Import and Unzip the Dataset

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

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

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

```
  inflating: flowers/tulip/7481217920_6f65766a1c_n.jpg
  inflating: flowers/tulip/779359602_30abcbf5bb_n.jpg
  inflating: flowers/tulip/8394186551_28eed83a94_m.jpg
  inflating: flowers/tulip/8454707381_453b4862eb_m.jpg
  inflating: flowers/tulip/8454719295_4276c0e9c5_n.jpg
  inflating: flowers/tulip/8511683706_4173683d45_m.jpg
  inflating: flowers/tulip/8520482921_21dd204ebd_n.jpg
  inflating: flowers/tulip/8520488975_a50d377f91.jpg
  inflating: flowers/tulip/8521597402_4b6169ba05.jpg
  inflating: flowers/tulip/8523133474_d2c0845b54.jpg
  inflating: flowers/tulip/8555123165_2fe57eff4f.jpg
  inflating: flowers/tulip/8572847041_d0cc07861f_n.jpg
  inflating: flowers/tulip/8585101979_4398146bf1_n.jpg
  inflating: flowers/tulip/8585102511_fc452e6700_n.jpg
  inflating: flowers/tulip/8585102913_d80d3e2ff7_n.jpg
  inflating: flowers/tulip/8585103457_d64697c3cf_n.jpg
  inflating: flowers/tulip/8586204750_2891bd2ec9_n.jpg
  inflating: flowers/tulip/8586205446_8953a6c70e_n.jpg
  inflating: flowers/tulip/8586205946_cda045f3f8_n.jpg
  inflating: flowers/tulip/8601596054_33e40c2a7a.jpg
  inflating: flowers/tulip/8614237582_74417799f4_m.jpg
  inflating: flowers/tulip/8619064872_dea79a9eb9.jpg
  inflating: flowers/tulip/8623170936_83f4152431.jpg
  inflating: flowers/tulip/8623173256_3f0eb4c506.jpg
  inflating: flowers/tulip/8659691170_09db83d023.jpg
  inflating: flowers/tulip/8668973377_c69527db42_m.jpg
  inflating: flowers/tulip/8668974855_8389ecbdca_m.jpg
  inflating: flowers/tulip/8669794378_97dda6036f_n.jpg
  inflating: flowers/tulip/8673412732_f8fd690ee4_n.jpg
  inflating: flowers/tulip/8673416166_620fc18e2f_n.jpg
  inflating: flowers/tulip/8673416556_639f5c88f1_n.jpg
  inflating: flowers/tulip/8681825637_837a63513a_n.jpg
  inflating: flowers/tulip/8686013485_3c4dfbfd1f_n.jpg
  inflating: flowers/tulip/8686332852_c6dcb2e86b.jpg
  inflating: flowers/tulip/8687675254_c93f50d8b0_m.jpg
  inflating: flowers/tulip/8690789564_394eb04982_n.jpg
  inflating: flowers/tulip/8690791226_b1f015259f_n.jpg
  inflating: flowers/tulip/8702982836_75222725d7.jpg
  inflating: flowers/tulip/8708209606_d3aede4801.jpg
  inflating: flowers/tulip/8708856019_f3be2353a4_n.jpg
  inflating: flowers/tulip/8710148289_6fc196a0f8_n.jpg
  inflating: flowers/tulip/8711277462_b43df5454b_m.jpg
```

```
      inflating: flowers/tulip/8712230357_1298b8513b.jpg  
      inflating: flowers/tulip/8712243901_54d686319e_m.jpg  
      inflating: flowers/tulip/8712244311_da8e90bf8e_n.jpg  
      inflating: flowers/tulip/8712263493_3db76c5f82.jpg  
      inflating: flowers/tulip/8712266605_3787e346cd_n.jpg  
      inflating: flowers/tulip/8712267391_c756f18ee7_n.jpg  
      inflating: flowers/tulip/8712267813_f7a9be2ec5.jpg  
      inflating: flowers/tulip/8712268519_f4c2c39a06_n.jpg  
      inflating: flowers/tulip/8712269349_2b933da2b8_n.jpg  
      inflating: flowers/tulip/8712270665_57b5bda0a2_n.jpg  
      inflating: flowers/tulip/8713388322_e5ae26263b_n.jpg  
      inflating: flowers/tulip/8713389178_66bceb71a8_n.jpg  
      inflating: flowers/tulip/8713391394_4b679ea1e3_n.jpg  
      inflating: flowers/tulip/8713392604_90631fb809_n.jpg  
      inflating: flowers/tulip/8713397694_bcbcbba2c2_n.jpg  
      inflating: flowers/tulip/8713398114_bc96f1b624_n.jpg  
```

