Assignment –3

Build CNN for Classification of Flowers

Assignment Date	10 October 2022
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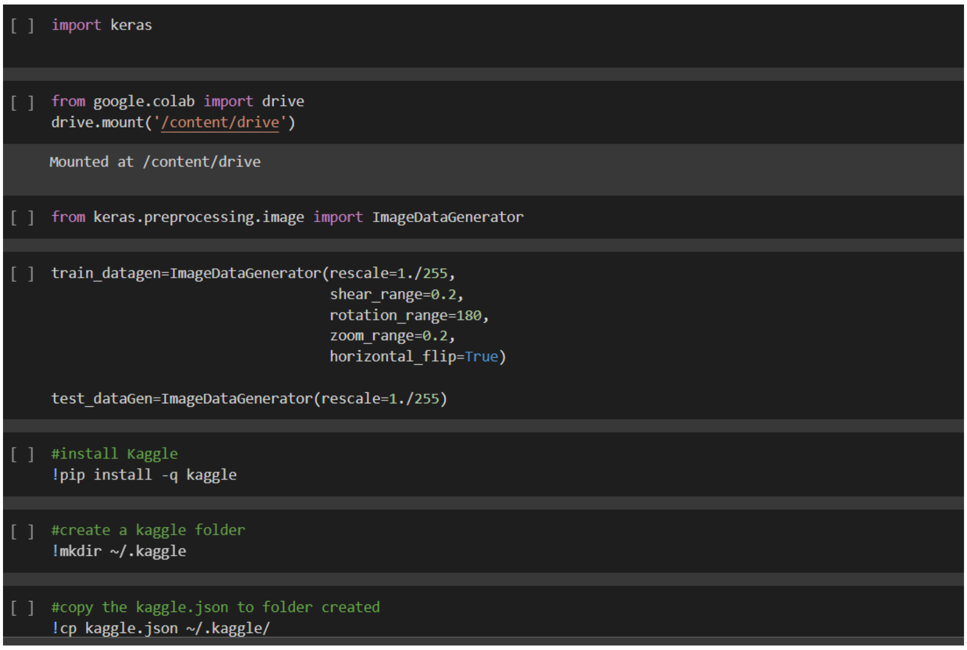
Maximum Marks	2 Marks

Import required packages



```
[ ]  import keras
```

```
[ ]  from google.colab import drive
     drive.mount('/content/drive')
```

```
     Mounted at /content/drive
```

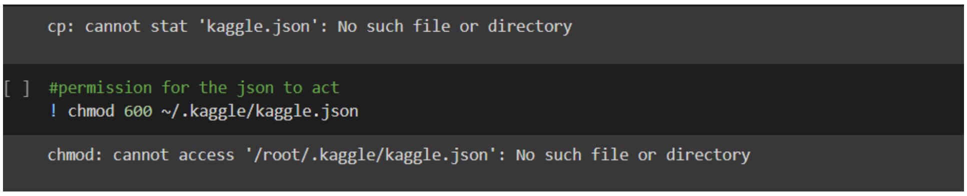
```
[ ]  from keras.preprocessing.image import ImageDataGenerator
```

```
[ ]  train_datagen=ImageDataGenerator(rescale=1./255,
                                     shear_range=0.2,
                                     rotation_range=180,
                                     zoom_range=0.2,
                                     horizontal_flip=True)

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

