

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRE

OPEN CV FOR VIDEO PROCESSING

Date	11 November 2022
Team ID	PNT2022TMID07050
Project Name	Emerging Methods for Early Detection of Forest Fires

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

Mounted at /content/drive

In [2]:

```
!unzip "/content/drive/MyDrive/archive.zip"
Archive: /content/drive/MyDrive/archive.zip
  inflating: Dataset/Dataset/test_set/forest/0.48007200_1530881924_final_forest.jpg
  inflating: Dataset/Dataset/test_set/forest/0.64133000_1519374442_forest_deep.jpg
  inflating: Dataset/Dataset/test_set/forest/0.72918000_1559733279_forests1_gettyimages.jpg
  inflating: Dataset/Dataset/test_set/forest/0.98884800_1554454572_spin.jpg
  inflating: Dataset/Dataset/test_set/forest/01_NeilBurnell_Mystical_photovertical.jpg
  inflating: Dataset/Dataset/test_set/forest/091318_LH_forest_loss_main_FREE.jpg
  inflating: Dataset/Dataset/test_set/forest/1009821.jpg
  inflating: Dataset/Dataset/test_set/forest/111188170_river_in_the_mountain_forest.jpg
  inflating: Dataset/Dataset/test_set/forest/1170x500_Ireland_web.jpg
  inflating: Dataset/Dataset/test_set/forest/1200px_Mountainarea.jpg
  inflating: Dataset/Dataset/test_set/forest/146019.jpg
  inflating: Dataset/Dataset/test_set/forest/1506697583544.jpg
  inflating: Dataset/Dataset/test_set/forest/1551622076_img_5241.jpg
```

inflating: Dataset/Dataset/test_set/forest/1551903255_2942.jpg
inflating: Dataset/Dataset/test_set/forest/1556508284pexels_photo_1179229.jpg
eg
inflating: Dataset/Dataset/test_set/forest/16475617_web1_ForestHealth_VIB_190418_2.jpg
inflating: Dataset/Dataset/test_set/forest/18435324436_6a20e7fc70_k.jpg
inflating: Dataset/Dataset/test_set/forest/1_chimp.jpg
inflating: Dataset/Dataset/test_set/forest/200px_View_of_Lake_Moraine.jpg
inflating: Dataset/Dataset/test_set/forest/2017_10_12_09_01_56.jpg
inflating: Dataset/Dataset/test_set/forest/220px_The_forest_near_Blatets__Vin
itsa.JPG
inflating: Dataset/Dataset/test_set/forest/23769_pcbkrdoss_1500310327.jpg
inflating: Dataset/Dataset/test_set/forest/2E215059_55C7_417B_8DDD693A
A6E416B4_source.jpg
inflating: Dataset/Dataset/test_set/forest/31105585103_4c32392ac1_k.jpg
inflating: Dataset/Dataset/test_set/forest/381417.jpg
inflating: Dataset/Dataset/test_set/forest/4632581118_dcfb9ed978_b.jpg.860x
0_q70_crop_scale.jpg
inflating: Dataset/Dataset/test_set/forest/4fe3f4e45d6bb93070989b8bbb77d30
e.jpg
inflating: Dataset/Dataset/test_set/forest/4k_timelapse_heavy_rain_on_mounta
in_forest_tree_fog_motion_bad_weather_condition_rfift1zh_thumbnail.png
inflating: Dataset/Dataset/test_set/forest/5325.jpg
inflating: Dataset/Dataset/test_set/forest/5472.jpg
inflating: Dataset/Dataset/test_set/forest/559672101517195076987621071193
712n.jpg
inflating: Dataset/Dataset/test_set/forest/78closer_exterior_view_of_northern_
Rocky_Mountain_forest.jpg
inflating: Dataset/Dataset/test_set/forest/79806645_landscape_of_tall_grass_fi
eld_green_mountain_forest.jpg
inflating: Dataset/Dataset/test_set/forest/7_18_MedicineBowHikingFishing_K
L_1319_4003.jpg
inflating: Dataset/Dataset/test_set/forest/7ece9530_9cf1_11e9_bf3c_4fe6e643
8142.jpg
inflating: Dataset/Dataset/test_set/forest/852554.jpg
inflating: Dataset/Dataset/test_set/forest/91ErlodmE5L.jpg
inflating: Dataset/Dataset/test_set/forest/91sALILjdLL.jpg
inflating: Dataset/Dataset/test_set/forest/A003_C014_0724EC.0000000.jpg
inflating: Dataset/Dataset/test_set/forest/Adirondack_Habitats_Mixed_Forest_
Barnum_Brook_Trail_Paul_Smiths_VIC_23_May_2012_61.jpg
inflating: Dataset/Dataset/test_set/forest/Adirondack_Habitats_Mixed_Forest_
Jenkins_Mountain_Trail_Paul_Smiths_VIC_12_August_2013_71.jpg
inflating: Dataset/Dataset/test_set/forest/Almaty_Mountains.jpg

