Assignment-3

CNN Model Training

Assignment Date	28 September 2022
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Maximum Marks	2 Marks

CNN Model training

Image Dataset

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

Import requirements

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D, MaxPooling2D,
Flatten, Dense
import numpy as np
from tensorflow.keras.preprocessing import image
```

Image Augmentation

```
image_gen_train = ImageDataGenerator(
      rescale=1./255,
      rotation_range=40,
      width_shift_range=0.2,
      height_shift_range=0.2,
      shear_range=0.2,
      zoom_range=0.2,
      horizontal_flip=True,
      fill_mode='nearest')

x_train = image_gen_train.flow_from_directory(batch_size=100,

directory='flowers',
                                                shuffle=True,

target_size=(64,64),
```

```
class_mode='categorical')
```

```
Found 4317 images belonging to 5 classes.
```

Create Model

Add Layers Convolution, MaxPooling, Flatten, Dense Hidden Layers, Output

```
model = Sequential()
model.add(Convolution2D(32,(4,4), activation='relu',
input_shape=(64,64,3)))
model.add(MaxPooling2D(pool_size=(3,3)))
model.add(Flatten())
model.add(Dense(300,activation='relu'))
model.add(Dense(500,activation='relu'))
model.add(Dense(700,activation='relu'))
model.add(Dense(900,activation='relu'))
model.add(Dense(800,activation='relu'))
model.add(Dense(5,activation='softmax'))
```

Compile The Model

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

Fit The Model

```
model.fit(x_train, steps_per_epoch=len(x_train), epochs=100)
```

```
Epoch 1/100
44/44 [==============================] - 14s 327ms/step - loss: 0.8491
- accuracy: 0.6729
Epoch 2/100
44/44 [==============================] - 14s 324ms/step - loss: 0.8388
- accuracy: 0.6729
Epoch 3/100
44/44 [==============================] - 14s 327ms/step - loss: 0.8766
- accuracy: 0.6627
Epoch 4/100
44/44 [==============================] - 14s 326ms/step - loss: 0.8553
- accuracy: 0.6690
Epoch 5/100
44/44 [==============================] - 14s 324ms/step - loss: 0.8148
- accuracy: 0.6859
Epoch 6/100
44/44 [==============================] - 14s 324ms/step - loss: 0.8194
- accuracy: 0.6857
Epoch 7/100
```

```
44/44 [==============================] - 15s 351ms/step - loss: 0.8133
- accuracy: 0.6871
Epoch 8/100
44/44 [==============================] - 14s 329ms/step - loss: 0.7986
- accuracy: 0.6938
Epoch 9/100
44/44 [==============================] - 14s 324ms/step - loss: 0.7976
- accuracy: 0.7009
Epoch 10/100
44/44 [==============================] - 14s 325ms/step - loss: 0.7829
- accuracy: 0.6986
Epoch 11/100
44/44 [==============================] - 14s 324ms/step - loss: 0.7885
- accuracy: 0.7016
Epoch 12/100
44/44 [==============================] - 14s 323ms/step - loss: 0.7674
- accuracy: 0.6972
Epoch 13/100
44/44 [==============================] - 14s 321ms/step - loss: 0.8201
- accuracy: 0.6859
Epoch 14/100
44/44 [==============================] - 15s 332ms/step - loss: 0.7691
- accuracy: 0.7116
Epoch 15/100
44/44 [==============================] - 14s 327ms/step - loss: 0.7651
- accuracy: 0.7016
Epoch 16/100
44/44 [==============================] - 14s 327ms/step - loss: 0.7344
- accuracy: 0.7153
Epoch 17/100
44/44 [==============================] - 14s 329ms/step - loss: 0.7268
- accuracy: 0.7248
Epoch 18/100
44/44 [==============================] - 14s 327ms/step - loss: 0.7488
- accuracy: 0.7116
Epoch 19/100
44/44 [==============================] - 14s 325ms/step - loss: 0.7399
- accuracy: 0.7111
Epoch 20/100
44/44 [==============================] - 16s 355ms/step - loss: 0.7295
- accuracy: 0.7209
Epoch 21/100
44/44 [==============================] - 14s 328ms/step - loss: 0.7283
- accuracy: 0.7123
Epoch 22/100
44/44 [==============================] - 14s 323ms/step - loss: 0.7308
- accuracy: 0.7262
Epoch 23/100
44/44 [==============================] - 14s 321ms/step - loss: 0.7163
- accuracy: 0.7239
```