```
[ ]  #install Kaggle
     !pip install -q kaggle
```

```
[ ]  #create a kaggle folder
     !mkdir ~/.kaggle
```

```
[ ]  #copy the kaggle.json to folder created
     !cp kaggle.json ~/.kaggle/
```

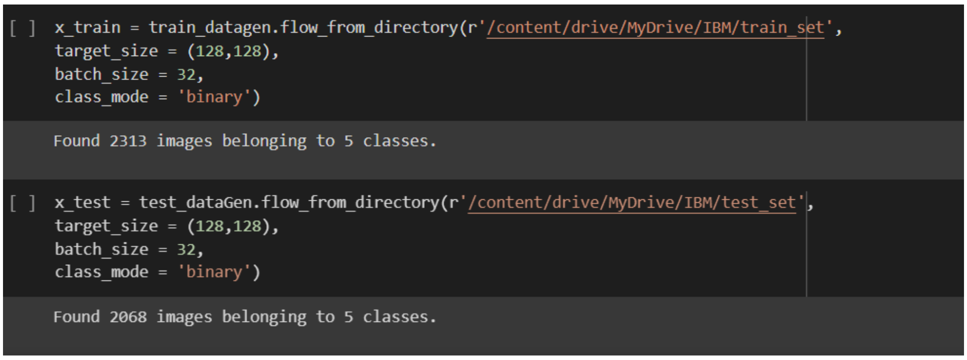


```
     cp: cannot stat 'kaggle.json': No such file or directory
```

```
[ ]  #permission for the json to act
     ! chmod 600 ~/.kaggle/kaggle.json
```

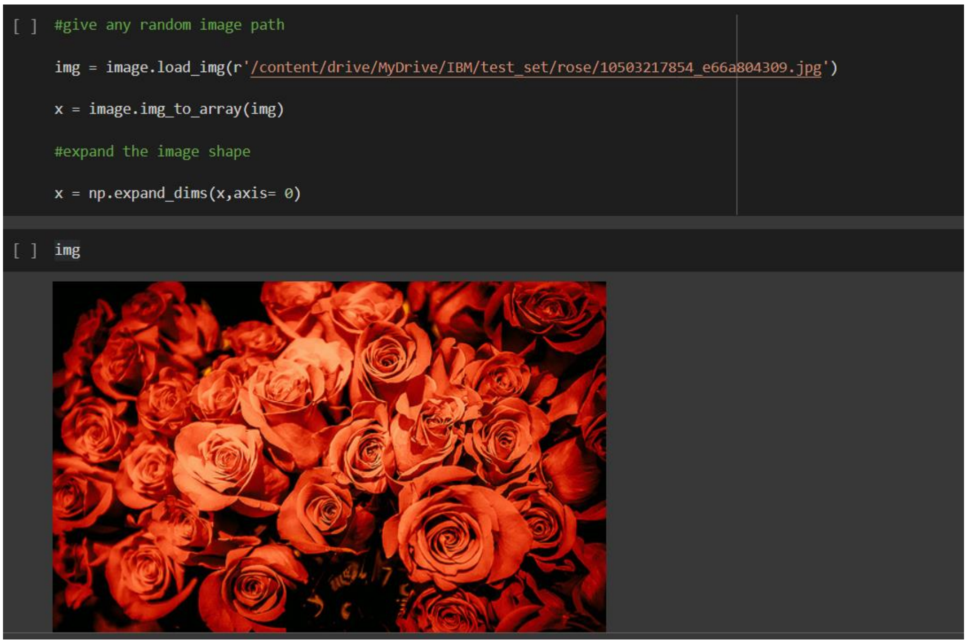
```
     chmod: cannot access '/root/.kaggle/kaggle.json': No such file or directory
```

1.Download the dataset

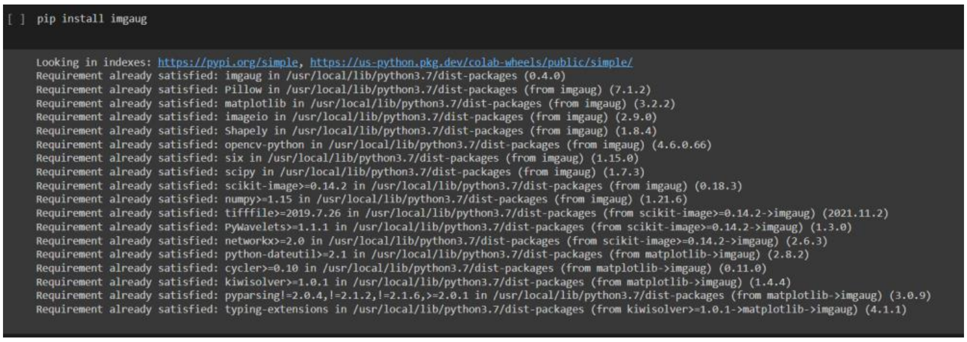


```
[ ]  x_train = train_datagen.flow_from_directory(r'/content/drive/MyDrive/IBM/train_set',
     target_size = (128,128),
     batch_size = 32,
     class_mode = 'binary')

     Found 2313 images belonging to 5 classes.

