EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

Video Analysis

Sending Alert Message

Date	18 Nov 2022
Team ID	PNT2022TMID39009
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_da
ta=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=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.destryoAllWindows()
```