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# Assignment 3 - Build CNN Model For Classification Of Flowers

1. Unzip dataset

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

Archive: /content/Flowers-Dataset.zip



inflating: flowers/daisy/100080576\_f52e8ee070\_n.jpg inflating: flowers/daisy/10140303196\_b88d3d6cec.jpg

inflating: flowers/daisy/10172379554\_b296050f82\_n.jpg inflating: flowers/daisy/10172567486\_2748826a8b.jpg

inflating: flowers/daisy/10172636503\_21bededa75\_n.jpg inflating: flowers/daisy/102841525\_bd6628ae3c.jpg

inflating: flowers/daisy/10300722094\_28fa978807\_n.jpg

inflating: flowers/daisy/1031799732\_e7f4008c03.jpg

inflating: flowers/daisy/10391248763\_1d16681106\_n.jpg inflating: flowers/daisy/10437754174\_22ec990b77\_m.jpg inflating: flowers/daisy/10437770546\_8bb6f7bdd3\_m.jpg inflating: flowers/daisy/10437929963\_bc13eebe0c.jpg

inflating: flowers/daisy/10466290366\_cc72e33532.jpg inflating: flowers/daisy/10466558316\_a7198b87e2.jpg inflating: flowers/daisy/10555749515\_13a12a026e.jpg inflating: flowers/daisy/10555815624\_dc211569b0.jpg

inflating: flowers/daisy/10555826524\_423eb8bf71\_n.jpg inflating: flowers/daisy/10559679065\_50d2b16f6d.jpg

inflating: flowers/daisy/105806915\_a9c13e2106\_n.jpg inflating: flowers/daisy/10712722853\_5632165b04.jpg inflating: flowers/daisy/107592979\_aaa9cdfe78\_m.jpg

inflating: flowers/daisy/10770585085\_4742b9dac3\_n.jpg inflating: flowers/daisy/10841136265\_af473efc60.jpg

inflating: flowers/daisy/10993710036\_2033222c91.jpg

inflating: flowers/daisy/10993818044\_4c19b86c82.jpg inflating: flowers/daisy/10994032453\_ac7f8d9e2e.jpg inflating: flowers/daisy/11023214096\_b5b39fab08.jpg

inflating: flowers/daisy/11023272144\_fce94401f2\_m.jpg inflating: flowers/daisy/11023277956\_8980d53169\_m.jpg inflating: flowers/daisy/11124324295\_503f3a0804.jpg

inflating: flowers/daisy/1140299375\_3aa7024466.jpg inflating: flowers/daisy/11439894966\_dca877f0cd.jpg

inflating: flowers/daisy/1150395827\_6f94a5c6e4\_n.jpg inflating: flowers/daisy/11642632\_1e7627a2cc.jpg

inflating: flowers/daisy/11834945233\_a53b7a92ac\_m.jpg

inflating: flowers/daisy/11870378973\_2ec1919f12.jpg

inflating: flowers/daisy/11891885265\_ccefec7284\_n.jpg inflating: flowers/daisy/12193032636\_b50ae7db35\_n.jpg inflating: flowers/daisy/12348343085\_d4c396e5b5\_m.jpg inflating: flowers/daisy/12585131704\_0f64b17059\_m.jpg inflating: flowers/daisy/12601254324\_3cb62c254a\_m.jpg inflating: flowers/daisy/1265350143\_6e2b276ec9.jpg



inflating: flowers/daisy/12701063955\_4840594ea6\_n.jpg inflating: 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.jpg inflating: flowers/daisy/1306119996\_ab8ae14d72\_n.jpg inflating: flowers/daisy/1314069875\_da8dc023c6\_m.jpg inflating: flowers/daisy/1342002397\_9503c97b49.jpg

inflating: flowers/daisy/134409839\_71069a95d1\_m.jpg inflating: flowers/daisy/1344985627\_c3115e2d71\_n.jpg

inflating: flowers/daisy/13491959645\_2cd9df44d6\_n.jpg inflating: flowers/daisy/1354396826\_2868631432\_m.jpg inflating: flowers/daisy/1355787476\_32e9f2a30b.jpg

inflating: flowers/daisy/13583238844\_573df2de8e\_m.jpg inflating: flowers/daisy/1374193928 a52320eafa.jpg