[ ]  x_test = test_dataGen.flow_from_directory(r'/content/drive/MyDrive/IBM/test_set',
     target_size = (128,128),
     batch_size = 32,
     class_mode = 'binary')

     Found 2068 images belonging to 5 classes.
```

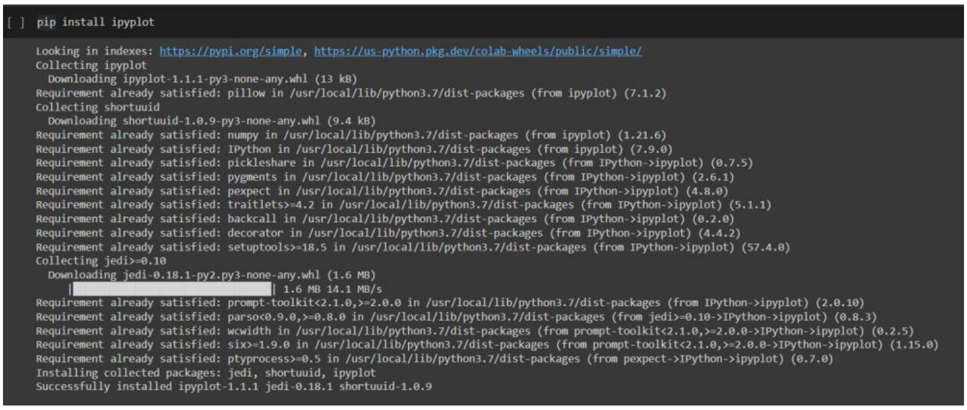
2. Image Augmentation



```
[ ]  #give any random image path

     img = image.load_img(r'/content/drive/MyDrive/IBM/test_set/rose/10503217854_e66a804309.jpg')

     x = image.img_to_array(img)

     #expand the image shape

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

[ ]  img
```

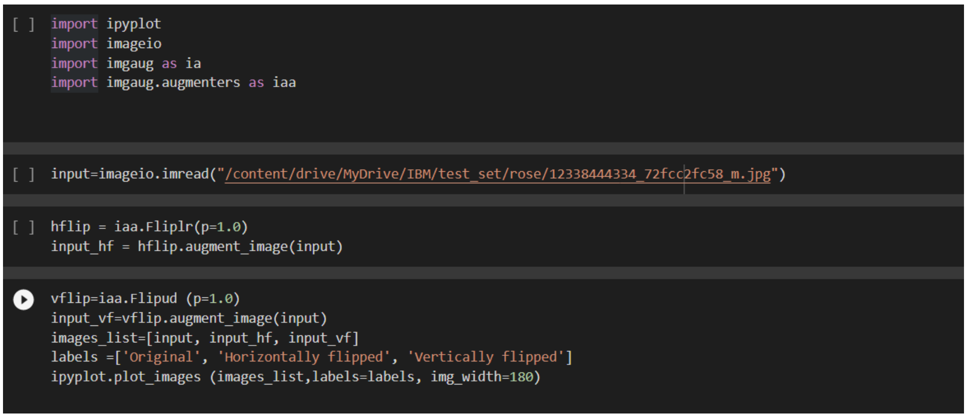


```
[ ]  pip install imgaug

     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: matplotlib in /usr/local/lib/python3.7/dist-packages (from imgaug) (3.2.2)
     Requirement already satisfied: imageio in /usr/local/lib/python3.7/dist-packages (from imgaug) (2.9.0)
     Requirement already satisfied: Shapely in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.8.4)
     Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (from imgaug) (4.6.0.66)
     Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.15.0)
     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: numpy>=1.15 in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.21.6)
     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: 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: networkx>=2.0 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (2.6.3)
     Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (2.8.2)
     Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (0.11.0)
     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) (3.0.9)
     Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packages (from kiwisolver>=1.0.1->matplotlib->imgaug) (4.1.1)
```



