Project Development Phase

Sprint-3

Date	12 November 2022
Team ID	PNT2022TMID32928
Project Name	Project - Emerging Methods For Early Detection of Forest Fires

Sprint - 3 Code

```
[ ] from google.colab import drive
    drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
!pip install tensorflow
!pip install opencv-python
!pip install opencv-contrib-python
import tensorflow as tf
import numpy as np
from tensorflow import keras
import os
import cv2
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.preprocessing import image
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: tensorflow in /usr/local/lib/python3.7/dist-packages (2.9.2)
Requirement already satisfied: tensorboard<2.10,>=2.9 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.1)
Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.1.0)
Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (14.0.6)
Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (4.1.1)
Requirement already satisfied: gast<=0.4.0,>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.4.0)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.15.0)
Requirement already satisfied: flatbuffers<2,>=1.12 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.12)
Requirement already satisfied: keras<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from tensorflow) (21.3)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.3.0)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.14.1)
Requirement already satisfied: keras-preprocessing>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.1.2)
```

```
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.1.0)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.15.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (4.1.1)
Requirement already satisfied: keras<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.14.1)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.50.0)
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-packages (from tensorflow) (57.4.0)
Requirement already satisfied: tensorboard<2.10,>=2.9 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.1)
Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.21.6)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.3.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in /usr/local/lib/python3.7/dist-packages (from astunparse>=1.6.0->tensorflow) (0.38.3)
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-packages (from h5py>=2.9.0->tensorflow) (1.5.2)
Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (1.0.1)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (0.6.1)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (0.4.6)
Requirement already satisfied: google-auth<3,>=1.6.3 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (2.14.1)
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (2.23.0)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (1.8.1)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (3.4.1)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (0.2.8)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (5.2.0)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (4.9)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.10,>=2.9->tensorflow) (1.3.1)
Requirement already satisfied: importlib-metadata>=4.4 in /usr/local/lib/python3.7/dist-packages (from markdown>=2.6.8->tensorboard<2.10,>=2.9->tensorflow) (4.13.0)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata>=4.4->markdown>=2.6.8->tensorboard<2.10,>=2.9->tensorflow) (3.10.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/dist-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (3.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (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<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (1.24.3
```

```
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (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<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (1.24.3
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (2.10)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.10,>=2.9->tens
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/python3.7/dist-packages (from packaging->tensorflow) (3.0.9)
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python) (1.21.6)
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: opencv-contrib-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-contrib-python) (1.21.6)
```

```
[ ]  train=ImageDataGenerator(rescale=1./255,
                              shear_range=0.2,
                              rotation_range=180,
                              zoom_range=0.2,
                              horizontal_flip=True)
     train = ImageDataGenerator(rescale=1/255)
     test = ImageDataGenerator(rescale=1/255)
```

```
[ ]  train_dataset = train.flow_from_directory("/content/drive/MyDrive/forest-fire/Dataset/Dataset/train_set",
                                               target_size=(128,128),
                                               batch_size = 32,
                                               class_mode = 'binary' )
```

```
     Found 436 images belonging to 2 classes.
```

```
[ ]  test_dataset = test.flow_from_directory("/content/drive/MyDrive/forest-fire/Dataset/Dataset/train_set",
                                             target_size=(128,128),
                                             batch_size = 32,
                                             class_mode = 'binary' )
```

```
     Found 436 images belonging to 2 classes.
```

```
[ ]  test_dataset.class_indices
```

```
{'forest': 0, 'with fire': 1}
```

```
[ ]  #to define linear initialisation import sequential
     from keras.models import Sequential
     #to add layer 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')
```

```
[ ]  model = keras.Sequential()
     model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
     model.add(MaxPooling2D(pool_size=(2,2)))
     model.add(Convolution2D(32,(3,3),activation='relu'))
     model.add(MaxPooling2D(pool_size=(2,2)))
     model.add(Convolution2D(32,(3,3),activation='relu'))
     model.add(MaxPooling2D(pool_size=(2,2)))
     model.add(Convolution2D(32,(3,3),activation='relu'))
     model.add(MaxPooling2D(pool_size=(2,2)))
     model.add(Flatten())
```

```
[ ]  model.add(Dense(150,activation='relu'))

     model.add(Dense(1,activation='sigmoid'))
```

