ASSIGNMENT 3

Importing the libraries

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense

from tensorflow.keras.layers import Convolution2D
from tensorflow.keras.layers import MaxPooling2D
from tensorflow.keras.layers import Flatten

#import the preprocess library of image
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

Image Augmentation

```
train_datagen = ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True,vertical_flip=True)
#rescale =  pixel value rescaling to 0 to 1 from 0 to 255
#shear_range => counter clock wise rotation(anti clock)

test_datagen  = ImageDataGenerator(rescale=1./255)

#load your images data

#load your images data

x_train = train_datagen.flow_from_directory(r"D:\IBM project\Flowers-Dataset\dataset\Training",target_size=(128,128),batch_size=32,class_mode="categorical")
```

Found 3457 images belonging to 5 classes.

```
x_test = test_datagen.flow_from_directory(r"D:\IBM project\Flowers-Dataset\dataset\Testing",target_size=(128,128),batch_size=32,class_mode="categorical")
```

Found 860 images belonging to 5 classes.

```
x_train.class_indices
```

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

Create Model

```
#initialize the model
model = Sequential()
```

Add Layers (Convolution,MaxPooling,Flatten,Dense-(Hidden Layers),Output)

```
#add convlution layer
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
# 32 => no of feature detectors
#(3,3)=> kernel size(feature detector size => 3*3 matrix)

#add maxpooling layer
model.add(MaxPooling2D(pool_size=(2,2)))
```

```
# you can add more convolutiona and pooling layers
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))

#flatten layer => input layer to your ANN
model.add(Flatten())

#hidden layers
model.add(Dense(units=500,kernel_initializer="random_uniform",activation="relu"))
model.add(Dense(units=200,kernel_initializer="random_uniform",activation="relu"))
model.add(Dense(units=300,kernel_initializer="random_uniform",activation="relu"))
model.add(Dense(units=400,kernel_initializer="random_uniform",activation="relu"))

#output layer
model.add(Dense(units=5,kernel_initializer="random_uniform",activation="softmax"))
```

Compile The Model

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

Fit The Model

```
#train the model
model.fit(x_train,steps_per_epoch=109,epochs=25,validation_data=x_test,validation_steps=27)
#steps_per_epoch = no of train images/batch size
#validation_steps = no of test images/batch size
```

```
Epoch 1/25
109/109 [==============================] - 93s 822ms/step - loss: 1.3275 - accuracy: 0.3908 -
val_loss: 1.7720 - val_accuracy: 0.3081
Epoch 2/25
109/109 [==============================] - 83s 762ms/step - loss: 1.2066 - accuracy: 0.4631 -
val_loss: 1.2472 - val_accuracy: 0.4221
Epoch 3/25
109/109 [==============================] - 83s 762ms/step - loss: 1.0958 - accuracy: 0.5270 -
val_loss: 1.1586 - val_accuracy: 0.5256
Epoch 4/25
109/109 [==============================] - 92s 843ms/step - loss: 1.0594 - accuracy: 0.5733 -
val_loss: 1.1411 - val_accuracy: 0.5384
Epoch 5/25
109/109 [==============================] - 88s 803ms/step - loss: 0.9549 - accuracy: 0.6225 -
val_loss: 1.1228 - val_accuracy: 0.5430
Epoch 6/25
109/109 [==============================] - 84s 765ms/step - loss: 0.8991 - accuracy: 0.6402 -
val_loss: 1.0456 - val_accuracy: 0.5709
Epoch 7/25
109/109 [==============================] - 89s 811ms/step - loss: 0.8736 - accuracy: 0.6575 -
val_loss: 1.1910 - val_accuracy: 0.5802
Epoch 8/25
109/109 [==============================] - 87s 794ms/step - loss: 0.9027 - accuracy: 0.6468 -
val_loss: 1.0589 - val_accuracy: 0.6070
Epoch 9/25
109/109 [==============================] - 86s 788ms/step - loss: 0.8072 - accuracy: 0.6882 -
val_loss: 1.0385 - val_accuracy: 0.6163
Epoch 10/25
```

```
109/109 [==============================] - 90s 820ms/step - loss: 0.7578 - accuracy: 0.7102 -
val_loss: 1.1246 - val_accuracy: 0.5872
Epoch 11/25
109/109 [==============================] - 84s 772ms/step - loss: 0.7377 - accuracy: 0.7142 -
val_loss: 1.0831 - val_accuracy: 0.5872
Epoch 12/25
109/109 [==============================] - 94s 863ms/step - loss: 0.7545 - accuracy: 0.7067 -
val_loss: 1.0106 - val_accuracy: 0.5884
Epoch 13/25
109/109 [==============================] - 99s 905ms/step - loss: 0.7118 - accuracy: 0.7423 -
val_loss: 1.0672 - val_accuracy: 0.6058
Epoch 14/25
109/109 [==============================] - 91s 831ms/step - loss: 0.6494 - accuracy: 0.7547 -
val_loss: 0.9917 - val_accuracy: 0.6384
Epoch 15/25
109/109 [==============================] - 120s 1s/step - loss: 0.6305 - accuracy: 0.7605 - val_loss:
1.2212 - val_accuracy: 0.5930
Epoch 16/25
109/109 [==============================] - 96s 883ms/step - loss: 0.5863 - accuracy: 0.7787 -
val_loss: 1.0767 - val_accuracy: 0.6279
Epoch 17/25
109/109 [==============================] - 91s 832ms/step - loss: 0.5464 - accuracy: 0.7964 -
val_loss: 1.1028 - val_accuracy: 0.6360
Epoch 18/25
109/109 [==============================] - 91s 836ms/step - loss: 0.5666 - accuracy: 0.7935 -
val_loss: 1.0856 - val_accuracy: 0.6209
Epoch 19/25
109/109 [==============================] - 88s 808ms/step - loss: 0.5793 - accuracy: 0.7891 -
val_loss: 1.0319 - val_accuracy: 0.6512
Epoch 20/25
109/109 [==============================] - 84s 771ms/step - loss: 0.5085 - accuracy: 0.8117 -
val_loss: 1.2402 - val_accuracy: 0.6116
Epoch 21/25
109/109 [==============================] - 82s 754ms/step - loss: 0.5008 - accuracy: 0.8146 -
val_loss: 1.0975 - val_accuracy: 0.6221
Epoch 22/25
109/109 [==============================] - 82s 752ms/step - loss: 0.4399 - accuracy: 0.8423 -
val_loss: 1.1795 - val_accuracy: 0.6209
Epoch 23/25
109/109 [==============================] - 81s 741ms/step - loss: 0.4287 - accuracy: 0.8426 -
val_loss: 1.3299 - val_accuracy: 0.6267
Epoch 24/25
109/109 [==============================] - 85s 777ms/step - loss: 0.4200 - accuracy: 0.8455 -
val_loss: 1.3333 - val_accuracy: 0.6395
Epoch 25/25
109/109 [==============================] - 80s 731ms/step - loss: 0.4816 - accuracy: 0.8212 -
val_loss: 1.1663 - val_accuracy: 0.6500
<keras.callbacks.History at 0x1fc8ad5fa90>
```