```
[ ]  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: pillow in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.1.2)
     Collecting shortuuid
       Downloading shortuuid-1.0.9-py3-none-any.whl (9.4 kB)
     Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from ipyplot) (1.21.6)
     Requirement already satisfied: IPython in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.9.0)
     Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.7.5)
     Requirement already satisfied: pygments in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.6.1)
     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: 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: setuptools>=18.5 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (57.4.0)
     Collecting jedi>=0.10
       Downloading jedi-0.18.1-py2.py3-none-any.whl (1.6 MB)
          |████████████████████████████████| 1.6 MB 14.1 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: 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)
     Installing collected packages: jedi, shortuuid, ipyplot
     Successfully installed ipyplot-1.1.1 jedi-0.18.1 shortuuid-1.0.9
```

3.Create Model

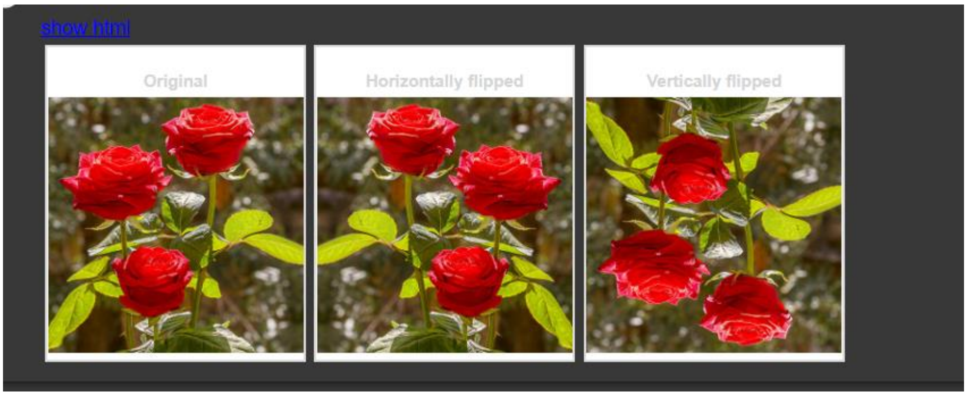


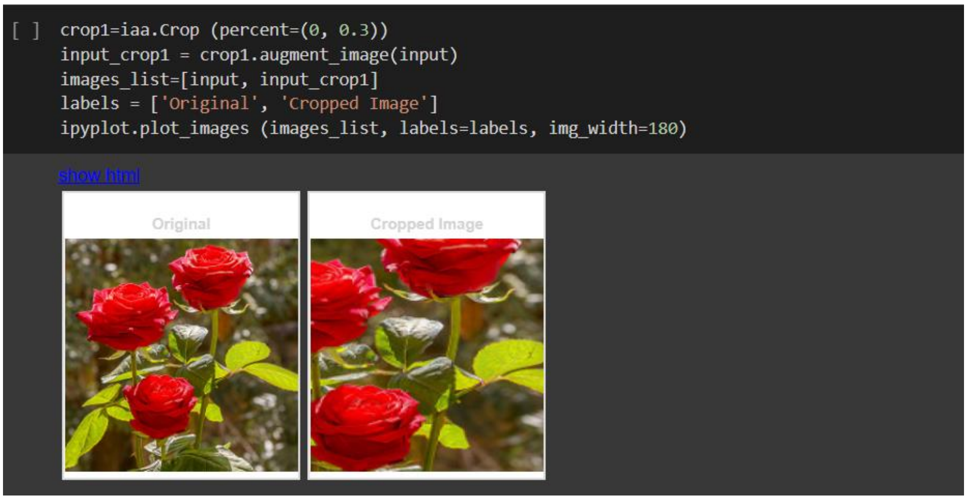
```
[ ]  import ipyplot
     import imageio
     import imgaug as ia
     import imgaug.augmenters as iaa
```

