Date : 07.10.2022

Name :

SATHIS

H

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Roll No :611719205010

Assignment 3 - Build CNN Model For Classification OfFlowers

- Unzip dataset

```
!unzip '/content/Flowers-Dataset.zip'
```

```
Archive:  /content/Flowers-Dataset.zip
  inflating:
  flowers/daisy/100080576_f52e8ee070_n.jp
  ginflating:
  flowers/daisy/10140303196_b88d3d6cec.jp
  g
  inflating:
  flowers/daisy/10172379554_b296050f82_n.jp
  ginflating:
  flowers/daisy/10172567486_2748826a8b.jpg
  inflating:
  flowers/daisy/10172636503_21bededa75_n.jp
  ginflating:
  flowers/daisy/102841525_bd6628ae3c.jpg
  inflating: flowers/daisy/10300722094_28fa978807_n.jpg
  inflating: flowers/daisy/1031799732_e7f4008c03.jpg
  inflating:
  flowers/daisy/10391248763_1d16681106_n.jp
  g                                 inflating:
  flowers/daisy/10437754174_22ec990b77_m.jp
  g                                 inflating:
  flowers/daisy/10437770546_8bb6f7bdd3_m.jp
```

```
g                               inflating:
flowers/daisy/10437929963_bc13eebe0c.jpg
inflating:
flowers/daisy/10466290366_cc72e33532.jp
g                             inflating:
flowers/daisy/10466558316_a7198b87e2.jp
g                             inflating:
flowers/daisy/10555749515_13a12a026e.jp
g                             inflating:
flowers/daisy/10555815624_dc211569b0.jp
g
inflating:
flowers/daisy/10555826524_423eb8bf71_n.jp
g                               inflating:
flowers/daisy/10559679065_50d2b16f6d.jpg
inflating:
flowers/daisy/105806915_a9c13e2106_n.jp
g                             inflating:
flowers/daisy/10712722853_5632165b04.jp
g                             inflating:
flowers/daisy/107592979_aaa9cdfe78_m.jp
g
inflating:
flowers/daisy/10770585085_4742b9dac3_n.jp
g                               inflating:
flowers/daisy/10841136265_af473efc60.jpg
inflating: flowers/daisy/10993710036_2033222c91.jpg
inflating:
flowers/daisy/10993818044_4c19b86c82.jp
g                             inflating:
flowers/daisy/10994032453_ac7f8d9e2e.jp
g                             inflating:
flowers/daisy/11023214096_b5b39fab08.jp
g
inflating:
flowers/daisy/11023272144_fce94401f2_m.jp
g                               inflating:
flowers/daisy/11023277956_8980d53169_m.jp
g                               inflating:
flowers/daisy/11124324295_503f3a0804.jpg
inflating:
flowers/daisy/1140299375_3aa7024466.jpg
inflating:
flowers/daisy/11439894966_dca877f0cd.jp
g
inflating:
flowers/daisy/1150395827_6f94a5c6e4_n.jp
ginflating:
flowers/daisy/11642632_1e7627a2cc.jpg
inflating: flowers/daisy/11834945233_a53b7a92ac_m.jpg
```

```
inflating: flowers/daisy/11870378973_2ec1919f12.jpg

inflating:
flowers/daisy/11891885265_ccefec7284_n.jp
g                                inflating:
flowers/daisy/12193032636_b50ae7db35_n.jp
g                                inflating:
flowers/daisy/12348343085_d4c396e5b5_m.jp
g                                inflating:
flowers/daisy/12585131704_0f64b17059_m.jp
g                                inflating:
flowers/daisy/12601254324_3cb62c254a_m.jp
g                                inflating:
flowers/daisy/1265350143_6e2b276ec9.jpg
inflating:
flowers/daisy/12701063955_4840594ea6_n.jp
ginflating:
flowers/daisy/1285423653_18926dc2c8_n.jpg
inflating:
flowers/daisy/1286274236_1d7ac84efb_n.jpg
inflating:
flowers/daisy/12891819633_e4c82b51e8.jpg
inflating:
flowers/daisy/1299501272_59d9da5510_n.jp
g                                inflating:
flowers/daisy/1306119996_ab8ae14d72_n.jp
g                                inflating:
flowers/daisy/1314069875_da8dc023c6_m.jp
g                                inflating:
flowers/daisy/1342002397_9503c97b49.jpg
inflating:
flowers/daisy/134409839_71069a95d1_m.jpg
inflating:
flowers/daisy/1344985627_c3115e2d71_n.jp
g
inflating:
flowers/daisy/13491959645_2cd9df44d6_n.jp
ginflating:
flowers/daisy/1354396826_2868631432_m.jpg
inflating:
flowers/daisy/1355787476_32e9f2a30b.jpg
inflating:
flowers/daisy/13583238844_573df2de8e_m.jp
ginflating: flowers/daisy/1374193928
a52320eafa.jpg
```

