine(rotate=(-30,30))
input_rot1=rot1.augment_image(input_img)
images_list=[input_img,input_rot1]
labels=['Original','Rotated Images']
ipyplot.plot_images(images_list,labels=labels,img_width=180)
Show HTML
Original Rotated Images
```

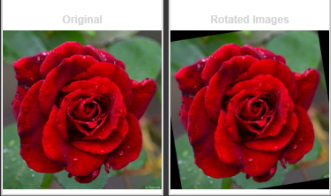
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, y_train) x python - model.fit x notebook5d (private) x + -

https://colab.research.google.com/drive/1WhbuTVNx5tSqKFx7SXo4bGGDMn8ic40#scrollTo=TA0CdCVDNOXq

+ Code + Text

```
[55] rot1=iaa.Affine(rotate=(-30,30))
input_rot1=rot1.augment_image(input_img)
images_list=[input_img,input_rot1]
labels=['Original','Rotated Images']
ipypplot.plot_images(images_list,labels=labels,img_width=180)
```

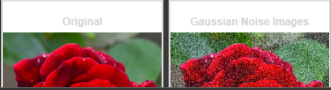
Show HTML



Original Rotated Images

```
[56] noise=iaa.AdditiveGaussianNoise(10,40)
input_noise=noise.augment_image(input_img)
images_list=[input_img,input_noise]
labels=['Original','Gaussian Noise Images']
ipypplot.plot_images(images_list,labels=labels,img_width=180)
```

Show HTML



Original Gaussian Noise Images

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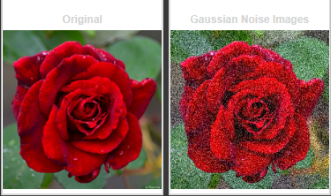
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, y_train) x python - model.fit x notebook5d (private) x + -

https://colab.research.google.com/drive/1WhbuTVNx5tSqKFx7SXo4bGGDMn8ic40#scrollTo=TA0CdCVDNOXq

+ Code + Text

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[56] noise=iaa.AdditiveGaussianNoise(10,40)
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images_list=[input_img,input_noise]
labels=['Original','Gaussian Noise Images']
ipypplot.plot_images(images_list,labels=labels,img_width=180)
```

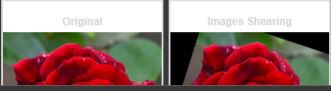
Show HTML



Original Gaussian Noise Images

```
[57] shear=iaa.Affine(shear=(-40,40))
input_shear=shear.augment_image(input_img)
images_list=[input_img,input_shear]
labels=['Original','Images Shearing']
ipypplot.plot_images(images_list,labels=labels,img_width=180)
```

Show HTML



Original Images Shearing

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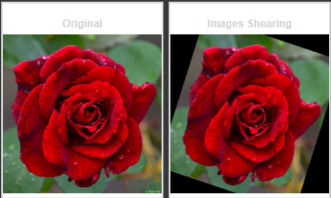
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+ Code + Text

RAM Disk

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

[show.html](#)



```
[58] 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)
```

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AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, y_train) x python - model.fit x notebook5d (priv) x + -


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+ Code + Text


RAM Disk

```
[58] 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](#)



```
[59] 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))
```



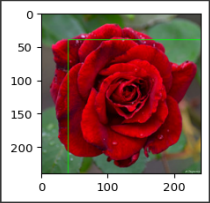
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```
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, x python - model.f notebook5d (priv x + -
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+ Code + Text

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[59] 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))
```



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

```
[60] 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
```

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

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```
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, x python - model.f notebook5d (priv x + -
```

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+ Code + Text

```
[62] 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))
```

```
[63] print(X_train.shape)
print(X_test.shape)

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

```
[64] X_train=X_train/255
X_test=X_test/255
```

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

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

```
[67] model.add(MaxPool2D(2,2))
```

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

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

Compile The Model

```
[77] import tensorflow as tf
```

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```
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, y_train) x python - model.fit x notebook5d (private) x + - x x
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+ Code + Text
Compile The Model
[77] import tensorflow as tf
[78] model.compile(optimizer='adam',
                  loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
                  metrics=['accuracy'])
Fit The Model
[79] model.fit(X_train,y_train,epochs=10)
Epoch 1/10
/usr/local/lib/python3.7/dist-packages/tensorflow/python/util/dispatch.py:1082: UserWarning: ``sparse_categorical_crossentropy`` received `from_logits=True`, but t
return dispatch_target(*args, **kwargs)
1875/1875 [=====] - 45s 23ms/step - loss: 0.4615 - accuracy: 0.9337
Epoch 2/10
1875/1875 [=====] - 43s 23ms/step - loss: 0.0782 - accuracy: 0.9760
Epoch 3/10
1875/1875 [=====] - 43s 23ms/step - loss: 0.0570 - accuracy: 0.9826
Epoch 4/10
1875/1875 [=====] - 45s 24ms/step - loss: 0.0445 - accuracy: 0.9859
Epoch 5/10
1875/1875 [=====] - 52s 28ms/step - loss: 0.0360 - accuracy: 0.9890
Epoch 6/10
1875/1875 [=====] - 44s 23ms/step - loss: 0.0325 - accuracy: 0.9898
Epoch 7/10
1875/1875 [=====] - 43s 23ms/step - loss: 0.0246 - accuracy: 0.9925
Epoch 8/10
1875/1875 [=====] - 41s 22ms/step - loss: 0.0221 - accuracy: 0.9934
Epoch 9/10
3s completed at 23:06
```

```
AI-Assignment-4 x Project Template x Untitled1.ipynb x IBM-Project-305 x model.fit(X_train, y_train) x python - model.fit x notebook5d (private) x + - x x
https://colab.research.google.com/drive/1WhbuTVNx5tSqKfX7SXo4bGGDMn8ic40#scrollTo=TA0CdCVDNOXq
+ Code + Text
Fit The Model
[79] model.fit(X_train,y_train,epochs=10)
Epoch 1/10
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Epoch 8/10
1875/1875 [=====] - 41s 22ms/step - loss: 0.0221 - accuracy: 0.9934
Epoch 9/10
1875/1875 [=====] - 43s 23ms/step - loss: 0.0203 - accuracy: 0.9940
Epoch 10/10
1875/1875 [=====] - 44s 24ms/step - loss: 0.0202 - accuracy: 0.9941
<keras.callbacks.History at 0x7f4a9fff3f50>
model.evaluate(X_test,y_test)
313/313 [=====] - 3s 9ms/step - loss: 0.1440 - accuracy: 0.9790
[0.14398375153541565, 0.9789999723434448]
3s completed at 23:06
```