```
[ ]  input=imageio.imread("/content/drive/MyDrive/IBM/test_set/rose/12338444334_72fcc2fc58_m.jpg")
```

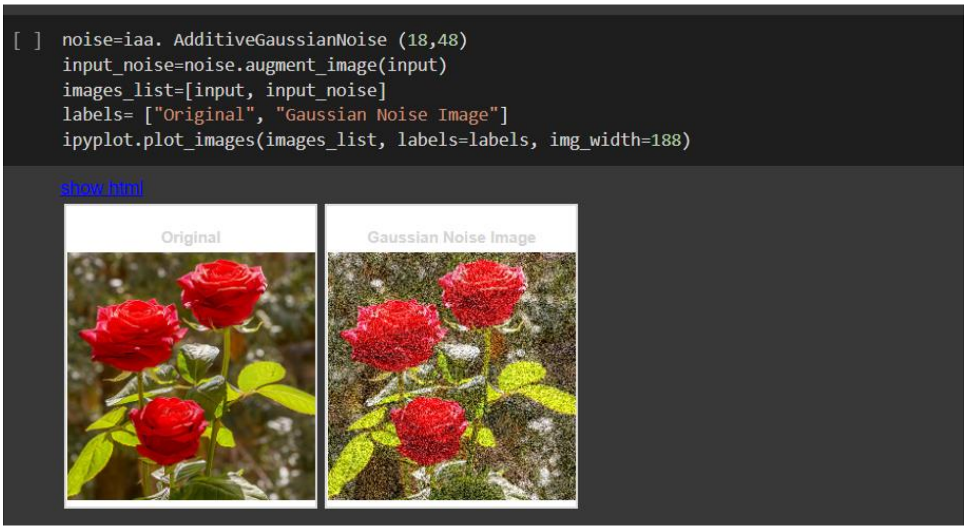
```
[ ]  hflip = iaa.Fliplr(p=1.0)
     input_hf = hflip.augment_image(input)
```

```
     vflip=iaa.Flipud (p=1.0)
     input_vf=vflip.augment_image(input)
     images_list=[input, input_hf, input_vf]
     labels =['Original', 'Horizontally flipped', 'Vertically flipped']
     ipyplot.plot_images (images_list,labels=labels, img_width=180)
```

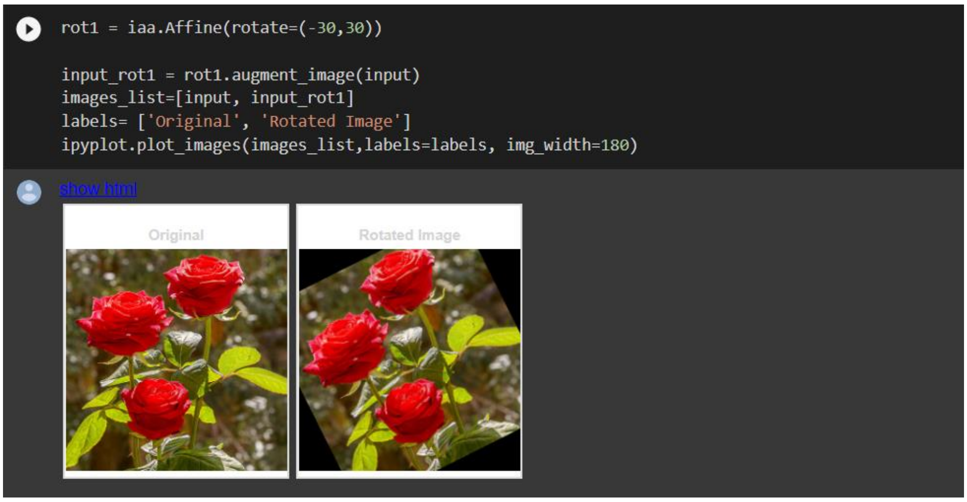




