

CNN MODEL FOR CLASSIFICATION OF FLOWERS

1. *DOWNLOAD THE DATA SET*

```
In [ ]: from google.colab import drive
drive.mount('/content/drive')
```

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).

```
In [ ]: cd/content/drive/MyDrive

/content/drive/MyDrive
```

```
In [ ]: !unzip '/content/drive/MyDrive/IBM_PROJECT/Flowers-Dataset.zip'

Archive: /content/drive/MyDrive/IBM_PROJECT/Flowers-Dataset.zip
replace flowers/daisy/100080576_f52e8ee070_n.jpg? [y]es, [n]o, [A]ll, [N]one, [r]ename:
```

2. *IMAGE AUGMENTATION*

```
In [ ]: from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
In [ ]: train_datagen=ImageDataGenerator(rescale=1./255, zoom_range=0.2, horizontal_flip=True, vertical_flip=False)
```

```
In [ ]: test_datagen=ImageDataGenerator(rescale=1./255)
```

```
In [ ]: pip install split-folders

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
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
```

```
In [ ]: import splitfolders
```

```
In [ ]: input_folder='/content/drive/MyDrive/flowers'
```

```
In [ ]: splitfolders.ratio(input_folder, output='/content/drive/MyDrive/flowersdataset', ratio=(.8, 0.2), group_prefix=None)
```

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```
In [ ]: x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/flowersdataset/train",target_size=(64,64),class_mode='categorical',batch_size=24)
Found 3452 images belonging to 5 classes.

In [ ]: x_test=test_datagen.flow_from_directory(r"/content/drive/MyDrive/flowersdataset/test",target_size=(64,64),class_mode='categorical',batch_size=24)
Found 865 images belonging to 5 classes.

In [ ]: x_train.class_indices

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

3. *CREATE MODEL*

```
In [ ]: from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten

In [ ]: model=Sequential()
```

4. *ADD LAYERS(CONVOLUTION, MAX POOLING, FLATTEN, DENSE, HIDDEN, OUTPUT LAYERS)*

```
In [ ]: #Adding Convolutional Layer
model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
```

```
In [ ]: #Adding Pooling Layer
model.add(MaxPooling2D(pool_size=(2,2)))
```

```
In [ ]: #Flatten Layer
model.add(Flatten())
```

```
In [ ]: model.summary()
```

```
Model: "sequential"

```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 62, 62, 32)	896
max_pooling2d (MaxPooling2D)	(None, 31, 31, 32)	0
flatten (Flatten)	(None, 30752)	0

```

Total params: 896
Trainable params: 896
Non-trainable params: 0

```

```
In [ ]: #Hidden Layers
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

```
In [ ]: #Output Layer
model.add(Dense(5,activation='softmax'))
```

5. COMPILE THE MODEL

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

```
In [ ]: len(x_train)
```

```
Out[ ]: 144
```

6. *FIT THE MODEL*

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

Epoch 1/10
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.
  """Entry point for launching an IPython kernel.
144/144 [=====] - 18s 126ms/step - loss: 0.7712 - accuracy: 0.7086 - val_loss: 0.9611 - val_accuracy: 0.6277
Epoch 2/10
144/144 [=====] - 18s 127ms/step - loss: 0.7241 - accuracy: 0.7219 - val_loss: 1.0017 - val_accuracy: 0.6358
Epoch 3/10
144/144 [=====] - 18s 127ms/step - loss: 0.6713 - accuracy: 0.7390 - val_loss: 0.9800 - val_accuracy: 0.6566
Epoch 4/10
144/144 [=====] - 18s 126ms/step - loss: 0.6496 - accuracy: 0.7584 - val_loss: 0.9857 - val_accuracy: 0.6347
Epoch 5/10
144/144 [=====] - 18s 126ms/step - loss: 0.5961 - accuracy: 0.7758 - val_loss: 1.3042 - val_accuracy: 0.5977
Epoch 6/10
144/144 [=====] - 19s 134ms/step - loss: 0.5691 - accuracy: 0.7848 - val_loss: 1.1743 - val_accuracy: 0.6486
Epoch 7/10
144/144 [=====] - 18s 125ms/step - loss: 0.5266 - accuracy: 0.8065 - val_loss: 1.0406 - val_accuracy: 0.6624
Epoch 8/10
144/144 [=====] - 18s 124ms/step - loss: 0.4916 - accuracy: 0.8166 - val_loss: 1.1685 - val_accuracy: 0.6277
Epoch 9/10
144/144 [=====] - 18s 124ms/step - loss: 0.4605 - accuracy: 0.8294 - val_loss: 1.2157 - val_accuracy: 0.6451
Epoch 10/10
144/144 [=====] - 18s 124ms/step - loss: 0.4216 - accuracy: 0.8453 - val_loss: 1.3665 - val_accuracy: 0.6162
```

