

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

Video Analysis

Sending Alert Message

Date	17 November 2022
Team ID	PNT2022TMID52343
Project Name	Emerging Methods for Early Detection of ForestFires

Importing The ImageDataGenerator Library

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

Define the parameters/arguments for ImageDataGenerator class

```
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,  
rotation_range=180,zoom_range=0.2, horizontal_flip=True)  
test_datagen=ImageDataGenerator(rescale=1./255)
```

Applying ImageDataGenerator functionality to trainset

```
x_train=train_datagen.flow_from_directory(r'/content/drive/MyDrive/Dataset/train_set',  
target_size=(128,128),batch_size=32, class_mode='binary')
```

Found 436 images belonging to 2 classes.

Applying ImageDataGenerator functionality to testset

```
x_test=test_datagen.flow_from_directory(r'/content/drive/MyDrive/Dataset/test_set',  
target_size=(128,128),batch_size=32, class_mode='binary')
```

Found 121 images belonging to 2 classes.

Import model building libraries

```
#To define Linear initialisation import Sequential  
from keras.models import Sequential  
#To add layers import Dense  
from keras.layers import Dense  
#To create Convolution kernel import Convolution2D  
from keras.layers import Convolution2D  
#import Maxpooling layer  
from keras.layers import MaxPooling2D  
#import flatten layer  
from keras.layers import Flatten import  
warnings warnings.filterwarnings('ignore')
```

Initializing the model

```
model=Sequential()
```

|

Add CNN Layer

```
model.add(Convolution2D(32, (3,3),input_shape=(128,128,3),activation='relu'))  
#add maxpooling layer  
model.add(MaxPooling2D(pool_size=(2,2)))  
#add flatten layer  
model.add(Flatten())
```

Add Dense Layer

```
#add hidden layer  
model.add(Dense(150,activation='relu'))  
#add output layer  
model.add(Dense(1,activation='sigmoid'))
```

Configure the learning process

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

Train the model

```
model.fit_generator(x_train,steps_per_epoch=14,epochs=10,validation_data=x_test,validation_steps=4)
```

Epoch 1/10

14/14 [=====] - 205s 15s/step - loss: 2.7344 - accuracy: 0.7454 - val_loss: 0.2016 - val_accuracy: 0.9256

Epoch 2/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.8945 - val_loss: 0.2290 - val_accuracy: 0.9339

Epoch 3/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.8922 - val_loss: 0.0524 - val_accuracy: 0.9835

Epoch 4/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9174 - val_loss: 0.1570 - val_accuracy: 0.9421

Epoch 5/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9083 - val_loss: 0.0767 - val_accuracy: 0.9752

Epoch 6/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9335 - val_loss: 0.0749 - val_accuracy: 0.9752

Epoch 7/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9312 - val_loss: 0.1264 - val_accuracy: 0.9421

Epoch 8/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9266 - val_loss: 0.0652 - val_accuracy: 0.9835

Epoch 9/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9358 - val_loss: 0.0567 - val_accuracy: 0.9835

Epoch 10/10

14/14 [=====] - 20s 1s/step - loss: accuracy: 0.9404 - val_loss: 0.0448 - val_accuracy: 0.9917

0.3267 -

0.2991 -

0.2418 -

0.1984 -

0.1643 -

0.1538 -

0.1732 -

0.1514 -

0.1445 -

<keras.callbacks.History at 0x7f51fdf33610>

Save The Model

```
model.save("forest1.h5")
```

Predictions

```
#import load_model from keras.model

from keras.models import load_model

#import image class from keras
from tensorflow.keras.preprocessing import image #import numpy import numpy as np
#import cv2
import cv2

#load the saved model
model = load_model("forest1.h5")

img=image.load_img(r'/content/drive/MyDrive/Dataset/test_set/forest/0.48007200_1530881924_final_forest.jpg')
x=image.img_to_array(img)
res = cv2.resize(x, dsize=(128, 128), interpolation=cv2.INTER_CUBIC) #expand the image shape

x=np.expand_dims(res,axis=0)
pred= model.predict(x)
1/1 [=====] - 0s 94ms/step pred
array([[0.]], dtype=float32)
```