```
crop1=iaa.Crop (percent=(0, 0.3))
input_crop1 = crop1.augment_image(input)
images_list=[input, input_crop1]
labels = ['Original', 'Cropped Image']
ipyplot.plot_images (images_list, labels=labels, img_width=180)
```

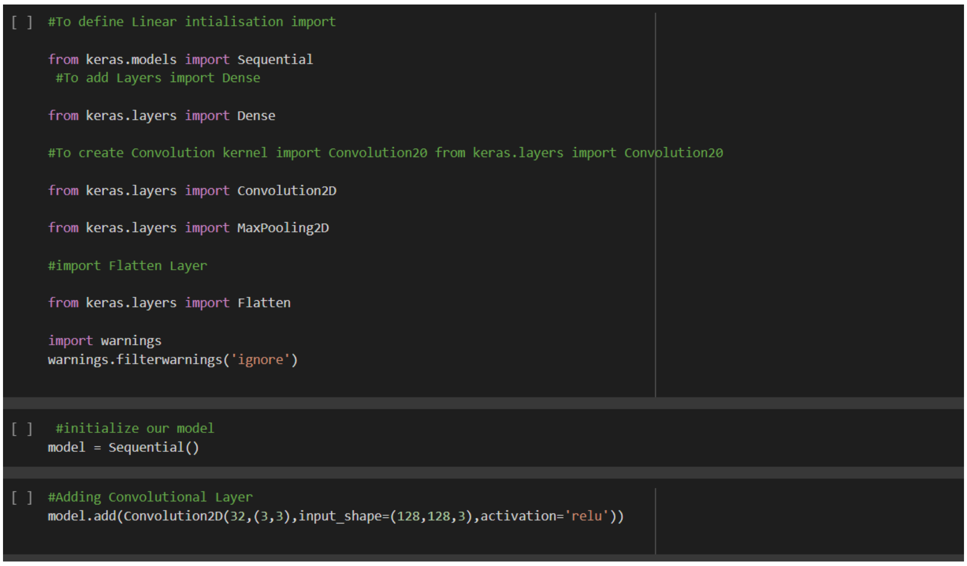


```
noise=iaa. AdditiveGaussianNoise (18,48)
input_noise=noise.augment_image(input)
images_list=[input, input_noise]
labels= ["Original", "Gaussian Noise Image"]
ipyplot.plot_images(images_list, labels=labels, img_width=188)
```



```
rot1 = iaa.Affine(rotate=(-30,30))

input_rot1 = rot1.augment_image(input)
images_list=[input, input_rot1]
labels= ['Original', 'Rotated Image']
ipyplot.plot_images(images_list,labels=labels, img_width=180)
```

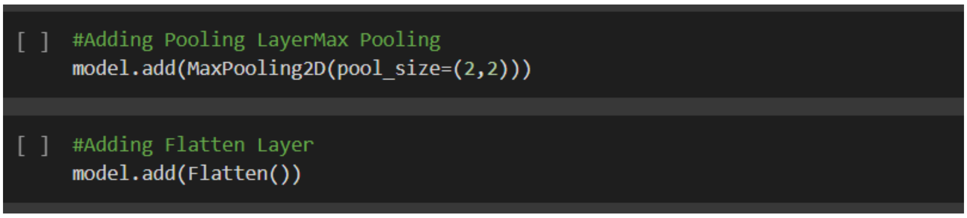
4.Add Layers(Convolution, MaxPooling, Flatten,Dense-(Hidden Layers),Output)



```
#To define Linear intialisation import

from keras.models import Sequential
 #To add Layers import Dense

from keras.layers import Dense

#To create Convolution kernel import Convolution20 from keras.layers import Convolution20

from keras.layers import Convolution2D

from keras.layers import MaxPooling2D

#import Flatten Layer

from keras.layers import Flatten

import warnings
warnings.filterwarnings('ignore')
```

```
 #initialize our model
model = Sequential()
```

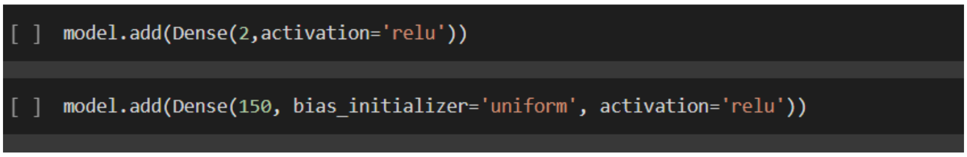
```
#Adding Convolutional Layer
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
```