inflating: Dataset/Dataset/test_set/forest/DSCN8209(1)_250x333.JPG
inflating: Dataset/Dataset/test_set/forest/DSC_0072_Forest.jpg
inflating: Dataset/Dataset/test_set/forest/Deciduous_forest.jpg
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inflating: Dataset/Dataset/test_set/forest/Fall_Trees_Alaskan_Adventure_by_John_Simeone.jpg
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inflating: Dataset/Dataset/test_set/forest/a.jpg
inflating: Dataset/Dataset/test_set/forest/acadia_np_622419_High_Res.jpg
inflating: Dataset/Dataset/test_set/forest/altai_regio_pine_forest_1550x804.jpg
inflating: Dataset/Dataset/test_set/forest/amazing_green_trees_in_dense_mountain_forest_nature_landscape_in_4k_aerial_view_b7oqfwutg_thumbnail_.png
inflating: Dataset/Dataset/test_set/forest/aokigaharaforest_1_star.jpg
inflating: Dataset/Dataset/test_set/forest/appalachian_mtns_forest_usda_srs.jpg
g
inflating: Dataset/Dataset/test_set/forest/austria_mountain_forest_landscape_wallpaper_1920x1200.jpg
inflating: Dataset/Dataset/test_set/forest/bavarian_forest_3385966_1280_1.jpg
inflating: Dataset/Dataset/test_set/forest/beautiful_green_forest_range_images_picture_photos_wallpaper_download.jpg
inflating: Dataset/Dataset/test_set/forest/beautiful_morning_mountain_forest_scenery_free_stock_photos_picjumbo_DSC02176.jpg
inflating: Dataset/Dataset/test_set/forest/beautiful_mountain_forest_wallpaper_1920x1200.jpg
inflating: Dataset/Dataset/test_set/forest/beechnoak_forest_560.jpg
inflating: Dataset/Dataset/test_set/forest/britishforest_696483208.jpg
inflating: Dataset/Dataset/test_set/forest/canva_waterfalls_in_the_mountain_forest__MADR_l3e0W4.jpg
inflating: Dataset/Dataset/test_set/forest/ce8b73d56bd242eb1f2369fe856f1c63_700.jpg
inflating: Dataset/Dataset/test_set/forest/cold_daylight_environment_1423600_640x427.jpg
inflating: Dataset/Dataset/test_set/forest/easternArc.jpg
inflating: Dataset/Dataset/test_set/forest/em_tiger_mountain_570x284_nc.jpg
inflating: Dataset/Dataset/test_set/forest/europeslostf.jpg
inflating: Dataset/Dataset/test_set/forest/fanas_gregorschmucki_2016_28_1_2_600x1733.jpg
inflating: Dataset/Dataset/test_set/forest/fantastic_dark_landscape_of_mountain_forest_in_clouds_fog_or_mist_picture_id688948674.jpg

