# Assignment 3

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| Assignment Date | 1 NOVEMBER 2022 |
| Team Id | PNT2022TMID34563 |
| Project Name | Natural Intensity Analysis and Classification |

## #Import necessary 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

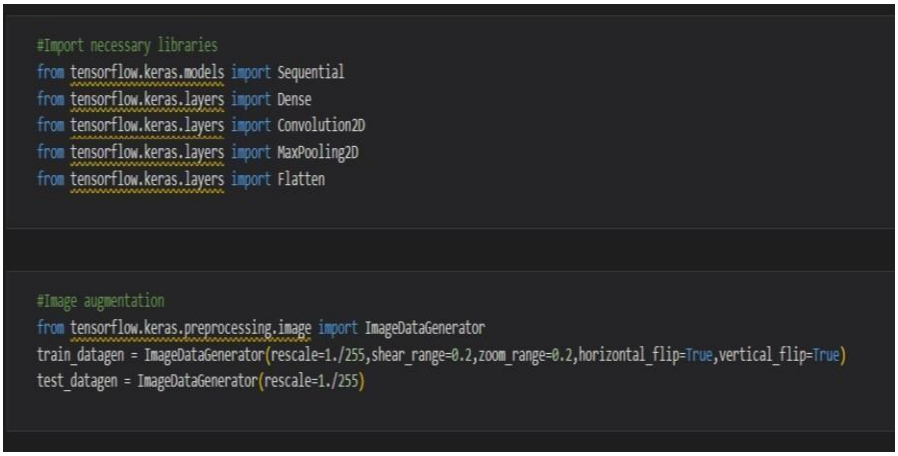
tensorflow.keras.layers import Flatten

## #Image augmentation

from tensorflow.keras.preprocessing.image import ImageDataGenerator

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

ImageDataGenerator(rescale=1./255)



## #data set

x_train = train_datagen.flow_from_directory(r"E:\Flowers\Training",target_size=(128,128),batch_size=32,class_mode="categorical")

x_test = test_datagen.flow_from_directory(r"E:\Flowers\Testing",target_size=(128,128),batch_size=32,class_ mode="categorical") x_train.class_indices model = Sequential()

```
x_train = train_datagen.flow_from_directory(r"E:\Flowers\Training",target_size=(128,128),batch_size=32,class_mode="categorical")
x_test = test_datagen.flow_from_directory(r"E:\Flowers\Testing",target_size=(128,128),batch_size=32,class_mode="categorical")
x_train.class_indices
```

```
Found 3003 images belonging to 5 classes.
Found 1325 images belonging to 5 classes.

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

## #Add layers

**#Convolution layer** model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))

**#Maxpooling layer** model.add(MaxPooling2D(pool_size=(2,2)))

**#flatten layer** model.add(Flatten()) **#hidden layer**

model.add(Dense(units=300,kernel_initializer="random_uniform",activation="relu"))

model.add(Dense(units=200,kernel_initializer="random_uniform",activation="relu"))

model.add(Dense(units=5,kernel_initializer="random_uniform",activation="softmax"))

model.summary()

```
model = Sequential()
#Add layers
#Convolution layer
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
#Maxpooling layer
model.add(MaxPooling2D(pool_size=(2,2)))
#flatten layer
model.add(Flatten())
#hidden layer
model.add(Dense(units=300,kernel_initializer="random_uniform",activation="relu"))
model.add(Dense(units=200,kernel_initializer="random_uniform",activation="relu"))
model.add(Dense(units=5,kernel_initializer="random_uniform",activation="softmax"))
model.summary()
```

[4]

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 126, 126, 32)      896

max_pooling2d (MaxPooling2D  (None, 63, 63, 32)       0
)

flatten (Flatten)            (None, 127008)            0

dense (Dense)                (None, 300)               38102700

dense_1 (Dense)              (None, 200)               60200

dense_2 (Dense)              (None, 5)                 1005

=================================================================
```

```
=================================================================
Total params: 38,164,801
Trainable params: 38,164,801
Non-trainable params: 0
_________________________________________________________________
```

## #compile the model

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

## #Fit the model

model.fit_generator(x_train,steps_per_epoch=75,epochs=15,validation_data=x_test,validation_steps=80)

```
#compile the model
model.compile(loss="categorical_crossentropy",optimizer="adam",metrics=["accuracy"])
#fit the model
model.fit_generator(x_train,steps_per_epoch=75,epochs=15,validation_data=x_test,validation_steps=80)
```