Save The Model

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

Test The Model

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
model = load_model("flowers.h5")
img = image.load_img("sunflower.jpg",target_size=(128,128))
Img
```

```
x = image.img_to_array(img)
x
array([[[210., 222., 238.],
        [186., 208., 221.],
        [215., 224., 241.],
        ...,
        [200., 212., 236.],
        [192., 210., 230.],
        [196., 213., 233.]],

       [[190., 206., 222.],
        [195., 214., 229.],
        [191., 207., 223.],
        ...,
        [186., 204., 224.],
        [180., 200., 224.],
        [184., 202., 224.]],

       [[184., 205., 222.],
        [201., 216., 235.],
        [189., 210., 227.],
        ...,
        [172., 196., 224.],
        [171., 192., 219.],
        [178., 198., 222.]],

       ...,

       [[109., 133.,  75.],
        [111., 135.,  77.],
        [128., 152.,  94.],
        ...,
        [122., 128.,  56.],
        [ 69.,  85.,  12.],
        [ 76.,  93.,  22.]],

       [[104., 128.,  70.],
```

```
       [106., 130.,  72.],
       [107., 131.,  73.],
       ...,
       [ 92.,  98.,  36.],
       [151., 166., 101.],
       [ 43.,  56.,  13.]],

      [[103., 127.,  69.],
       [112., 136.,  78.],
       [118., 142.,  84.],
       ...,
       [115., 121.,  73.],
       [122., 139.,  84.],
       [ 74.,  86.,  48.]]], dtype=float32)
x.shape
```

```
 (128, 128, 3)
```

```
#(1,64,64,3) to expand the dims
x = np.expand_dims(x,axis=0)
x.shape
```

```
 (1, 128, 128, 3)
```

```
pred_prob = model.predict(x)
```

```
1/1 [==============================] - 0s 177ms/step
```

```
pred_prob
```

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

```
class_name=['daisy','dandelion','rose','sunflower','tulip']
pred_id = pred_prob.argmax(axis=1)[0]
```

```
pred_id
```

```
3
```

```
print("predicted animal is ",str(class_name[pred_id]))
```

```
predicted animal is  sunflower
```