Importing Necessary Libraries

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


import numpy as np
import
matplotlib.pyplot
as pltimport pandas
as pd
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import
Dense,Activation,Dropout,Conv2D,Flatten,MaxPool2D,Reshfrom
tensorflow.keras.applications.resnet50 import ResNet50
from tensorflow.keras.applications.resnet50 import
preprocess_inputfrom tensorflow.keras.preprocessing
import image
from tensorflow.keras.preprocessing.image import
ImageDataGenerator,load_img,img_to_arrayfrom tensorflow.keras.callbacks
import EarlyStopping, ReduceLROnPlateau
```

- # Image Augumentation

Dataset consist of 5 classes.

Daisy - European Species of Aster family.

Sunflower - Identified as the genus of Helianthus.

Tulip - It belongs to the species of spring blooming geophytes.

Rose - It belongs to the family of rosaceae.

Dandelion - Indentifies as the genus of Asterceae.

```
path = 'flowers/'
train_data_gen = ImageDataGenerator(rescale = 1./255,
                                    shear_range = 0.2,
                                    zoom_range = 0.2,
                                    horizontal_f
                                    lip = True,
                                    validation_s
                                    plit = 0.30)
test_data_gen = ImageDataGenerator(rescale = 1./255,validation_split = 0.30)


training_set = train_data_gen.flow_from_directory(path,
```

```
                                                target_s
                                                ize=(64,
                                                64),
                                                batch_si
                                                ze=100,
                                                class_mode='c
                                                ategorical',
                                                shuffle=True,
                                                color_mode='rgb',
                                                subset = 'training')

testing_set = test_data_gen.flow_from_directory(path,
                                                target_s
                                                ize=(64,
                                                64),
                                                batch_si
                                                ze=100,
                                                class_mode='c
                                                ategorical',
                                                shuffle=True,
                                                color_mode='rgb',
                                                subset = 'validation')
```

```
Found 3024 images belonging
to 5 classes.Found 1293
images belonging to 5
classes.
```

- Create the model

```
model = Sequential()
```

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

```
#convolution and Pooling layer 1
```

```
model.add(Conv2D(filters=48,kernel_size=3,activation='relu',input_shape
=(64,64,3)))model.add(MaxPool2D(pool_size=2,strides=2))
model.add(Dropout(0.2))

#convolution and Pooling layer 2
model.add(Conv2D(filters=32,kernel_size=3,activat
ion='relu'))
model.add(MaxPool2D(pool_size=2,strides=2))
model.add(Dropout(0.2))

#Flattenin
g the
images
model.add(
Flatten())
#Fully Connected layers
model.add(Dense(64,activat
ion='relu'))
model.add(Dropout(0.2))
model.add(Dense(5,activation

='softmax'))model.summary()
```

```
Model: "sequential"
 Layer (type)                Output Shape              Param #
=================================================================
```

conv2d (Conv2D)	(None, 62, 62, 48)			1344
max_pooling2d (MaxPooling2D)	(None, 31, 31, 48)			0
dropout (Dropout)	(None, 31, 31, 48)			0
conv2d_1 (Conv2D)	(None, 29, 29, 32)			13856
max_pooling2d_1 (MaxPooling 2D)	(None, 14, 14, 32)			0
dropout_1 (Dropout)	(None,	14, 14,	32)	0
flatten (Flatten)	(None,	6272)		0
dense (Dense)	(None,	64)		401472
dropout_2 (Dropout)	(None,	64)		0
dense_1 (Dense)	(None,	5)		325

```
=================================================================
Total params: 416,997
Trainable params: 416,997
```

```
Non-trainable params: 0
```

- Compiling the Model

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

- Fitting the Model