```
Epoch 24/100
44/44 [==============================] - 14s 321ms/step - loss: 0.7193
- accuracy: 0.7195
Epoch 25/100
44/44 [==============================] - 14s 322ms/step - loss: 0.7022
- accuracy: 0.7350
Epoch 26/100
44/44 [==============================] - 14s 331ms/step - loss: 0.6853
- accuracy: 0.7359
Epoch 27/100
44/44 [==============================] - 14s 324ms/step - loss: 0.6735
- accuracy: 0.7415
Epoch 28/100
44/44 [==============================] - 14s 321ms/step - loss: 0.6622
- accuracy: 0.7345
Epoch 29/100
44/44 [==============================] - 14s 324ms/step - loss: 0.6519
- accuracy: 0.7533
Epoch 30/100
44/44 [==============================] - 14s 322ms/step - loss: 0.6739
- accuracy: 0.7387
Epoch 31/100
44/44 [==============================] - 14s 325ms/step - loss: 0.6655
- accuracy: 0.7417
Epoch 32/100
44/44 [==============================] - 15s 342ms/step - loss: 0.6756
- accuracy: 0.7452
Epoch 33/100
44/44 [==============================] - 14s 330ms/step - loss: 0.6760
- accuracy: 0.7422
Epoch 34/100
44/44 [==============================] - 14s 326ms/step - loss: 0.6540
- accuracy: 0.7549
Epoch 35/100
44/44 [==============================] - 14s 323ms/step - loss: 0.6555
- accuracy: 0.7468
Epoch 36/100
44/44 [==============================] - 14s 326ms/step - loss: 0.6468
- accuracy: 0.7501
Epoch 37/100
44/44 [==============================] - 14s 324ms/step - loss: 0.6295
- accuracy: 0.7582
Epoch 38/100
44/44 [==============================] - 14s 321ms/step - loss: 0.6185
- accuracy: 0.7660
Epoch 39/100
44/44 [==============================] - 14s 322ms/step - loss: 0.6136
- accuracy: 0.7672
Epoch 40/100
44/44 [==============================] - 14s 323ms/step - loss: 0.6283
```

```
- accuracy: 0.7512
Epoch 41/100
44/44 [==============================] - 14s 323ms/step - loss: 0.6187
- accuracy: 0.7623
Epoch 42/100
44/44 [==============================] - 14s 323ms/step - loss: 0.6403
- accuracy: 0.7526
Epoch 43/100
44/44 [==============================] - 14s 325ms/step - loss: 0.6459
- accuracy: 0.7547
Epoch 44/100
44/44 [==============================] - 14s 321ms/step - loss: 0.6031
- accuracy: 0.7697
Epoch 45/100
44/44 [==============================] - 15s 353ms/step - loss: 0.6089
- accuracy: 0.7596
Epoch 46/100
44/44 [==============================] - 14s 324ms/step - loss: 0.6015
- accuracy: 0.7656
Epoch 47/100
44/44 [==============================] - 14s 322ms/step - loss: 0.5977
- accuracy: 0.7672
Epoch 48/100
44/44 [==============================] - 14s 321ms/step - loss: 0.6015
- accuracy: 0.7704
Epoch 49/100
44/44 [==============================] - 14s 322ms/step - loss: 0.5831
- accuracy: 0.7762
Epoch 50/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5603
- accuracy: 0.7818
Epoch 51/100
44/44 [==============================] - 14s 320ms/step - loss: 0.5805
- accuracy: 0.7693
Epoch 52/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5806
- accuracy: 0.7709
Epoch 53/100
44/44 [==============================] - 14s 324ms/step - loss: 0.5723
- accuracy: 0.7892
Epoch 54/100
44/44 [==============================] - 14s 325ms/step - loss: 0.5698
- accuracy: 0.7816
Epoch 55/100
44/44 [==============================] - 14s 322ms/step - loss: 0.5628
- accuracy: 0.7843
Epoch 56/100
44/44 [==============================] - 14s 320ms/step - loss: 0.5666
- accuracy: 0.7850
Epoch 57/100
```

```
44/44 [==============================] - 15s 352ms/step - loss: 0.5535
- accuracy: 0.7918
Epoch 58/100
44/44 [==============================] - 14s 324ms/step - loss: 0.5787
- accuracy: 0.7802
Epoch 59/100
44/44 [==============================] - 14s 322ms/step - loss: 0.5544
- accuracy: 0.7885
Epoch 60/100
44/44 [==============================] - 14s 324ms/step - loss: 0.5449
- accuracy: 0.7880
Epoch 61/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5459
- accuracy: 0.7950
Epoch 62/100
44/44 [==============================] - 14s 319ms/step - loss: 0.5317
- accuracy: 0.7968
Epoch 63/100
44/44 [==============================] - 14s 320ms/step - loss: 0.5428
- accuracy: 0.7906
Epoch 64/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5153
- accuracy: 0.8013
Epoch 65/100
44/44 [==============================] - 14s 324ms/step - loss: 0.5241
- accuracy: 0.7945
Epoch 66/100
44/44 [==============================] - 14s 324ms/step - loss: 0.5332
- accuracy: 0.7899
Epoch 67/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5414
- accuracy: 0.7985
Epoch 68/100
44/44 [==============================] - 14s 323ms/step - loss: 0.5314
- accuracy: 0.7952
Epoch 69/100
44/44 [==============================] - 14s 322ms/step - loss: 0.5117
- accuracy: 0.8043
Epoch 70/100
44/44 [==============================] - 16s 357ms/step - loss: 0.5059
- accuracy: 0.8040
Epoch 71/100
44/44 [==============================] - 14s 327ms/step - loss: 0.4936
- accuracy: 0.8080
Epoch 72/100
44/44 [==============================] - 14s 326ms/step - loss: 0.5027
- accuracy: 0.8089
Epoch 73/100
44/44 [==============================] - 14s 329ms/step - loss: 0.4889
- accuracy: 0.8124
```