OpenCV For Video Processing

```
pip install twilio
```

Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wheels/public/simple/>

Collecting twilio

Downloading twilio-7.15.1-py2.py3-none-any.whl (1.4 MB)

Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.5)

Collecting PyJWT<3.0.0,>=2.0.0

Downloading PyJWT-2.6.0-py3-none-any.whl (20 kB)

Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.23.0) Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (3.0.4)

Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.10)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-

packages (from requests>=2.0.0->twilio) (2022.9.24)
 Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
 /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (1.24.3)
 Installing collected packages: PyJWT, twilio
 Successfully installed PyJWT-2.6.0 twilio-7.15.1
 pip install playsound
 Looking in indexes: https://pypi.org/simple, https://us-
 python.pkg.dev/colab-wheels/public/simple/
 Collecting playsound
 Downloading playsound-1.3.0.tar.gz (7.7 kB) Building wheels for collected
 packages: playsound
 Building wheel for playsound (setup.py) ... e=playsound-1.3.0-py3- none-any.whl
 size=7035
 sha256=e7e96c774a98522e182b59b7b292f0f932097658d8bfce86c922c363f862b0e
 2
 Stored in directory:
 /root/.cache/pip/wheels/ba/f8/bb/ea57c0146b664dca3a0ada4199b0ecb5f9dfc
 b7b7e22b65ba2
 Successfully built playsound
 Installing collected packages: playsound
 Successfully installed playsound-1.3.0
 #import opencv library
 import cv2
 #import numpy
 import numpy as np
 #import image function from keras
 from keras.preprocessing import image
 #import load_model from keras
 from keras.models import load_model
 #import client from twilio API
 from twilio.rest import Client
 #import playsound package
 from playsound import playsound
 WARNING:playsound:playsound is relying on another python subprocess. Please
 use `pip install pygobject` if you want playsound to run more efficiently.
 #load the saved model
 model=load_model("forest1.h5") #define video video=cv2.VideoCapture(0) #define
 the features name=['forest','with fire']

Creating An Account In Twilio Service

```

account_sid='ACfb4e6d0e7b0d25def63044919f1b96e3'
auth_token='f9ae4fc4a617a527da8672e97eefb2d8'
client=Client(account_sid,auth_token)
message=client.messages \
.create(
    body='Forest Fire is detected, stay alert',
  
```

```

        from_='+1 302 248 4366',
        to='+91 99400 12164'
    )
    print(message.sid)

```

SM4aa5a4751b7bcec159dc4c695752293d

Sending Alert Message

```

while(1):
    sucess, frame= video.read()
    cv2.imwrite("image.jpg",frame)
    img=image.load_img("image.jpg",target_size=(64,64)) x=image.img_to_array(img)
    x=np.expand_dims(x,axis=0)
    pred=model.predict_classes(x)
    p=pred[0]
    print(pred)
    cv2.putText(frame,"predicted class="+str(name[p]),(100,100),

cv2.FONT_HERSHEY_SIMPLEX,1, (0,0,0), 1) pred = model.predict_classes(x) if
pred[0]==1:

account_sid='ACfb4e6d0e7b0d25def63044919f1b96e3'
auth_token='f9ae4fc4a617a527da8672e97eefb2d8'
client=Client(account_sid,auth_token) message=client.messages \

.create(
body='Forest Fire is detected, stay alert', from_='+1 302 248 4366',
to='+91 99400 12164'

)
print(message.sid) print('Fire Detected') print('SMS sent!')

else:
print('No Danger') cv2.imshow("image",frame)
if cv2.waitKey(1) & 0xFF == ord('a'): break
video.release() cv2.destroyAllWindows()

```