Date :07.10.2022

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Assignment3-BuildCNNModelForClassificationOfFlowers

1. Unzipdataset

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

```
Archive:/content/Flowers-Dataset.zip
  inflating:
  flowers/daisy/100080576_f52e8ee070_n.jpginflating:f
  lowers/daisy/10140303196_b88d3d6cec.jpg
  inflating:
  flowers/daisy/10172379554_b296050f82_n.jpginflating:
  flowers/daisy/10172567486_2748826a8b.jpg
  inflating:
  flowers/daisy/10172636503_21bededa75_n.jpginflating:
  flowers/daisy/102841525_bd6628ae3c.jpg
  inflating: flowers/daisy/10300722094_28fa978807_n.jpg
  inflating: flowers/daisy/1031799732_e7f4008c03.jpg
  inflating:
  flowers/daisy/10391248763_1d16681106_n.jpginflating:
  flowers/daisy/10437754174_22ec990b77_m.jpginflating:
  flowers/daisy/10437770546_8bb6f7bdd3_m.jpginflating:
  flowers/daisy/10437929963_bc13eebe0c.jpg
  inflating:
  flowers/daisy/10466290366_cc72e33532.jpginflating:
  flowers/daisy/10466558316_a7198b87e2.jpginflating:
  flowers/daisy/10555749515_13a12a026e.jpginflating:f
  lowers/daisy/10555815624_dc211569b0.jpg
  inflating:
  flowers/daisy/10555826524_423eb8bf71_n.jpginflating:
  flowers/daisy/10559679065_50d2b16f6d.jpg
  inflating:
  flowers/daisy/105806915_a9c13e2106_n.jpginflating:
  flowers/daisy/10712722853_5632165b04.jpginflating:f
  lowers/daisy/107592979_aaa9cdfe78_m.jpg
  inflating:
  flowers/daisy/10770585085_4742b9dac3_n.jpginflating:
  flowers/daisy/10841136265_af473efc60.jpg
  inflating: flowers/daisy/10993710036_2033222c91.jpg
  inflating:
  flowers/daisy/10993818044_4c19b86c82.jpginflating:
  flowers/daisy/10994032453_ac7f8d9e2e.jpginflating:f
  lowers/daisy/11023214096_b5b39fab08.jpg
  inflating:
  flowers/daisy/11023272144_fce94401f2_m.jpginflating:
```

```
flowers/daisy/11023277956_8980d53169_m.jpginflating:
flowers/daisy/11124324295_503f3a0804.jpg
inflating:
flowers/daisy/1140299375_3aa7024466.jpginflating:fl
owers/daisy/11439894966_dca877f0cd.jpg
inflating:
flowers/daisy/1150395827_6f94a5c6e4_n.jpginflating:
flowers/daisy/11642632_1e7627a2cc.jpg
inflating: flowers/daisy/11834945233_a53b7a92ac_m.jpg
inflating: flowers/daisy/11870378973_2ec1919f12.jpg
```

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

ImportingNecessaryLibraries

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


importnumpyasnp
import matplotlib.pyplot as
pltimportpandas as pd
fromtensorflow.keras.modelsimportSequential
from tensorflow.keras.layers import
Dense,Activation,Dropout,Conv2D,Flatten,MaxPool2D,Reshfromtensorflow.keras.applications.re
snet50 importResNet50
from tensorflow.keras.applications.resnet50 import
preprocess_inputfromtensorflow.keras.preprocessing importimage
from tensorflow.keras.preprocessing.image import
ImageDataGenerator,load_img,img_to_arrayfromtensorflow.keras.callbacksimportEarlyStopping
, ReduceLROnPlateau
```

2. ImageAugumentation

- Datasetconsistof5classes.
- **Daisy**-EuropeanSpeciesofAsterfamily.
- **Sunflower**-IdentifiedasthegenusofHelianthus.
- **Tulip**-Itbelongstothespeciesofspringbloominggeophytes.
- **Rose**-Itbelongstothefamilyofrosaceae.

- **Dandelion**-IndentifiesasthegenusofAsterceae.

```
path ='flowers/'
```

```
train_data_gen=ImageDataGenerator(rescale =1./255,
                                  shear_range=0.2,
                                  zoom_range=0.2,
                                  horizontal_flip =
                                  True,validation_split=0.
                                  30)
test_data_gen=ImageDataGenerator(rescale =1./255,validation_split=0.30)


training_set= train_data_gen.flow_from_directory(path,
                                                 target_size=(64,64),
                                                 batch_size=100,
                                                 class_mode='categorical',
                                                 shuffle=True,
                                                 color_mode='rgb',
                                                 subset='training')

testing_set= test_data_gen.flow_from_directory(path,
                                                 target_size=(64,64),
                                                 batch_size=100,
                                                 class_mode='categorical',
                                                 shuffle=True,
                                                 color_mode='rgb',
                                                 subset='validation')
```

```
Found 3024 images belonging to 5
classes.Found1293imagesbelongingto5classe
s.
```

3. Createthemodel

