ASSIGNMENT-3

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRE

Date	03 October 2022
Team id	PNT2022TMID07050
Project Name	Emerging Methods for Early
	Detection of Forest Fires

Question-1 Load dataset:

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inflating: flowers/rose/7471891548 40f350dff2 n.jpg
inflating: flowers/rose/7471891698_072c1de52f_n.jpg
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inflating: flowers/rose/7474126248_889a026929_n.jpg
inflating: flowers/rose/7474126688_5f888ace5b_n.jpg
inflating: flowers/rose/7481117422_66e73115ac_n.jpg
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inflating: flowers/rose/7481118556_6c209b9b7d_n.jpg
inflating: flowers/rose/7481118926_43fa291306_n.jpg
inflating: flowers/rose/7481119180_7be71a322a_n.jpg
inflating: flowers/rose/7481119492 a0016cb059 n.jpg
inflating: flowers/rose/7481119854_b4bb358f0b_n.jpg
inflating: flowers/rose/7502389724 85b4a6c855 n.jpg
inflating: flowers/rose/7525783408_0999483bf4_m.jpg
inflating: flowers/rose/7551637034_55ae047756_n.jpg
inflating: flowers/rose/7683456068_02644b8382_m.jpg
```

```
inflating: flowers/rose/7820626638_3e2d712303.jpg
inflating: flowers/rose/7865295712_bcc94d120c.jpg
inflating: flowers/rose/8032328803 30afac8b07 m.jpg
inflating: flowers/rose/8035908422_87220425d2_n.jpg
inflating: flowers/rose/8035910225_125beceb98_n.jpg
inflating: flowers/rose/8036594516_69a7da5f73_m.jpg
inflating: flowers/rose/8050213579_48e1e7109f.jpg
inflating: flowers/rose/8060338380_eb6c806624_n.jpg
inflating: flowers/rose/8063462557 e0a8bd6c64 n.jpg
inflating: flowers/rose/8096324039_4db2555490.jpg
inflating: flowers/rose/8125886145_ae99f91fd0.jpg
inflating: flowers/rose/8181940917_1ac63937d5_n.jpg
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inflating: flowers/rose/8269247725_4b56cd860d_n.jpg
inflating: flowers/rose/8272822550_fc49484186_n.jpg
inflating: flowers/rose/8273451349_acd4748da6_n.jpg
inflating: flowers/rose/8279801891 5369a6c3c1 n.jpg
inflating: flowers/rose/8301512319_45185c447f_n.jpg
inflating: flowers/rose/8337607102 d9e0fa887e.jpg
inflating: flowers/rose/8388497874_1fe750cc95_m.jpg
inflating: flowers/rose/8394286483 69fe04cc7f.jpg
inflating: flowers/rose/8437935944_aab997560a_n.jpg
inflating: flowers/rose/850416050 31b3ff7086.jpg
inflating: flowers/rose/8516036987_8a06dfe1b5_n.jpg
inflating: flowers/rose/8523394349_61b31fdd8f_m.jpg
inflating: flowers/rose/8524505682_bda885af3a_n.jpg
inflating: flowers/rose/8524505868_236f4c94b5.jpg
inflating: flowers/rose/8562144481_1d629848ff.jpg
inflating: flowers/rose/8622493424_877ae35ed7.jpg
inflating: flowers/rose/8642943283 47e44d049d m.jpg
inflating: flowers/rose/8644003462_2272de26eb.jpg
inflating: flowers/rose/8667101118 87ea757b15.jpg
inflating: flowers/rose/8667746487_781af9e615_n.jpg
inflating: flowers/rose/8671682526 7058143c99.jpg
inflating: flowers/rose/8674140377_ae7b0be523.jpg
inflating: flowers/rose/8692040971 826614516f n.jpg
inflating: flowers/rose/8692051081_dffa8709e7_m.jpg
inflating: flowers/rose/8723767157_c45bfd3ab6.jpg
inflating: flowers/rose/873660804_37f5c6a46e_n.jpg
```