```
#Adding Pooling LayerMax Pooling
model.add(MaxPooling2D(pool_size=(2,2)))
```

```
#Adding Flatten Layer
model.add(Flatten())
```

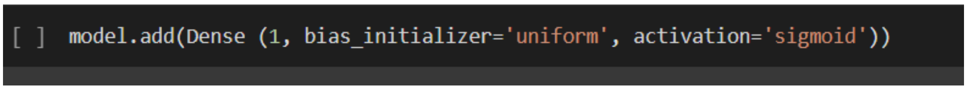
Adding Hidden Layers



```
model.add(Dense(2,activation='relu'))
```

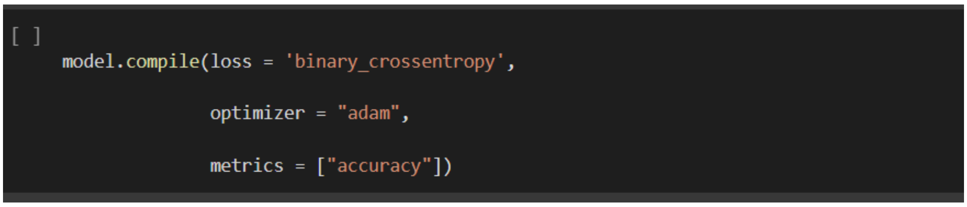
```
model.add(Dense(150, bias_initializer='uniform', activation='relu'))
```

Adding Output Layer



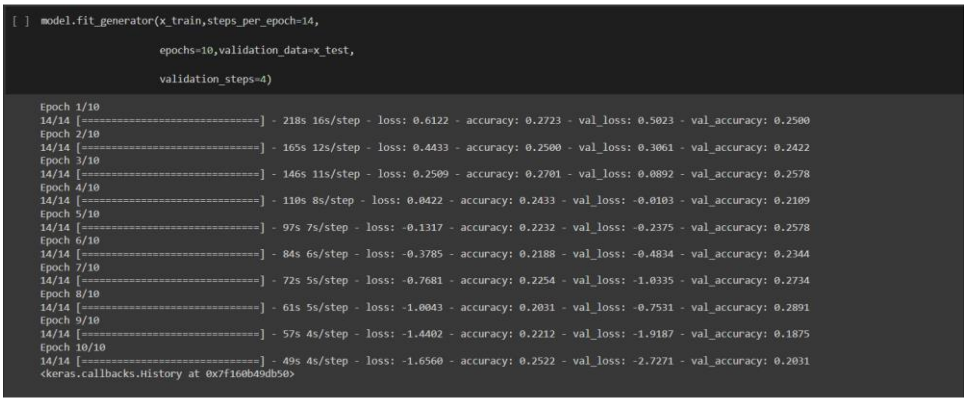
```
model.add(Dense (1, bias_initializer='uniform', activation='sigmoid'))
```

5.Compile the Model