```
model = Sequential()
```

4. AddLayers(Convolution,MaxPooling,Flatten,Dense-HiddenLayers,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,activation='relu'))
model.add(MaxPool2D(pool_size=2,strides=2))
model.add(Dropout(0.2))

#Flattening the
imagesmodel.add(Flatte
n())
```

```
#Fully Connected layers
model.add(Dense(64,activation='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              (None, 14, 14, 32)       0
 (MaxPooling2D)

 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
_________________________________________________________________
```

5. CompilingtheModel

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

6. FittingtheModel

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

lr=ReduceLROnPlateau(monitor='val_accuracy',
                     factor=0.2,patience=5,
                     min_lr=0.00001)
```

```
callback = [early_stop,lr]
```

TrainingtheModel

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

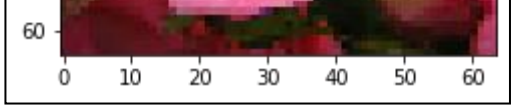
```
Epoch 1/10
31/31 [==============================] - 30s 966ms/step - loss: 0.7625 - accuracy: 0
Epoch 2/10
31/31 [==============================] - 30s 969ms/step - loss: 0.7454 - accuracy: 0
Epoch 3/10
31/31 [==============================] - 31s 985ms/step - loss: 0.7348 - accuracy: 0
Epoch 4/10
31/31 [==============================] - 30s 968ms/step - loss: 0.7144 - accuracy: 0
Epoch 5/10
31/31 [==============================] - 31s 992ms/step - loss: 0.7233 - accuracy: 0
Epoch 6/10
31/31 [==============================] - 32s 1s/step - loss: 0.7017 - accuracy: 0.73
Epoch 7/10
31/31 [==============================] - 30s 963ms/step - loss: 0.6715 - accuracy: 0
Epoch 8/10
31/31 [==============================] - 31s 978ms/step - loss: 0.6512 - accuracy: 0
Epoch 9/10
31/31 [==============================] - 31s 982ms/step - loss: 0.6711 - accuracy: 0
Epoch 10/10
31/31 [==============================] - 30s 974ms/step - loss: 0.6481 - accuracy: 0
```

LossandAccuracycneckusingplot

```
#plot the loss
plt.plot(result.history['loss'],label='trainloss')
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()
```

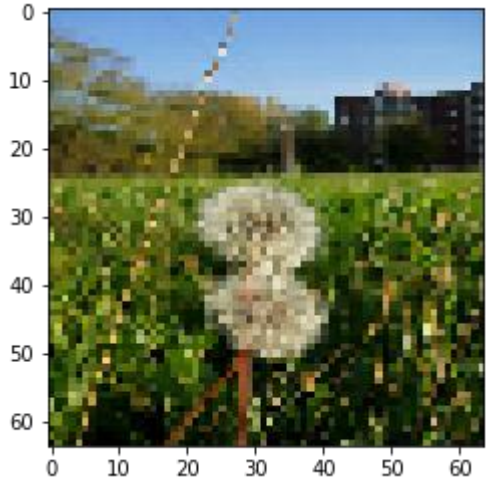
8 TestingtheModel

```
training_set.class_indices


classes =
['Daisy','Dandelion','Rose','Sunflower','Tulip']deftesting
(img):
    img =
    image.load_img(img,target_size=(64,64))x =
    image.img_to_array(img)
    x=np.expand_dims(x,axis=0)
    pred = np.argmax(model.predict(x))
    returnprint("Predictedclassas:",classes[pred])

defimg_show(img):
    img1 =
    image.load_img(img,target_size=(64,64))plt.ims
    how(img1)


#test1
img_show('/content/flowers/sunflower/12471443383_b71e7a7480_m.jpg')
testing('/content/flowers/sunflower/12471443383_b71e7a7480_m.jpg')
```

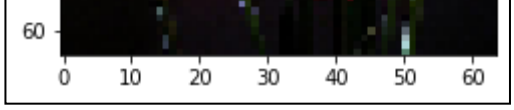



```
#test3
img_show('/content/flowers/dandelion/2116997627_30fed84e53_m.jpg')
testing('/content/flowers/dandelion/2116997627_30fed84e53_m.jpg')
```

```
Predicted class as: Daisy
```




```
#test4
img_show('/content/flowers/daisy/1314069875_da8dc023c6_m.jpg')
testing('/content/flowers/daisy/1314069875_da8dc023c6_m.jpg')
```



Conclusion:

Thedatasethasabout4317imagesfrom5differentclasses.

1. Eachclasseshavemorethan500imagesfortrainingthedata.
2. 30%ofthedatatakenforvalidation.
3. Theaccuracyofthemodelisaround80%.
4. Thevalidationaccuracyisaround70%.
5. Themodelisbuiltwith2layeredconvolutionalnetworkconsidering1344trainableparameters.
6. Testingthemodelwithunknownimagesgives95%accuracy.