```
inflating: flowers/rose/8742493617_c2a9bf854f_m.jpg
inflating: flowers/rose/8742493689_fb852f0228_n.jpg
inflating: flowers/rose/8747396730_966149e6fe_n.jpg
inflating: flowers/rose/8775267816_726ddc6d92_n.jpg
inflating: flowers/rose/8853083579_dd1dfa3188.jpg
inflating: flowers/rose/8926641787_d2515dfe8f_m.jpg
inflating: flowers/rose/8949720453_66e8304c30.jpg
inflating: flowers/rose/8960904651_9a0b727258.jpg
inflating: flowers/rose/898102603 2d5152f09a.jpg
inflating: flowers/rose/8983268106_dc913d17d8_m.jpg
inflating: flowers/rose/8987479080 32ab912d10 n.jpg
inflating: flowers/rose/909277823_e6fb8cb5c8_n.jpg
inflating: flowers/rose/9159362388_c6f4cf3812_n.jpg
inflating: flowers/rose/9160289562_ab2718d19b.jpg
inflating: flowers/rose/9164900485_605aa12da8.jpg
inflating: flowers/rose/9164924345_6b63637acf.jpg
inflating: flowers/rose/9167147034_0a66ee3616_n.jpg
inflating: flowers/rose/921138131 9e1393eb2b m.jpg
inflating: flowers/rose/9216321995_83df405ea9.jpg
inflating: flowers/rose/9216323421 f737c1d50e.jpg
inflating: flowers/rose/9216324117_5fa1e2bc25_n.jpg
inflating: flowers/rose/921984328 a60076f070 m.jpg
inflating: flowers/rose/9298314004 c1a8146521.jpg
inflating: flowers/rose/9300754115 dd79670066 n.jpg
inflating: flowers/rose/9309388105_12c0b8dd54_m.jpg
inflating: flowers/rose/9320934277_4fb95aef5d_n.jpg
inflating: flowers/rose/9337528427_3d09b7012b.jpg
inflating: flowers/rose/9338237628_4d2547608c.jpg
inflating: flowers/rose/9353111163_7a89b2df35_n.jpg
inflating: flowers/rose/9355706808_a9a723a8e8_n.jpg
inflating: flowers/rose/9369421752 db1ab2a6a4 m.jpg
inflating: flowers/rose/9404876600_04f6d37685.jpg
inflating: flowers/rose/9423755543 edb35141a3 n.jpg
inflating: flowers/rose/9433167170_fa056d3175.jpg
inflating: flowers/rose/9458445402 79e4dfa89c.jpg
inflating: flowers/rose/9609569441_eeb8566e94.jpg
inflating: flowers/rose/9614492283 66020fb4eb n.jpg
inflating: flowers/rose/9633056561_6f1b7e8faf_m.jpg
inflating: flowers/rose/9702378513_229a96b754_m.jpg
inflating: flowers/rose/99383371_37a5ac12a3_n.jpg
```

Question-2 Image Augmentation:

```
import tensorflow as tenserflow
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train data aug = ImageDataGenerator(rescale=1./255,
                     zoom_range=0.2,
                     horizontal_flip=True)
test_data_aug = ImageDataGenerator(rescale=1./255)
xtrain = train_data_aug.flow_from_directory('/content/flowers',
                          target\_size=(64,64),
                          class_mode='categorical',
                          batch size=100)
Found 4317 images belonging to 5 classes.
xtest = test_data_aug.flow_from_directory('/content/flowers',
                        target_size=(64,64),
                        class_mode='categorical',
                        batch_size=100)
Question-3 Create model:
```

from tensorflow.keras.models import Sequential from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense Add Layers (Convolution, Max-Pooling, Flatten, Dense-(Hidden Layers), Output)

```
model = Sequential()
model.add(Convolution2D(32,(3,3),activation='relu',input_shape=(64,64,3))) #
Convolution layer
model.add(MaxPooling2D(pool_size=(2,2))) # Max pooling layer
model.add(Flatten()) # Flatten layer
# Fully connected layers (ANN)
```

```
model.add(Dense(300,activation='relu')) # Hidden layer 1 model.add(Dense(150,activation='relu')) # Hidden layer 2 model.add(Dense(5,activation='softmax')) # Output layer
```

Question-4 Compile and fit the model:

```
model.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accurac
y'])
Fit the Model
model.fit_generator(xtrain,
        steps_per_epoch=len(xtrain),
        epochs=10,
        validation data=xtest,
        validation steps=len(xtest))
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5: UserWarning:
`Model.fit_generator` is deprecated and will be removed in a future version. Please
use `Model.fit`, which supports generators.
 ** ** **
Epoch 1/10
accuracy: 0.4054 - val loss: 1.2184 - val accuracy: 0.5003
Epoch 2/10
accuracy: 0.5701 - val_loss: 1.0610 - val_accuracy: 0.5763
Epoch 3/10
accuracy: 0.6104 - val loss: 0.9595 - val accuracy: 0.6382
Epoch 4/10
accuracy: 0.6405 - val_loss: 0.9755 - val_accuracy: 0.6356
Epoch 5/10
```

