EMERGINGMETHODSFOREARLYD ETECTIONOFFOREST FIRES

VideoAnalysis

SendingAlertMessage

Date	06November2022
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ProjectName	EmergingMethodsforEarlyDetectionof ForestFires

ImportingTheImageDataGeneratorLibrary

importkeras
fromkeras.preprocessing.imageimportImageDataGenerator

Definetheparameters/argumentsforImageDataGeneratorclass

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)

ApplyingImageDataGeneratorfunctionalitytotrainset

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

Found436imagesbelongingto2classes.

ApplyingImageDataGeneratorfunctionalitytotestset

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

Found121imagesbelongingto2classes.

Importmodelbuildinglibraries

```
#TodefineLinearinitialisationimportSequential
fromkeras.modelsimportSequential
#Toaddlayersimport Dense
fromkeras.layersimportDense
#TocreateConvolutionkernelimportConvolution2D
fromkeras.layersimportConvolution2D
#importMaxpoolinglayer
fromkeras.layersimportMaxPooling2D
#importflattenlayer
from keras.layers import Flatten
importwarningswarnings.filterwarnings('ign
ore')
```

Initializingthemodel

```
model=Sequential()
```

AddCNNLayer

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

AddDenseLayer

```
#add hidden
layermodel.add(Dense(150,activation='relu'
))#add output
layermodel.add(Dense(1,activation='sigmoi
d'))
```

Configurethelearningprocess

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

Trainthemodel

```
model.fit_generator(x_train,steps_per_epoch=14,epochs=10,validation_data=x_test,v
alidation_steps=4)
Epoch1/10
14/14[==============================]-205s15s/step-loss:2.7344-
accuracy: 0.7454 - val_loss: 0.2016 - val_accuracy:
0.9256Epoch2/10
14/14[==============================]-20s1s/step-loss:accuracy:0.8945-
val_loss:0.2290-
val_accuracy:0.9339Epoch3/10
14/14[==============================]-20s1s/step-loss:accuracy:0.8922-
val_loss:0.0524-
val_accuracy:0.9835Epoch4/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9174-
val_loss:0.1570-
val_accuracy:0.9421Epoch5/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9083-
val_loss:0.0767-
val_accuracy:0.9752Epoch6/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9335-
val_loss:0.0749-
val_accuracy:0.9752Epoch7/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9312-
val_loss:0.1264-
val_accuracy:0.9421Epoch8/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9266-
val_loss:0.0652-
val_accuracy:0.9835Epoch9/10
14/14[==============================]-20s1s/step-loss:accuracy:0.9358-
val_loss:0.0567-
val_accuracy:0.9835Epoch10/10
14/14[==============================]-20s1s/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.Historyat0x7f51fdf33610>
```

SaveTheModel

model.save("forest1.h5")

Predictions

#importload_modelfromkeras.model

fromkeras.modelsimportload_model#i

mportimageclassfromkeras
from tensorflow.keras.preprocessing import image #import numpy import numpy asnp
#import
cv2importc
v2

#loadthesavedmodel
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)#expandtheimageshape

x=np.expand_dims(res,axis=0)pred
=model.predict(x)
1/1[==============================]-0s94ms/steppred
array([[0.]],dtype=float32)

OpenCVForVideoProcessing

pipinstalltwilio
Lookinginindexes:https://pypi.org/simple,https://us-python.pkg.dev/colab-wheels/public/simple/Collectingtwilio
Downloadingtwilio-7.15.1-py2.py3-none-any.whl(1.4MB)
entalreadysatisfied:pytzin/usr/local/lib/python3.7/dist-packages(fromtwilio)(2022.5)
CollectingPyJWT<3.0.0,>=2.0.0
DownloadingPyJWT-2.6.0-py3-none-any.whl(20kB)
Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages(fromtwilio)(2.23.0)Requirementalreadysatisfied:chardet<4,>=3.0.2in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio)(3.0.4)Requirementalreadysatisfied:idna<3,>=2.5in/usr/local/lib/python3.7/dist-packages(fromrequests>=2.0.0->twilio)
(2.10)
Requirementalreadysatisfied:certifi>=2017.4.17in/usr/local/lib/python3.7/dist-

packages(fromrequests>=2.0.0->twilio)(2022.9.24)
Requirementalreadysatisfied:urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1in
/usr/local/lib/python3.7/dist-packages (from requests>=2.0.0- >twilio)
(1.24.3)Installingcollected packages:PyJWT, twilio
SuccessfullyinstalledPyJWT-2.6.0twilio-
7.15.1pipinstall playsound
Lookinginindexes:https://pypi.org/simple,https://us-
python.pkg.dev/colab-
wheels/public/simple/Collectingplaysound
Downloadingplaysound-
1.3.0.tar.gz(7.7kB)Buildingwheelsforcollectedpackages:playsound
Building wheel for playsound (setup.py) ... e=playsound-1.3.0-py3- none-
any.whlsize=7035sha256=e7e96c774a98522e182b59b7b292f0f932097658d8bfce86
c922c363f862b0e2
Storedindirectory:
/root/.cache/pip/wheels/ba/f8/bb/ea57c0146b664dca3a0ada4199b0ecb5f9dfcb7b
7e22b65ba2
Successfullybuiltplaysound
Installingcollectedpackages:playsoundSucces
sfully installed playsound-
1.3.0#importopencv library
import
cv2#importnu
mpy
importnumpyasnp
#import image function from
kerasfromkeras.preprocessingimportim
age#importload_modelfromkeras
fromkeras.modelsimportload_model#i
mportclientfromtwilioAPI
from twilio.rest import
Client#importplaysoundpack
age
fromplaysoundimportplaysound
WARNING:playsound:playsoundisrelyingonanotherpythonsubprocess.Pleaseuse`pi
pinstallpygobject`ifyouwantplaysoundtorunmoreefficiently.
#loadthesavedmodel
model=load_model("forest1.h5") #define video video=cv2.VideoCapture(0)
#definethefeatures name=['forest','with fire']

CreatingAnAccountInTwilioService

account_sid='ACfb4e6d0e7b0d25def63044919f1b96e3'
auth_token='f9ae4fc4a617a527da8672e97eefb2d8'cli
ent=Client(account_sid,auth_token)message=client.m
essages\
.create(
    body='ForestFireisdetected,stayalert',

```
    from_='+13022484366',
    to='+919940012164'
)
print(message.sid)SM4aa5a4751b7bcec159dc4c695752
```

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SendingAlertMessage

```
while(1):
sucess, frame=
video.read()cv2.imwrite("image.jpg",fra
me)
img=image.load_img("image.jpg",target_size=(64,64))x=image.img_to_array(img)x=np.ex
pand_dims(x,axis=0)
pred=model.predict_classes(x)p=pre
d[0]
print(pred)
cv2.putText(frame,"predictedclass="+str(name[p]),(100,100),

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

account_sid='ACfb4e6d0e7b0d25def63044919f1b96e3'auth_token='f9ae4fc
4a617a527da8672e97eefb2d8'client=Client(account_sid,auth_token)message=c
lient.messages\

.create(
body='Forest Fire is detected, stay alert', from_='+1 302 248
4366',to='+9199400 12164'

)
print(message.sid)print('FireDetected')print('SMSsent!')

else:
print('NoDanger')cv2.imshow("image",frame)i
f cv2.waitkey(1) & 0xFF == ord('a'):
breakvideo.release()cv2.destryoAllWindows()
```