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

```
[ ]  r = model.fit(train_dataset, epochs = 5, validation_data = test_dataset)
```

```
Epoch 1/5
14/14 [==============================] - 109s 8s/step - loss: 0.5099 - accuracy: 0.7202 - val_loss: 0.4518 - val_accuracy: 0.7752
Epoch 2/5
14/14 [==============================] - 38s 3s/step - loss: 0.3181 - accuracy: 0.8486 - val_loss: 0.1922 - val_accuracy: 0.9243
Epoch 3/5
14/14 [==============================] - 39s 3s/step - loss: 0.1754 - accuracy: 0.9335 - val_loss: 0.1402 - val_accuracy: 0.9427
Epoch 4/5
14/14 [==============================] - 36s 3s/step - loss: 0.1616 - accuracy: 0.9404 - val_loss: 0.1253 - val_accuracy: 0.9633
Epoch 5/5
14/14 [==============================] - 38s 3s/step - loss: 0.1277 - accuracy: 0.9564 - val_loss: 0.1183 - val_accuracy: 0.9495
```

```
[ ]  predictions = model.predict(test_dataset)
     predictions = np.round(predictions)
```

```
14/14 [==============================] - 16s 1s/step
```

```
predictions
```

```
array([[0.],
       [0.],
       [0.],
       [1.],
       [0.],
       [0.],
       [0.],
       [0.],
       [0.],
       [0.],
       [1.],
       [0.],
       [0.],
       [0.],
       [1.],
       [0.],
       [0.],
       [0.],
       [0.],
       [1.],
       [0.],
       [0.],
       [0.],
       [0.],
       [0.],
       [0.],
       [1.],
       [0.],
       [1.],
       [0.],
       [1.],
       [1.],
       [1.],
```

```
[ ]  print(len(predictions))
```

```
436
```

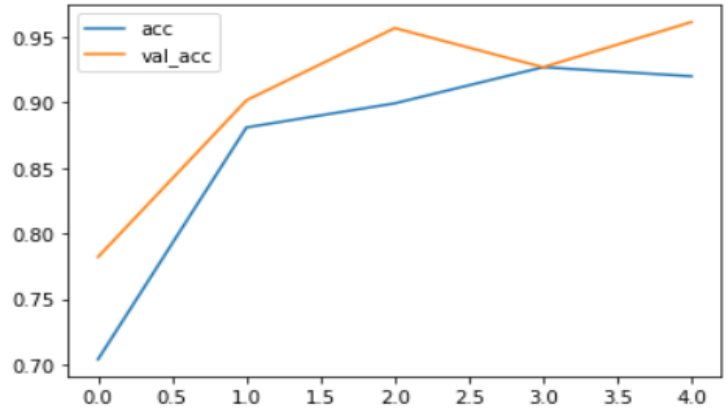
```
[ ]  model.save("/content/forest1.h5")
```

```
[ ]  #import load_model from keras.model
     from keras.models import load_model
     #import image class from keras
     import tensorflow as tf
     from tensorflow.keras.preprocessing import image
     #import numpy
     import numpy as np
     #import cv2
     import cv2
```

```
[ ]  model = load_model("/content/forest1.h5")
```

```
[ ]  plt.plot(r.history['accuracy'],label='acc')
     plt.plot(r.history['val_accuracy'],label='val_acc')
     plt.legend()
```

