EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

VIDEO ANALYSIS

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Project Name	Emerging Methods for Early Detection of Forest Fires

Importing The ImageDataGenerator Library

import tensorflow 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,rotati on_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'D:/IBM/archive/Dataset/

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'D:/IBM/archive/Dataset/ 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 Hidden 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=["ac curacy"])

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 [==============================] - 41s 3s/step - loss: 1.9923 -

accuracy: 0.6995 - val_loss: 0.2322 - val_accuracy: 0.9256

Epoch 2/10

14/14 [==============================] - 36s 3s/step - loss: 0.7206 -

accuracy: 0.7913 - val_loss: 0.5338 - val_accuracy: 0.8182

Epoch 3/10

14/14 [==============================] - 35s 3s/step - loss: 0.3881 -

accuracy: 0.8647 - val_loss: 0.1472 - val_accuracy: 0.9504

Epoch 4/10

14/14 [==============================] - 36s 3s/step - loss: 0.2811 -

accuracy: 0.8784 - val_loss: 0.0512 - val_accuracy: 0.9835

Epoch 5/10

14/14 [==============================] - 36s 3s/step - loss: 0.2397 -

accuracy: 0.9037 - val_loss: 0.1337 - val_accuracy: 0.9339

Epoch 6/10

14/14 [==============================] - 36s 3s/step - loss: 0.2102 -

accuracy: 0.9083 - val_loss: 0.0566 - val_accuracy: 0.9917

Epoch 7/10

14/14 [==============================] - 36s 3s/step - loss: 0.1648 -

accuracy: 0.9335 - val_loss: 0.0464 - val_accuracy: 0.9835

Epoch 8/10

14/14 [==============================] - 35s 3s/step - loss: 0.1761 -

accuracy: 0.9220 - val_loss: 0.0440 - val_accuracy: 0.9835

Epoch 9/10

14/14 [==============================] - 36s 3s/step - loss: 0.2224 -

accuracy: 0.9060 - val_loss: 0.0428 - val_accuracy: 0.9917

Epoch 10/10

14/14 [==============================] - 35s 3s/step - loss: 0.1938 - accuracy: 0.9220 - val_loss: 0.0586 - val_accuracy: 0.9752

<keras.callbacks.History at 0x1ec83f578e0>

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'D:/IBM/archive/Dataset/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 182ms/step pred

array([[0.]], dtype=float32)

OpenCV For Video Processing

```
#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

#load the saved model model=load_model("forest1.h5")
video=cv2.VideoCapture(0) name=['forest','with fire']
```

Creating An Account In Twilio Service

```
account_sid='AC7fbd9e1b65a166f13459d8eca7b664cf'
auth_token='8e7e8e6672a8fb0a908ab3137560022d' client=Client(account_sid,auth_token)
message=client.messages \

.create(

 body='Forest Fire is detected, stay alert', from_='+18434385489', to='+91
95666 05556'

) print(message.sid)
```

SM60a70f73fc42eacabbbb8f87d34cadbc Sending Alert Message

```
from tensorflow.keras.utils import load_img,img_to_array while(1):    success, frame=
video.read()    cv2.imwrite("image.jpg",frame)

   img=load_img("image.jpg",target_size=(128,128))    x=img_to_array(img)
x=np.expand_dims(x,axis=0)    predict_x=model.predict(x)

  #classes_x=np.argmax(qqqpredict_x,axis=1)
#pred=model.predict_classes(x)    p=predict_x[0]
print(predict_x)

  #cv2.putText(frame,"predicted class="+str(name[p]),
(100,100),cv2.FONT_HERSHEY_SIMPLEX,1, (0,0,0), 1)
pred=model.predict(x)    if pred[0]==1:
account_sid='AC7fbd9e1b65a166f13459d8eca7b664cf'
auth_token='8e7e8e6672a8fb0a908ab3137560022d'       client=Client(account_sid,auth_token)
message=client.messages \

      .create(

      body='Forest Fire is detected, stay alert', from_='+18434385489',to='+91 95666
05556')       print(message.sid)       print('Fire Detected')       print('SMS sent!')    else:
print('No Danger')       cv2.imshow("image",frame)    if cv2.waitKey(1) & 0xFF ==
ord('q'):       break  video.release() cv2.destroyAllWindows()
```

1/1 [==============================] - 0s 112ms/step [[0.]]

1/1 [==============================] - 0s 44ms/step

No Danger

1/1 [==============================] - 0s 30ms/step

[[0.]]

1/1 [==============================] - 0s 26ms/step

No Danger

1/1 [==============================] - 0s 27ms/step

[[1.]]

1/1 [==============================] - 0s 39ms/step

SMd96d46906fc89f8045d0ef2dd63d7c90 Fire Detected

SMS sent!

1/1 [==============================] - 0s 50ms/step

[[1.]]

1/1 [==============================] - 0s 42ms/step

SM3c04ad27dcceb5c97d6338c075ad3639 Fire Detected

SMS sent!

1/1 [==============================] - 0s 32ms/step

[[0.]]

1/1 [==============================] - 0s 31ms/step

No Danger

1/1 [==============================] - 0s 32ms/step

[[1.]]

1/1 [==============================] - 0s 28ms/step

SMa1f8dc905448597cac5146476855ed85 Fire Detected

SMS sent!

1/1 [==============================] - 0s 37ms/step

[[0.01424243]]

1/1 [==============================] - 0s 30ms/step

No Danger

1/1 [==============================] - 0s 36ms/step

[[1.]]

1/1 [==============================] - 0s 29ms/step

SM3bd2503d7e5e1e2e4021d01f7295fb8b Fire Detected

SMS sent!

1/1 [==============================] - 0s 64ms/step

[[0.]]

1/1 [==============================] - 0s 48ms/step

No Danger

1/1 [==============================] - 0s 43ms/step

[[0.]]

1/1 [==============================] - 0s 49ms/step

No Danger

1/1 [==============================] - 0s 52ms/step

[[1.]]

1/1 [==============================] - 0s 60ms/step

SM3a57c94bccd3c9e0255a263f48f822b0

Fire Detected

SMS sent!