# 1. Downloading Dataset

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

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.
```

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

```
Archive:  /content/drive/MyDrive/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
```

## 2.DATA AUGMENTATION

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,vertic
```

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

```
pip install split-folders
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
Collecting split-folders
  Downloading split_folders-0.5.1-py3-none-any.whl (8.4 kB)
Installing collected packages: split-folders
Successfully installed split-folders-0.5.1
```

```
import splitfolders
```

```
input_folder='/content/drive/MyDrive/flowers'
```

```
splitfolders.ratio(input_folder,output='/content/drive/MyDrive/flowersdataset',ratio=(.8,0
```

```
Copying files: 4317 files [00:37, 114.37 files/s]
```

```
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/flowersdataset/train",t
```

```
Found 3452 images belonging to 5 classes.
```

```
x_test=test_datagen.flow_from_directory(r"/content/drive/MyDrive/flowersdataset/test",targ
```

```
Found 865 images belonging to 5 classes.
```

```
x_train.class_indices
```

```
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
```

## 3. CNN Model Training

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D, MaxPooling2D, Flatten, Dense
```

```
model = Sequential()
model.add(Convolution2D(32,(3,3),activation='relu',input_shape=(64,64,3)))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(5,activation='softmax'))
```

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

```
model.fit_generator(x_train,
                    steps_per_epoch=len(x_train),
                    epochs=10,
                    validation_data=x_test,
                    validation_steps=len(x_test))
```

```
Epoch 1/10
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5: UserWarning: `Model.
  """
144/144 [==============================] - 20s 129ms/step - loss: 1.2963 - accuracy:
Epoch 2/10
144/144 [==============================] - 19s 135ms/step - loss: 1.0504 - accuracy:
Epoch 3/10
144/144 [==============================] - 18s 128ms/step - loss: 0.9348 - accuracy:
Epoch 4/10
144/144 [==============================] - 18s 128ms/step - loss: 0.8510 - accuracy:
Epoch 5/10
144/144 [==============================] - 19s 135ms/step - loss: 0.7922 - accuracy:
Epoch 6/10
144/144 [==============================] - 18s 128ms/step - loss: 0.7572 - accuracy:
Epoch 7/10
144/144 [==============================] - 19s 129ms/step - loss: 0.6867 - accuracy:
Epoch 8/10
144/144 [==============================] - 19s 130ms/step - loss: 0.6385 - accuracy:
Epoch 9/10
144/144 [==============================] - 19s 133ms/step - loss: 0.6001 - accuracy:
Epoch 10/10
144/144 [==============================] - 19s 134ms/step - loss: 0.5564 - accuracy:
<keras.callbacks.History at 0x7f1312279f10>
```

## 4. SAVING MODEL

```
model.save('flowers.h5')
```

## 5. TESTING MODEL

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

```
img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f321486
img
```

```
img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f321486
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
x_train.class_indices
index=['daisy','dandellion','rose','sunflower','tulip']
index[y[0]]
```

```
1/1 [==============================] - 0s 84ms/step
'rose'
```

```
import numpy as np
from tensorflow.keras.preprocessing import image
```

```
img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/99306615_739eb94b9e_
img
```

```
x_train.class_indices
```

```
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
```

## 6. TUNING MODEL

```
from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau


early_stop = EarlyStopping(monitor='val_accuracy',
                           patience=5)

lr = ReduceLROnPlateau(monitor='val_accuracy',
                       factor=0.5,
                       patience=5,
                       min_lr=0.00001)

callbacks = [early_stop,lr]


model.fit_generator(x_train,
                    steps_per_epoch=len(x_train),
                    epochs=100,
                    callbacks=callbacks,
                    validation_data=x_test,
                    validation_steps=len(x_test),)
```

```
Epoch 1/100
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: UserWarning: `Model.

144/144 [==============================] - 19s 135ms/step - loss: 0.5171 - accuracy:
Epoch 2/100
144/144 [==============================] - 20s 140ms/step - loss: 0.4628 - accuracy:
Epoch 3/100
144/144 [==============================] - 19s 132ms/step - loss: 0.4644 - accuracy:
Epoch 4/100
144/144 [==============================] - 18s 127ms/step - loss: 0.4082 - accuracy:
Epoch 5/100
144/144 [==============================] - 19s 130ms/step - loss: 0.4006 - accuracy:
Epoch 6/100
144/144 [==============================] - 18s 128ms/step - loss: 0.3706 - accuracy:
Epoch 7/100
144/144 [==============================] - 19s 134ms/step - loss: 0.3145 - accuracy:
Epoch 8/100
144/144 [==============================] - 19s 129ms/step - loss: 0.2842 - accuracy:
Epoch 9/100
144/144 [==============================] - 21s 143ms/step - loss: 0.2798 - accuracy:
Epoch 10/100
144/144 [==============================] - 18s 127ms/step - loss: 0.2708 - accuracy:
Epoch 11/100
144/144 [==============================] - 18s 128ms/step - loss: 0.2472 - accuracy:
Epoch 12/100
144/144 [==============================] - 18s 127ms/step - loss: 0.2354 - accuracy:
Epoch 13/100
144/144 [==============================] - 18s 127ms/step - loss: 0.2039 - accuracy:
<keras.callbacks.History at 0x7f1312037a10>
```

```
x_train.class_indices
```

```
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
```

```
img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f32148
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
x_train.class_indices
index=['daisy','dandellion','rose','sunflower','tulip']
index[y[0]]
```

```
1/1 [==============================] - 0s 17ms/step
'daisy'
```

```
op = ['daisy','dandelion','rose','sunflower','tulip']
pred = np.argmax(model.predict(x))
op[pred]
```

```
1/1 [==============================] - 0s 16ms/step
'daisy'
```