Python

```
C:\Users\hp\Anaconda3\lib\site-packages\ipykernel_launcher.py:4: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`,
which supports generators.
  after removing the cwd from sys.path.

Output exceeds the size limit. Open the full output data in a text editor
Epoch 1/15
75/75 [==============================] - ETA: 0s - loss: 1.0726 - accuracy: 0.5791WARNING:tensorflow:Your input ran out of data; interrupting training. Make sure that your dataset or
generator can generate at least `steps_per_epoch * epochs` batches (in this case, 80 batches). You may need to use the repeat() function when building your dataset.
75/75 [==============================] - 83s 1s/step - loss: 1.0726 - accuracy: 0.5791 - val_loss: 1.2372 - val_accuracy: 0.5049
Epoch 2/15
75/75 [==============================] - 68s 906ms/step - loss: 0.9907 - accuracy: 0.6125
Epoch 3/15
75/75 [==============================] - 69s 917ms/step - loss: 0.8981 - accuracy: 0.6489
Epoch 4/15
75/75 [==============================] - 70s 922ms/step - loss: 0.8850 - accuracy: 0.6522
Epoch 5/15
75/75 [==============================] - 73s 962ms/step - loss: 0.8177 - accuracy: 0.6789
Epoch 6/15
75/75 [==============================] - 75s 997ms/step - loss: 0.8101 - accuracy: 0.6917
Epoch 7/15
75/75 [==============================] - 73s 966ms/step - loss: 0.8099 - accuracy: 0.6868
Epoch 8/15
75/75 [==============================] - 72s 957ms/step - loss: 0.7574 - accuracy: 0.7229
Epoch 9/15
75/75 [==============================] - 70s 926ms/step - loss: 0.7146 - accuracy: 0.7215
Epoch 10/15
```


```
Epoch 5/15
75/75 [==============================] - 73s 962ms/step - loss: 0.8177 - accuracy: 0.6789
Epoch 6/15
75/75 [==============================] - 75s 997ms/step - loss: 0.8101 - accuracy: 0.6917
Epoch 7/15
75/75 [==============================] - 73s 966ms/step - loss: 0.8099 - accuracy: 0.6868
Epoch 8/15
75/75 [==============================] - 72s 957ms/step - loss: 0.7574 - accuracy: 0.7229
Epoch 9/15
75/75 [==============================] - 70s 926ms/step - loss: 0.7146 - accuracy: 0.7215
Epoch 10/15
```


```
75/75 [==============================] - 69s 911ms/step - loss: 0.6867 - accuracy: 0.7446
Epoch 11/15
75/75 [==============================] - 69s 920ms/step - loss: 0.6735 - accuracy: 0.7404
Epoch 12/15
75/75 [==============================] - 70s 931ms/step - loss: 0.6735 - accuracy: 0.7562
...
Epoch 14/15
75/75 [==============================] - 75s 995ms/step - loss: 0.6296 - accuracy: 0.7724
Epoch 15/15
75/75 [==============================] - 75s 988ms/step - loss: 0.6024 - accuracy: 0.7775

<keras.callbacks.History at 0x218dfffd2b0>
```

## #Save the model

model.save("flower.h5") from

tensorflow.keras.models import load_model from

tensorflow.keras.preprocessing import image import

numpy as np model = load_model("Flower.h5")


## #Test the model:

img = image.load_img(r"C:\Users\hp\Downloads\rose.jpg",target_size=(128,128)) img

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

x

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

x.shape

pred_prob = model.predict(x) pred_prob

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

```
#Testing with the image
img = image.load_img(r"C:\Users\hp\Downloads\rose.jpg",target_size=(128,128))
img
type(img)
```

```
PIL.Image.Image
```

```
x = image.img_to_array(img)
x
x.shape
x = np.expand_dims(x,axis=0)
x.shape
```

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

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

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

class_name = ["daisy","dandelion","rose","sunfower","tulip"]

pred_id = pred_prob.argmax(axis=1)[0] pred_id print("Predicted

flower is",str(class_name[pred_id]))

```
class_name = ["daisy","dandelion","rose","sunfower","tulip"]
```

```
pred_id = pred_prob.argmax(axis=1)[0]
pred_id
print("Predicted flower is",str(class_name[pred_id]))
```

```
Predicted flower is rose
```