# Importing Necessary Libraries

import warnings

warnings.filterwarnings("ignore")

import numpy as np

import matplotlib.pyplot as plt import pandas as pd

from tensorflow.keras.models import Sequential

from tensorflow.keras.layers import Dense,Activation,Dropout,Conv2D,Flatten,MaxPool2D,Resh from tensorflow.keras.applications.resnet50 import ResNet50

from tensorflow.keras.applications.resnet50 import preprocess\_input from tensorflow.keras.preprocessing import image

from tensorflow.keras.preprocessing.image import ImageDataGenerator,load\_img,img\_to\_array from 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\_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. 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,activation='relu')) model.add(MaxPool2D(pool\_size=2,strides=2))

model.add(Dropout(0.2))

#Flattening the images model.add(Flatten())

#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 #

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 |

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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=0.00001)

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')

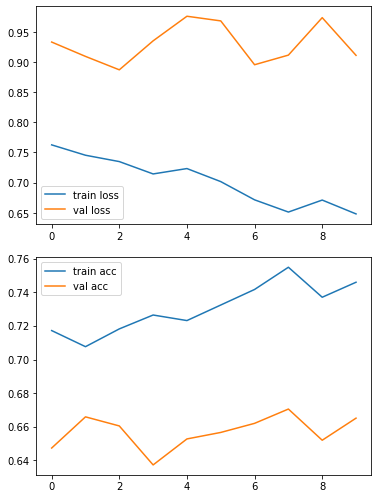
plt.plot(result.history['val\_loss'], label='val loss') plt.legend()

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()



7. Saving the Model

model.save('daisy.h5')

8. Testing the Model

training\_set.class\_indices

classes = ['Daisy','Dandelion','Rose','Sunflower','Tulip'] def testing(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))

return print("Predicted class as:",classes[pred])

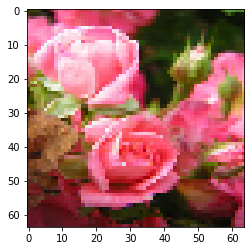
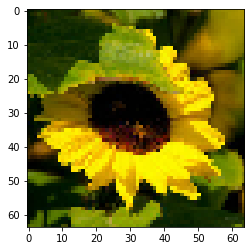
def img\_show(img):

img1 = image.load\_img(img,target\_size=(64,64)) plt.imshow(img1)

#test1

img\_show('/content/flowers/sunflower/12471443383\_b71e7a7480\_m.jpg') testing('/content/flowers/sunflower/12471443383\_b71e7a7480\_m.jpg')

Predicted class as: Sunflower



#test2

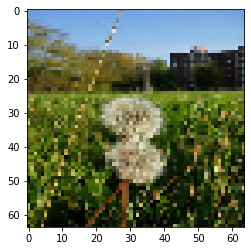
img\_show('/content/flowers/rose/323872063\_7264e7e018\_m.jpg') testing('/content/flowers/rose/323872063\_7264e7e018\_m.jpg')

Predicted class as: Rose

#test3

img\_show('/content/flowers/dandelion/2116997627\_30fed84e53\_m.jpg') testing('/content/flowers/dandelion/2116997627\_30fed84e53\_m.jpg')

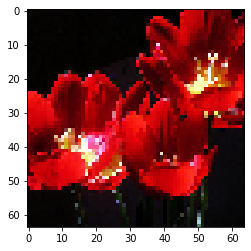
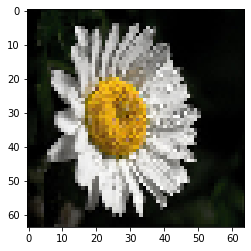
Predicted class as: Daisy



#test4

img\_show('/content/flowers/daisy/1314069875\_da8dc023c6\_m.jpg') testing('/content/flowers/daisy/1314069875\_da8dc023c6\_m.jpg')

Predicted class as: Daisy



#test5

img\_show('/content/flowers/tulip/132538273\_335240fe5b\_n.jpg') testing('/content/flowers/tulip/132538273\_335240fe5b\_n.jpg')

Predicted class as: Tulip

**Conclusion:**

**The dataset has about 4317 images from 5 different classes.**

* 1. Each classes have more than 500 images for training the data.
  2. 30% of the data taken for validation.
  3. The accuracy of the model is around 80%.
  4. The validation accuracy is around 70%.
  5. The model is built with 2 layered convolutional network considering 1344 trainable parameters.
  6. Testing the model with unknown images gives 95% accuracy.