Out[]:

7. *** SAVE THE MODEL***

```
In [ ]: model.save('flowers.h5')
```

8. *** TEST THE MODEL***

```
In [ ]: import numpy as np
        from tensorflow.keras.models import load_model
        from tensorflow.keras.preprocessing import image
```

```
In [ ]: #img = image.load_img(r"/content/drive/MyDrive/cnn/flowers/rose/10503217854_e66a804309.jpg")
img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f3214862_n.jpg",target_size=(128,128))
img
```



```
In [ ]: img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f3214862_n.jpg",target_size=(64,64))
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','dandelion','rose','sunflower','tulip']
index[y[0]]
```

Out[]: 'daisy'

```
In [ ]: import numpy as np
        from tensorflow.keras.preprocessing import image
```

```
In [ ]: img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/99306615_739eb94b9e_m.jpg",target_size=(240,240))
img
```



Array Conversion

```
In [ ]: x = image.img_to_array(img)
        x
```

```
Out[ ]: array([[128., 123.,  94.],
               [131., 126.,  97.],
               [131., 126.,  97.],
               ...,
               [ 46.,  77.,  17.],
               [ 46.,  77.,  17.],
               [ 46.,  75.,  17.]],

            [[124., 119.,  89.],
             [128., 123.,  94.],
             [128., 123.,  94.],
             ...,
             [ 44.,  73.,  15.],
             [ 44.,  73.,  15.],
             [ 43.,  70.,  17.]],

            [[119., 116.,  85.],
             [125., 121.,  92.],
             [125., 121.,  92.],
             ...,
             [ 43.,  70.,  17.],
             [ 43.,  70.,  17.],
             [ 43.,  67.,  19.]],

            ...,

            [[ 49.,  56.,  14.],
             [119., 112.,  58.],
             [119., 112.,  58.],
             ...,
             [ 94., 131.,  62.],
             [ 94., 131.,  62.],
             [ 79., 121.,  37.]],

            [[ 88.,  86.,  38.],
             [126., 114.,  66.],
             [126., 114.,  66.],
             ...,
             [ 91., 125.,  64.],
             [ 91., 125.,  64.],
             [ 82., 120.,  45.]],

            [[110.,  97.,  63.],
             [121., 105.,  79.],
             [121., 105.,  79.],
             ...,
             [ 80., 111.,  52.],
             [ 80., 111.,  52.],
             [ 63.,  98.,  30.]])], dtype=float32)
```

```
In [ ]: x = np.expand_dims(x,axis=0)
        x
```

```
Out[ ]: array([[[[128., 123.,  94.],
                  [131., 126.,  97.],
                  [131., 126.,  97.],
                  ...,
                  [ 46.,  77.,  17.],
                  [ 46.,  77.,  17.],
                  [ 46.,  75.,  17.]],

                 [[124., 119.,  89.],
                  [128., 123.,  94.],
                  [128., 123.,  94.],
                  ...,
                  [ 44.,  73.,  15.],
                  [ 44.,  73.,  15.],
                  [ 43.,  70.,  17.]],

                 [[119., 116.,  85.],
                  [125., 121.,  92.],
                  [125., 121.,  92.],
                  ...,
                  [ 43.,  70.,  17.],
                  [ 43.,  70.,  17.],
                  [ 43.,  67.,  19.]],

                 ...,

                 [[ 49.,  56.,  14.],
                  [119., 112.,  58.],
                  [119., 112.,  58.],
                  ...,
                  [ 94., 131.,  62.],
                  [ 94., 131.,  62.],
                  [ 79., 121.,  37.]],

                 [[ 88.,  86.,  38.],
                  [126., 114.,  66.],
                  [126., 114.,  66.],
                  ...,
                  [ 91., 125.,  64.],
                  [ 91., 125.,  64.],
                  [ 82., 120.,  45.]],

                 [[110.,  97.,  63.],
                  [121., 105.,  79.],
                  [121., 105.,  79.],
                  ...,
                  [ 80., 111.,  52.],
                  [ 80., 111.,  52.],
                  [ 63.,  98.,  30.]]]])], dtype=float32)
```

