

## Assignment-III

### Fertilizer recommendation system for disease prediction

Date	3 October 2022
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Maximum marks	2 marks

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

train_datagen = ImageDataGenerator(rescale= 1./255, horizontal_flip = True, vertical_flip = True, zoom_range = 0.2) test_datagen = ImageDataGenerator(rescale= 1./255)

x_train =
train_datagen.flow_from_directory(r"C:\Users\maris_q3mm6nk\Desktop\data_for_ibm\FlowersDataset\flowers", target_size = (64,64), class_mode = "categorical", batch_size = 24) Found 4317 images belonging to 5 classes.

x_test =
test_datagen.flow_from_directory(r"C:\Users\maris_q3mm6nk\Desktop\data_for_ibm\Flowers-Dataset\flowers", target_size = (64,64), class_mode = "categorical", batch_size = 24)

Found 4317 images belonging to 5 classes.

x_train.class_indices

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

from tensorflow.keras.models import Sequential from tensorflow.keras.layers import Dense from tensorflow.keras.layers import Convolution2D, MaxPooling2D, Flatten model=Sequential()

model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2))) model.add(Flatten())
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

model.add(Dense(300,activation='relu')) model.add(Dense(150,activation='relu'))
model.add(Dense(5,activation='softmax')) len(x_train)
180 model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=10)

Epoch 1/10
180/180 [=====] - 33s 183ms/step - loss: 1.3003 - accuracy: 0.4691 - val_loss: 1.1679 - val_accuracy: 0.5342
Epoch 2/10
180/180 [=====] - 28s 157ms/step - loss: 1.0616 - accuracy: 0.5812 - val_loss: 1.0829 - val_accuracy: 0.5800
Epoch 3/10
180/180 [=====] - 28s 157ms/step - loss: 0.9799 - accuracy: 0.6185 - val_loss: 1.1128 - val_accuracy: 0.5821
Epoch 4/10
180/180 [=====] - 29s 161ms/step - loss: 0.9217 - accuracy: 0.6366 - val_loss: 0.9303 - val_accuracy: 0.6386
Epoch 5/10
180/180 [=====] - 28s 158ms/step - loss: 0.8893 - accuracy: 0.6583 - val_loss: 0.8627 - val_accuracy: 0.6650
Epoch 6/10
180/180 [=====] - 29s 162ms/step - loss: 0.8509 - accuracy: 0.6755 - val_loss: 0.8262 - val_accuracy: 0.6880
Epoch 7/10
180/180 [=====] - 30s 169ms/step - loss: 0.8274 - accuracy: 0.6755 - val_loss: 0.8372 - val_accuracy: 0.6796
Epoch 8/10
180/180 [=====] - 30s 166ms/step - loss: 0.7923 - accuracy: 0.6965 - val_loss: 0.8437 - val_accuracy: 0.6734
Epoch 9/10
180/180 [=====] - 28s 157ms/step - loss: 0.7745 - accuracy: 0.7072 - val_loss: 0.6995 - val_accuracy: 0.7306
Epoch 10/10
180/180 [=====] - 28s 158ms/step - loss: 0.7363 - accuracy: 0.7192 - val_loss: 0.7278 - val_accuracy: 0.7278

<keras.callbacks.History at 0x16061cf68f0>

model.save('IBM_flowers.h5') pwd
'C:\\\\Users\\\\maris_q3mm6nk\\\\Desktop\\\\data_for_ibm'
```

```
import numpy as np from tensorflow.keras.models
import load_model from
tensorflow.keras.preprocessing import image
model=load_model('IBM_flowers.h5')

img=image.load_img(r'C:\Users\maris_q3mm6nk\Desktop\data_for_ibm\Flowers-
Dataset\flowers\rose/394990940_7af082cf8d_n.jpg') img
```



```
img=image.load_img(r'C:\Users\maris_q3mm6nk\Desktop\data_for_ibm\FlowersD
ataset\flowers\rose/394990940_7af082cf8d_n.jpg',target_size=(64,64)) img
```



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

```
x
```

```
array([[ [ 4., 14., 3.],
[ 4., 15., 0.], [ 7., 10., 3.],
..., [ 1., 1., 1.],
[ 1., 1., 1.],
[ 3., 3., 3.]],

[[21., 37., 8.],
[ 7., 18., 1.],
[ 5., 11., 1.],
..., [ 1., 1., 3.],
[ 1., 1., 1.],
[ 2., 2., 2.]]],
```

```
[[15., 34., 4.],
 [ 5., 18., 0.],
 [ 6., 14., 3.],
 ...,
 [ 1., 2., 4.],
 [ 0., 0., 0.],
 [ 1., 1., 1.]],

...,

[[ 7., 11., 10.],
 [ 7., 16., 15.],
 [17., 23., 21.],
 ...,
 [ 1., 1., 1.],
 [ 2., 2., 2.],
 [ 0., 0., 0.]],

[[ 9., 18., 15.],
 [ 2., 7., 3.],
 [ 5., 11., 7.],
 ...,
 [ 0., 0., 0.],
 [ 1., 1., 1.],
 [ 1., 1., 1.]],

[[18., 26., 28.],
 [ 0., 10., 2.],
 [ 8., 14., 10.],
 ...,
 [ 2., 6., 9.],
 [ 1., 1., 1.],      [ 1.,
 1., 1.]]], dtype=float32)

x=np.expand_dims(x,axis=0)
x

array([[[[ 4., 14., 3.],
 [ 4., 15., 0.],
 [ 7., 10., 3.],
 ...,
 [ 1., 1., 1.],
 [ 1., 1., 1.],
 [ 3., 3., 3.]],

[[21., 37., 8.],
 [ 7., 18., 1.],
 [ 5., 11., 1.],
 ...,
 [ 1., 1., 3.],
 [ 1., 1., 1.],
```

```
[ 2.,  2.,  2.]],

[[15., 34., 4.],
 [ 5., 18., 0.],
 [ 6., 14., 3.],
 ...,
 [ 1., 2., 4.],
 [ 0., 0., 0.],
 [ 1., 1., 1.]],

...,

[[ 7., 11., 10.],
 [ 7., 16., 15.],
 [17., 23., 21.],
 ...,
 [ 1., 1., 1.],
 [ 2., 2., 2.],
 [ 0., 0., 0.]],

[[ 9., 18., 15.],
 [ 2., 7., 3.],
 [ 5., 11., 7.],
 ...,
 [ 0., 0., 0.],
 [ 1., 1., 1.],
 [ 1., 1., 1.]],

[[18., 26., 28.],
 [ 0., 10., 2.],
 [ 8., 14., 10.],
 ...,
 [ 2., 6., 9.],
 [ 1., 1., 1.],
 [ 1., 1., 1.]]], dtype=float32)

y=np.argmax(model.predict(x),axis=1)
y

1/1 [=====] - 0s 74ms/step
array([2], dtype=int64) x_train.class_indices
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
index=['daisy','dandelion','rose','sunflower','tulip'] index[y[0]]
'rose'
```