```
44/44 [============] - 27s 604ms/step - loss: 0.8992 -
accuracy: 0.6641 - val_loss: 0.8379 - val_accuracy: 0.6745
Epoch 6/10
accuracy: 0.6845 - val_loss: 0.8750 - val_accuracy: 0.6664
Epoch 7/10
accuracy: 0.6933 - val loss: 0.8074 - val accuracy: 0.6996
Epoch 8/10
accuracy: 0.7151 - val_loss: 0.7510 - val_accuracy: 0.7153
Epoch 9/10
accuracy: 0.7315 - val_loss: 0.7528 - val_accuracy: 0.7155
Epoch 10/10
accuracy: 0.7322 - val_loss: 0.6177 - val_accuracy: 0.7709
<keras.callbacks.History at 0x7fef66a50790>
```

Question-5 Save the model:

```
model.save('/content/flowers')
```

Test the Model

import numpy as np

from tensorflow.keras.preprocessing import image

img =

image.load_img('/content/flowers/rose/10503217854_e66a804309.jpg',target_size =(64,64))

img



 $x = image.img_to_array(img)$

 \mathbf{X}

array([[[0., 2., 0.],

[0., 2., 0.],

[0., 2., 0.],

...,

[92., 14., 0.],

[61., 13., 9.],

[17., 7., 5.]],

[[0., 2., 0.],

[0., 2., 0.],

[0., 2., 0.],

...,

[150., 3., 0.],

[85., 10., 7.],

[119., 4., 1.]],

[[0., 2., 0.],

[0., 2., 0.],

[0., 2., 0.],

...,

[88., 9., 0.],

[207., 7., 10.],

```
[152., 0., 0.]],
٠..,
[[0., 4., 0.],
[ 1., 3., 0.],
[ 0., 2., 0.],
...,
[ 2., 2., 4.],
[ 0., 2., 5.],
[ 51., 10., 6.]],
[[0., 2., 0.],
[ 1., 3., 0.],
[ 1., 3., 0.],
[ 0., 3., 1.],
[ 0., 3., 4.],
[ 0., 5., 3.]],
[[ 1., 3., 0.],
[ 0., 2., 0.],
[ 1., 1., 0.],
...,
[ 29., 5., 1.],
[41., 13., 0.],
[ 5., 4., 0.]]], dtype=float32)
```

```
[ 0., 2., 0.],
```

...,

- [92., 14., 0.],
- [61., 13., 9.],
- [17., 7., 5.]],
- [[0., 2., 0.],
- [0., 2., 0.],
- [0., 2., 0.],

...,

- [150., 3., 0.],
- [85., 10., 7.],
- [119., 4., 1.]],
- [[0., 2., 0.],
- [0., 2., 0.],
- [0., 2., 0.],

...,

- [88., 9., 0.],
- [207., 7., 10.],
- [152., 0., 0.]],

...,

- [[0., 4., 0.],
- [1., 3., 0.],
- [0., 2., 0.],

...,

- [2., 2., 4.],
- [0., 2., 5.],
- [51., 10., 6.]],

```
[[0., 2., 0.],
     [ 1., 3., 0.],
     [ 1., 3., 0.],
     [ 0., 3., 1.],
     [ 0., 3., 4.],
     [ 0., 5., 3.]],
     [[1., 3., 0.],
     [0., 2., 0.],
     [ 1., 1., 0.],
     ...,
     [29., 5., 1.],
     [41., 13., 0.],
     [ 5., 4., 0.]]]], dtype=float32)
model.predict(x)
array([[0., 0., 1., 0., 0.]], dtype=float32)
xtrain.class_indices
{'daisy': 0, 'dandelion': 1, 'rose': 2, 'sunflower': 3, 'tulip': 4}
op = ['daisy', 'dandelion', 'rose', 'sunflower', 'tulip']
pred = np.argmax(model.predict(x))
op[pred]
'rose'
img =
image.load_img('/content/flowers/dandelion/10043234166_e6dd915111_n.jpg',tar
get_size=(64,64))
x = image.img\_to\_array(img)
x = np.expand\_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op[pred]
```

'dandelion'