```
Epoch 74/100
44/44 [==============================] - 14s 323ms/step - loss: 0.4955
- accuracy: 0.8103
Epoch 75/100
44/44 [==============================] - 14s 325ms/step - loss: 0.4757
- accuracy: 0.8186
Epoch 76/100
44/44 [==============================] - 14s 326ms/step - loss: 0.4749
- accuracy: 0.8170
Epoch 77/100
44/44 [==============================] - 14s 325ms/step - loss: 0.4917
- accuracy: 0.8070
Epoch 78/100
44/44 [==============================] - 15s 331ms/step - loss: 0.5089
- accuracy: 0.8096
Epoch 79/100
44/44 [==============================] - 15s 338ms/step - loss: 0.4806
- accuracy: 0.8140
Epoch 80/100
44/44 [==============================] - 14s 327ms/step - loss: 0.4573
- accuracy: 0.8196
Epoch 81/100
44/44 [==============================] - 14s 322ms/step - loss: 0.4975
- accuracy: 0.8117
Epoch 82/100
44/44 [==============================] - 16s 354ms/step - loss: 0.4484
- accuracy: 0.8290
Epoch 83/100
44/44 [==============================] - 14s 322ms/step - loss: 0.4755
- accuracy: 0.8230
Epoch 84/100
44/44 [==============================] - 14s 321ms/step - loss: 0.4793
- accuracy: 0.8135
Epoch 85/100
44/44 [==============================] - 14s 321ms/step - loss: 0.4569
- accuracy: 0.8228
Epoch 86/100
44/44 [==============================] - 14s 324ms/step - loss: 0.4570
- accuracy: 0.8223
Epoch 87/100
44/44 [==============================] - 14s 324ms/step - loss: 0.4535
- accuracy: 0.8228
Epoch 88/100
44/44 [==============================] - 14s 328ms/step - loss: 0.4411
- accuracy: 0.8256
Epoch 89/100
44/44 [==============================] - 14s 324ms/step - loss: 0.4484
- accuracy: 0.8304
Epoch 90/100
44/44 [==============================] - 14s 322ms/step - loss: 0.4336
```

```
- accuracy: 0.8334
Epoch 91/100
44/44 [==============================] - 14s 323ms/step - loss: 0.4363
- accuracy: 0.8328
Epoch 92/100
44/44 [==============================] - 14s 322ms/step - loss: 0.4342
- accuracy: 0.8323
Epoch 93/100
44/44 [==============================] - 14s 323ms/step - loss: 0.4611
- accuracy: 0.8158
Epoch 94/100
44/44 [==============================] - 16s 355ms/step - loss: 0.4241
- accuracy: 0.8381
Epoch 95/100
44/44 [==============================] - 14s 319ms/step - loss: 0.4296
- accuracy: 0.8374
Epoch 96/100
44/44 [==============================] - 14s 323ms/step - loss: 0.4079
- accuracy: 0.8395
Epoch 97/100
44/44 [==============================] - 14s 324ms/step - loss: 0.4390
- accuracy: 0.8351
Epoch 98/100
44/44 [==============================] - 15s 330ms/step - loss: 0.4296
- accuracy: 0.8316
Epoch 99/100
44/44 [==============================] - 14s 323ms/step - loss: 0.4234
- accuracy: 0.8411
Epoch 100/100
44/44 [==============================] - 14s 325ms/step - loss: 0.4305
- accuracy: 0.8390

<keras.callbacks.History at 0x7f88007632d0>
```

Save The Model

```
model.save('model2.h5')
```

Test The Model

```
image_path = f'/content/img_1.jpeg'
img = image.load_img(image_path,target_size=(64,64))
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['daisy','dandelion','rose','sunflower','tulip']
print(op[pred])
```

```
1/1 [==============================] - 0s 15ms/step
sunflower
```