Project Development Phase

Sprint-1

Date	29 October 2022
Team ID	PNT2022TMID32928
Project Name	Project - Emerging Methods For Early Detection of Forest Fires

Sprint - 1 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}
```

```python
#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')
```

```python
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())
```

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

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

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

```python
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
```

```python
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.],
       [1.],
       [0.],
       [0.],
       [0.],
       [1.],
       [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")
```