```
early_stop = EarlyStopping(monitor='val_accuracy',
                           patience=5,verbose=1,
                               mode='auto')

lr = ReduceLROnPlateau(monitor='val_accuracy',
                       factor=0.2
                       ,patience=
                       5,
                       min_lr=0.0
                       0001)
callback = [early_stop,lr]
```

Training the Model

```
result = model.fit(x=training_set, validation_data=testing_set, epochs=10)
```

Epoch 31/31	1/10 [==============================]	- 30s	966ms/step	- loss:	0.7625	- accuracy:	0
Epoch	2/10						
31/31 Epoch 31/31	[==============================]3/10 [==============================]	- 30s - 31s	969ms/step 985ms/step	• loss: • loss:	0.7454 0.7348	• accuracy: • accuracy:	0 0

Epoch 31/31	4/10 [==============================]	- 30s	968ms/step	- loss:	0.7144	- accuracy:	0
Epoch	5/10						
31/31 Epoch	[==============================] 6/10	- 31s	992ms/step	- loss:	0.7233	- accuracy:	0
31/31 Epoch	[==============================] 7/10	- 32s	1s/step - loss: 0.7017 - accuracy: 0.73				
31/31	[==============================]	- 30s	963ms/step	- loss:	0.6715	- accuracy:	0
Epoch 31/31	8/10 [==============================]	- 31s	978ms/step	- loss:	0.6512	- accuracy:	0
Epoch	9/10						
31/31 Epoch 31/31	[==============================] 10/10 [==============================]	- 31s - 30s	982ms/step 974ms/step	• loss: • loss:	0.6711 0.6481	• accuracy: • accuracy:	0 0

Loss and Accuracy check using plot

```
#plot the loss
plt.plot(result.history['loss'], label='train loss')
plt.plot(result.history['val_loss'],
label='val loss')plt.legend()
plt.show()

# plot the accuracy
plt.plot(result.history['accuracy'],
label='train acc')
plt.plot(result.history['val_accuracy'],
label='val acc')plt.legend()
plt.show()


training_set.class_indices
```

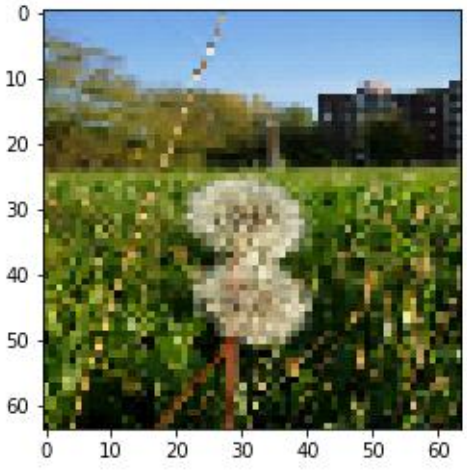
```
classes =
['Daisy','Dandelion','Rose','Sunflower','Tulip
']def testing(img):
    img =
    image.load_img(img,target_size=(6
    4,64))x = image.img_to_array(img)
    x = np.expand_dims(x,axis=0)
    pred = np.argmax(model.predict(x))
    return print("Predicted class as:",classes[pred])

def img_show(img):
    img1 =
    image.load_img(img,target_size=(64
    ,64))plt.imshow(img1)


#test1
img_show('/content/flowers/sunflower/12471443383_b71e7a
7480_m.jpg')
testing('/content/flowers/sunflower/12471443383_b71e7a7
480_m.jpg')
     Predicted class as: Sunflower


#test3
img_show('/content/flowers/dandelion/2116997627_30fed8
4e53_m.jpg')
testing('/content/flowers/dandelion/2116997627_30fed84
e53_m.jpg')

     Predicted class as: Daisy
```



```
#test4
img_show('/content/flowers/daisy/1314069875_da8dc0
23c6_m.jpg')
testing('/content/flowers/daisy/1314069875_da8dc02
3c6_m.jpg')
     Predicted class as: Daisy
```

Conclusion:

The dataset has about 4317 images from 5 different classes.

- Each classes have more than 500 images for training the data.
- 30% of the data taken for validation.
- The accuracy of the model is around 80%.
- The validation accuracy is around 70%.
- The model is built with 2 layered convolutional network considering 1344 trainableparameters.
- Testing the model with unknown images gives 95% accuracy.