

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

Video Analysis

Sending Alert Message

Date	10 November 2022
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Project Name	Emerging Methods for Early Detection of Forest Fires

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)
```

ent 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=e7e96c774a98522e182b59b7b292f0f932097658d8bfce86c922c363f862b0e2

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()
```