inflating: Dataset/Dataset/test_set/forest/fb26e4420f3ae3b12788fffddea0fb132_full.jpg
inflating: Dataset/Dataset/test_set/forest/file_20180627_112634_8tdgn4.jpg
inflating: Dataset/Dataset/test_set/with fire/180802_CarrFire_010_large_700x467.jpg
inflating: Dataset/Dataset/test_set/with fire/19464620_401.jpg
inflating: Dataset/Dataset/test_set/with fire/599857.jpg
inflating: Dataset/Dataset/test_set/with fire/Bandipur_fires_2019.jpg
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inflating: Dataset/Dataset/test_set/with fire/Fire_2_696x392.jpg
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inflating: Dataset/Dataset/test_set/with fire/How_to_Protect_Your_Home_From_Forest_Fire_1024x588.jpg
inflating: Dataset/Dataset/test_set/with fire/RED7_May29_1986.jpg
inflating: Dataset/Dataset/test_set/with fire/The_Rim_Fire_in_the_Stanislaus_National_Forest_near_in_California_began_on_Aug._17__2013_0004.jpg
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inflating: Dataset/Dataset/test_set/with fire/Washington_DNR_Chiwaukum_WildFires_2014_2015_WA_DNR_cropped.jpg
inflating: Dataset/Dataset/test_set/with fire/Wild_fires.jpg
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inflating: Dataset/Dataset/test_set/with fire/cumming_forest_fires.jpg
inflating: Dataset/Dataset/test_set/with fire/deerfire_high_res_edit.jpg
inflating: Dataset/Dataset/test_set/with fire/defense_large.jpg
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inflating: Dataset/Dataset/test_set/with fire/forest_fire_0.jpg
inflating: Dataset/Dataset/test_set/with fire/forest_fire_2268729_1280.jpg
inflating: Dataset/Dataset/test_set/with fire/forest_fire_at_bandipur_tiger_reserve_04f0dd5e_3919_11e9_9798_f85edb62de22.jpg
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inflating: Dataset/Dataset/test_set/with fire/image.jpg
inflating: Dataset/Dataset/test_set/with fire/in_forestfire1_(1).jpg
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inflating: Dataset/Dataset/train_set/forest/with_fire (1).gif
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inflating: Dataset/Dataset/train_set/with fire/with fire (81).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (82).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (83).jpg
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inflating: Dataset/Dataset/train_set/with fire/with fire (93).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (94).jpg
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inflating: Dataset/Dataset/train_set/with fire/with fire (96).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (97).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (98).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire (99).jpg
inflating: Dataset/Dataset/train_set/with fire/with fire.jpeg
inflating: forest1.h5

In [3]:

```
!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
import matplotlib.pyplot as plt
```

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: keras<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)

Requirement already satisfied: protobuf<3.20,>=3.9.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.19.6)

Requirement already satisfied: flatbuffers<2,>=1.12 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.12)

Requirement already satisfied: tensorflow-estimator<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)

Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.2.0)

Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.3.0)

Requirement already satisfied: keras-preprocessing>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.1.2)

Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (14.0.6)

Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from tensorflow) (21.3)

Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.1.0)

Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.14.1)

Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.15.0)

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: opt-einsum>=2.3.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.3.0)

Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (4.1.1)

Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-packages (from tensorflow) (57.4.0)

Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.27.0)

Requirement already satisfied: tensorboard<2.10,>=2.9 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.1)

Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.50.0)

Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.1.0)

Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.6.3)

Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.21.6)

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: 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: 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: 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: 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: 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<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: 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: 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: 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: 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) (0.4.8)

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: 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: 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->tensorflow) (3.2.2)

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)

In [4]:

```
train = ImageDataGenerator(rescale=1/255)
```

```
test = ImageDataGenerator(rescale=1/255)
```

```
train_dataset =
```

```
train.flow_from_directory("/content/drive/MyDrive/Dataset/train_set",
```

```
target_size=(150,150),
batch_size = 32,
class_mode = 'binary')
```

```
test_dataset =
test.flow_from_directory("/content/drive/MyDrive/Dataset/test_set",
                        target_size=(150,150),
                        batch_size=32,
                        class_mode = 'binary')
```

Found 436 images belonging to 2 classes.

Found 121 images belonging to 2 classes.

In [5]:

```
test_dataset.class_indices
```

Out[5]:

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

In [6]:

```
#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')
```

In [7]:

```
model = keras.Sequential()
model.add(keras.layers.Conv2D(32,(3,3),activation='relu',input_shape=(150,150,3)))
model.add(keras.layers.MaxPool2D(2,2))
model.add(keras.layers.Conv2D(64,(3,3),activation='relu'))
model.add(keras.layers.MaxPool2D(2,2))
model.add(keras.layers.Conv2D(128,(3,3),activation='relu'))
model.add(keras.layers.MaxPool2D(2,2))
model.add(keras.layers.Conv2D(128,(3,3),activation='relu'))
model.add(keras.layers.MaxPool2D(2,2))
model.add(keras.layers.Flatten())
model.add(keras.layers.Dense(512,activation='relu'))
model.add(keras.layers.Dense(1,activation='sigmoid'))
```

In [8]:

```
model.add(Dense(150,activation='relu'))  
model.add(Dense(1,activation='sigmoid'))
```

In [9]:

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

In [10]:

```
r = model.fit(train_dataset,epochs = 10,validation_data = test_dataset)
```

Epoch 1/10

```
14/14 [=====] - 225s 16s/step - loss: 0.6835  
- accuracy: 0.6216 - val_loss: 0.6658 - val_accuracy: 0.5950
```

Epoch 2/10

```
14/14 [=====] - 26s 2s/step - loss: 0.6197 -  
accuracy: 0.6445 - val_loss: 0.5775 - val_accuracy: 0.5950
```