PREDICTION

```
In [ ]: from keras.callbacks import EarlyStopping, ReduceLROnPlateau
```

```
early_stopping = EarlyStopping(monitor='val_accuracy',
                                patience=5)
reduce_lr = ReduceLROnPlateau(monitor='val_accuracy',
                                patience=5,
                                factor=0.5,min_lr=0.00001)

callback = [reduce_lr,early_stopping]
```

```
In [ ]: model.fit_generator(x_train,
                            steps_per_epoch=len(x_train),
                            epochs=10,
                            callbacks=callback,
                            validation_data=x_test,
                            validation_steps=len(x_test))
```

Epoch 1/10

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.

```
144/144 [=====] - 18s 124ms/step - loss: 0.3998 - accuracy: 0.8546 - val_loss: 1.1986 - val_accuracy: 0.6474 - lr: 0.0010
Epoch 2/10
144/144 [=====] - 18s 124ms/step - loss: 0.3423 - accuracy: 0.8743 - val_loss: 1.2779 - val_accuracy: 0.6520 - lr: 0.0010
Epoch 3/10
144/144 [=====] - 18s 123ms/step - loss: 0.3601 - accuracy: 0.8746 - val_loss: 1.3240 - val_accuracy: 0.6751 - lr: 0.0010
Epoch 4/10
144/144 [=====] - 18s 124ms/step - loss: 0.3210 - accuracy: 0.8833 - val_loss: 1.3387 - val_accuracy: 0.6543 - lr: 0.0010
Epoch 5/10
144/144 [=====] - 18s 124ms/step - loss: 0.2878 - accuracy: 0.9009 - val_loss: 1.6106 - val_accuracy: 0.6046 - lr: 0.0010
Epoch 6/10
144/144 [=====] - 18s 124ms/step - loss: 0.2683 - accuracy: 0.9047 - val_loss: 1.3772 - val_accuracy: 0.6647 - lr: 0.0010
Epoch 7/10
144/144 [=====] - 18s 125ms/step - loss: 0.2607 - accuracy: 0.9122 - val_loss: 1.4208 - val_accuracy: 0.6647 - lr: 0.0010
Epoch 8/10
144/144 [=====] - 18s 125ms/step - loss: 0.2459 - accuracy: 0.9163 - val_loss: 1.4632 - val_accuracy: 0.6532 - lr: 0.0010
```

Out[]:

```
In [ ]: x_train.class_indices
```

Out[]: {'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}

```
In [ ]: img=image.load_img(r"/content/drive/MyDrive/flowersdataset/test/daisy/3706420943_66f3214862_n.jpg",target_size=(64,64))
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','dandelion','rose','sunflower','tulip']
index[y[0]]
```

Out[]: 'daisy'

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

Out[]: 'daisy'