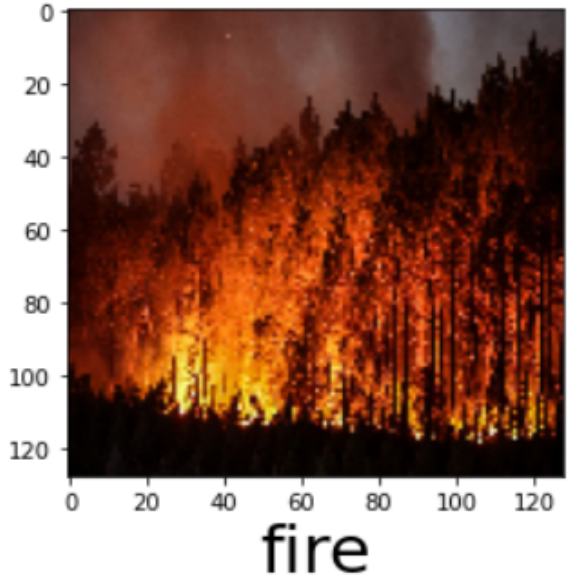
```
<matplotlib.legend.Legend at 0x7fe03d7e9a90>
```



```
[ ]  def predictImage(filename):
       img1=image.load_img(filename,target_size=(128,128))
       plt.imshow(img1)
       y=image.img_to_array(img1)
       x=np.expand_dims(y,axis=0)
       val=model.predict(x)
       print(val)
       if val==0:
         plt.xlabel(" NO fire",fontsize=30)
       elif val==1:
         plt.xlabel("fire",fontsize=30)
```

```
predictImage("/content/drive/MyDrive/forest fire.jpg")
```

```
1/1 [==============================] - 0s 113ms/step
[[1.]]
```



```
[ ]  predictImage("/content/drive/MyDrive/download (1).jpg")
```

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


```
[ ]  pip install twilio
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: twilio in /usr/local/lib/python3.7/dist-packages (7.15.3)
Requirement already satisfied: PyJWT<3.0.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.6.0)
Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.6)
Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.23.0)
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)
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: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2022.9.24)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.10)
```

```
[ ]  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) ... done
  Created wheel for playsound: filename=playsound-1.3.0-py3-none-any.whl size=7035 sha256=a0ae42b911d3b3fd6d3ac0cb3c1938927416aaaa8fbcda494b55eabd267f16a3
  Stored in directory: /root/.cache/pip/wheels/ba/f8/bb/ea57c0146b664dca3a0ada4199b0ecb5f9dfcb7b7e22b65ba2
Successfully built playsound
Installing collected packages: playsound
Successfully installed playsound-1.3.0
```

```
[ ]  pip install opencv-python
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python) (1.21.6)
```

```
[ ]  #import opencv librariy
     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
     #imort playsound package
     from playsound import playsound
```

```
[ ]  #load the saved model
     model = load_model(r'/content/forest1.h5')
     #define video
     video = cv2.VideoCapture('/content/drive/MyDrive/pexels-arnav-kainthola-7543653.mp4')
     #define the features
     name = ['forest','with forest']
```

```
[ ]  video.isOpened()
```

```
True
```

```
[ ]  from tensorflow.keras.preprocessing import image
```

```
[ ]  from IPython.display import Audio
```

```
while(video.isOpened()):
  success,frame=video.read()
  cv2.imwrite("image.jpg",frame)
  img=image.load_img("image.jpg",target_size=(128,128))
  x=image.img_to_array(img)
  x=np.expand_dims(x,axis=0)
  pred=model.predict(x)
  p=pred[0]
  print(pred)
  cv2.putText(frame,"predicted class = ",(100,100),cv2.FONT_HERSHEY_SIMPLEX, 1, (0,0,0), 1)
  if pred[0]==1:
    account_sid='AC78ba7cac649688be703fe64e444ade4a'
    auth_token='9f95514e9bcb9d58bda93aba728f6af5'
    client=Client(account_sid,auth_token)
    message=client.messages \
    .create(
        body="Forest fire is detected ,stay alert",
        from_='+15595464324',
        to='+91 6383095416')
    print(message.sid)
    print('Fire detected')
    print('SMS sent')
    wn=Audio('/content/drive/MyDrive/alarm-sound.mp3',autoplay=True)
    display(wn)
    break
  else:
    print('No danger')
    break
  if cv2.waitKey(1) & 0xFF==ord('a'):
    break
```

```
video.release()
cv2.destroyAllWindows()
```