Image Augmentation

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

```
#Data augmentation on training variable
train_datagen = ImageDataGenerator(rescale=1./255,
                                   zoom_range=0.2,
                                   horizontal_flip=True)
```

```
#Data augmentation on testing variable
test_datagen = ImageDataGenerator(rescale=1./255)
```

```
#Data augmentation on training data
xtrain = train_datagen.flow_from_directory('/content/flowers',
                                           target_size=(64,64),
                                           class_mode='categorical',
                                           batch_size=100)
```

```
Found 3384 images belonging to 5 classes.
```

Import Layers

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

Add CNN Layers

```
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'))
```

Compile the Model

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

```
model.fit(xtrain,steps_per_epoch=len(xtrain),epochs=10)
```

```
Epoch 1/10
34/34 [==============================] - 23s 646ms/step - loss: 1.7948 - accuracy: 0.348
Epoch 2/10
34/34 [==============================] - 22s 644ms/step - loss: 1.1695 - accuracy: 0.526
Epoch 3/10
34/34 [==============================] - 22s 641ms/step - loss: 1.0633 - accuracy: 0.582
Epoch 4/10
34/34 [==============================] - 26s 759ms/step - loss: 1.0108 - accuracy: 0.605
Epoch 5/10
34/34 [==============================] - 22s 637ms/step - loss: 0.9663 - accuracy: 0.628
Epoch 6/10
34/34 [==============================] - 22s 642ms/step - loss: 0.8937 - accuracy: 0.666
Epoch 7/10
34/34 [==============================] - 22s 637ms/step - loss: 0.8554 - accuracy: 0.682
Epoch 8/10
34/34 [==============================] - 22s 644ms/step - loss: 0.8235 - accuracy: 0.684
Epoch 9/10
34/34 [==============================] - 22s 643ms/step - loss: 0.7987 - accuracy: 0.702
Epoch 10/10
34/34 [==============================] - 22s 639ms/step - loss: 0.7775 - accuracy: 0.701
<keras.callbacks.History at 0x7fdc3ba7b090>
```

Save Model

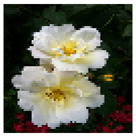
```
model.save('flowers.h5')
```

Testing Model

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

Testdata:Daisy

```
img = image.load_img('/content/flowers/rose/10090824183_d02c613f10_m.jpg',target_size=(64,64)
img
```



```
x = image.img_to_array(img)
x
```

```
array([[[14., 22.,  7.],
        [11., 22.,  6.],
        [ 8., 19.,  3.],
        ...,
        [32., 47., 24.],
        [30., 48., 22.],
        [33., 49., 23.]],

       [[13., 20., 12.],
        [11., 21., 10.],
        [11., 22.,  8.],
        ...,
        [37., 51., 26.],
        [35., 49., 26.],
        [25., 45., 20.]],

       [[19., 30., 16.],
        [19., 31., 17.],
        [16., 29., 12.],
        ...,
        [31., 47., 20.],
        [28., 49., 18.],
        [27., 43., 17.]],

       ...,

       [[15., 17.,  6.],
        [ 2.,  9.,  2.],
        [ 2.,  9.,  1.],
        ...,
        [ 8., 21., 11.],
        [ 2., 12.,  3.],
        [ 9., 16.,  9.]],
       [[12., 20.,  9.],
        [ 1.,  8.,  1.],
        [ 5., 10.,  3.],
        ...,
        [ 3.,  8.,  2.],
        [ 6., 16.,  5.],
        [ 5.,  7.,  4.]],

       [[24., 27., 18.],
        [11., 21., 13.],
        [ 8., 13.,  6.],
        ...,
        [ 1.,  6.,  0.],
        [ 2.,  9.,  1.],
        [ 2.,  9.,  1.]]], dtype=float32)
```

```
x = np.expand_dims(x,axis=0)
x
model.predict(x)
```

```
     array([[1., 0., 0., 0., 0.]], dtype=float32)
```

```
xtrain.class_indices
```

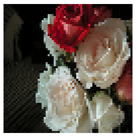
```
     {'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
```

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

```
     'daisy'
```

Test data:Rose

```
img = image.load_img('/content/flowers/rose/102501987_3cdb8e5394_n.jpg',target_size=(64,64))
img
```

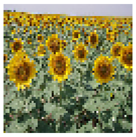


```
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
outp[pred]
```

```
    'rose'
```

Test data:Sunflower

```
img = image.load_img('/content/flowers/sunflower/1022552036_67d33d5bd8_n.jpg',target_size=(64
img
```

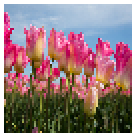


```
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
outp[pred]
```

```
    'sunflower'
```

Test data:Tulip

```
img = image.load_img('/content/flowers/tulip/10128546863_8de70c610d.jpg',target_size=(64,64))
img
```



```
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
outp[pred]
```

```
    'tulip'
```

Test data:Dandelion

```
img = image.load_img('/content/flowers/dandelion/11405573_24a8a838cc_n.jpg',target_size=(64,6
img
```

```
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
outp[pred]
```

```
'dandelion'
```