```
[ ]
    model.compile(loss = 'binary_crossentropy',

                  optimizer = "adam",

                  metrics = ["accuracy"])
```

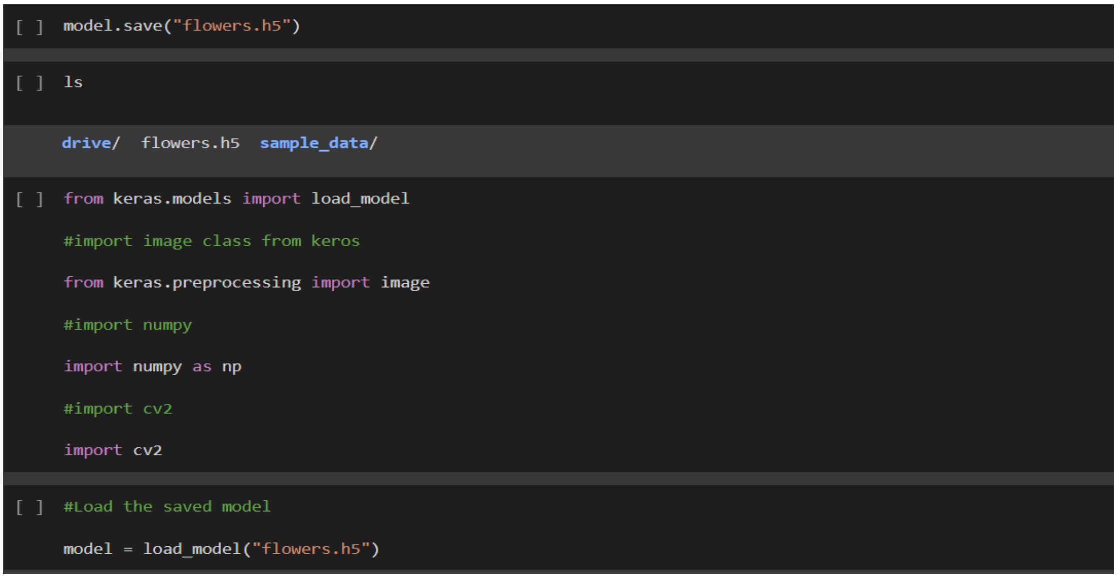
6.Fit the Model



```
[ ] model.fit_generator(x_train,steps_per_epoch=14,

                    epochs=10,validation_data=x_test,

                    validation_steps=4)
```

```
Epoch 1/10
14/14 [==============================] - 218s 16s/step - loss: 0.6122 - accuracy: 0.2723 - val_loss: 0.5023 - val_accuracy: 0.2500
Epoch 2/10
14/14 [==============================] - 165s 12s/step - loss: 0.4433 - accuracy: 0.2500 - val_loss: 0.3061 - val_accuracy: 0.2422
Epoch 3/10
14/14 [==============================] - 146s 11s/step - loss: 0.2509 - accuracy: 0.2701 - val_loss: 0.0892 - val_accuracy: 0.2578
Epoch 4/10
14/14 [==============================] - 110s 8s/step - loss: 0.0422 - accuracy: 0.2433 - val_loss: -0.0103 - val_accuracy: 0.2109
Epoch 5/10
14/14 [==============================] - 97s 7s/step - loss: -0.1317 - accuracy: 0.2232 - val_loss: -0.2375 - val_accuracy: 0.2578
Epoch 6/10
14/14 [==============================] - 84s 6s/step - loss: -0.3785 - accuracy: 0.2188 - val_loss: -0.4834 - val_accuracy: 0.2344
Epoch 7/10
14/14 [==============================] - 72s 5s/step - loss: -0.7681 - accuracy: 0.2254 - val_loss: -1.0335 - val_accuracy: 0.2734
Epoch 8/10
14/14 [==============================] - 61s 5s/step - loss: -1.0043 - accuracy: 0.2031 - val_loss: -0.7531 - val_accuracy: 0.2891
Epoch 9/10
14/14 [==============================] - 57s 4s/step - loss: -1.4402 - accuracy: 0.2212 - val_loss: -1.9187 - val_accuracy: 0.1875
Epoch 10/10
14/14 [==============================] - 49s 4s/step - loss: -1.6560 - accuracy: 0.2522 - val_loss: -2.7271 - val_accuracy: 0.2031
<keras.callbacks.History at 0x7f160b49db50>
```

7.Save the Model & Test the Model



```
[ ] model.save("flowers.h5")
```

```
[ ] ls
```

```
    drive/  flowers.h5  sample_data/
```

```
[ ] from keras.models import load_model

    #import image class from keros

    from keras.preprocessing import image

    #import numpy

    import numpy as np

    #import cv2

    import cv2
```

```
[ ] #Load the saved model

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