Epoch 3/10

```
14/14 [=====] - 26s 2s/step - loss: 0.5909 -  
accuracy: 0.6445 - val_loss: 0.5818 - val_accuracy: 0.5950
```

Epoch 4/10

```
14/14 [=====] - 27s 2s/step - loss: 0.5374 -  
accuracy: 0.6445 - val_loss: 0.5170 - val_accuracy: 0.5950
```

Epoch 5/10

```
14/14 [=====] - 26s 2s/step - loss: 0.5055 -  
accuracy: 0.6445 - val_loss: 0.4824 - val_accuracy: 0.5950
```

Epoch 6/10

```
14/14 [=====] - 28s 2s/step - loss: 0.4934 -  
accuracy: 0.6445 - val_loss: 0.4909 - val_accuracy: 0.5950
```

Epoch 7/10

```
14/14 [=====] - 28s 2s/step - loss: 0.5032 -  
accuracy: 0.6445 - val_loss: 0.4371 - val_accuracy: 0.5950
```

Epoch 8/10

```
14/14 [=====] - 28s 2s/step - loss: 0.5243 -  
accuracy: 0.6445 - val_loss: 0.4816 - val_accuracy: 0.5950
```

Epoch 9/10

```
14/14 [=====] - 27s 2s/step - loss: 0.4510 -  
accuracy: 0.8807 - val_loss: 0.4155 - val_accuracy: 0.9669
```

Epoch 10/10

```
14/14 [=====] - 26s 2s/step - loss: 0.4195 -  
accuracy: 0.9106 - val_loss: 0.3803 - val_accuracy: 0.9752
```

In [11]:

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

```
4/4 [=====] - 5s 1s/step
```

predictions

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

In [12]:

Out[12]:

[0.],
[1.],
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[1.],  
[0.],  
[1.],  
[0.],  
[0.]], dtype=float32)
```

```
print(len(predictions))
```

```
121
```

```
model.save("forest2.h5")
```

In [13]:

In [14]:

In [15]:

```
#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
```

In [16]:

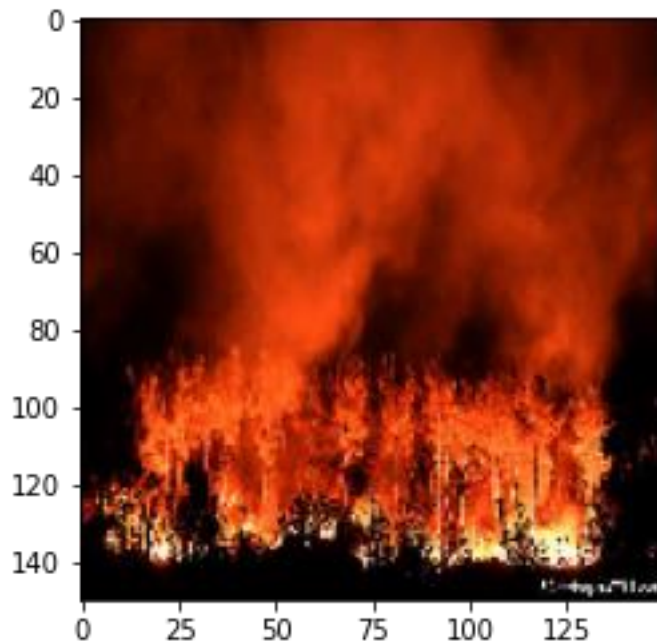
```
model = load_model("forest2.h5")
```

In [17]:

```
def predictImage(filename):  
    img1 = image.load_img(filename,target_size=(150,150))  
    plt.imshow(img1)  
    Y = image.img_to_array(img1)  
    X = np.expand_dims(Y,axis=0)  
    val = model.predict(X)  
    print(val)  
    if val == 1:  
        plt.xlabel("Fire")  
    elif val == 0:  
        plt.xlabel("No Fire")
```

In [18]:

```
predictImage("/content/drive/MyDrive/Dataset/test_set/with  
fire/19464620_401.jpg")  
1/1 [=====] - 0s 100ms/step  
[[0.5006299]]
```

In [19]:

```
pip install twilio
```

Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wheels/public/simple/>

Collecting twilio

Downloading twilio-7.15.2-py2.py3-none-any.whl (1.4 MB)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
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Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.6)

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: 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: 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)

Installing collected packages: PyJWT, twilio

Successfully installed PyJWT-2.6.0 twilio-7.15.2

In [20]:

```
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=85d270811392b43150e85db7bf274975ec44e33cbde522639944f168c8cd84e1

Stored in directory: /root/.cache/pip/wheels/ba/f8/bb/ea57c0146b664dca3a0ada4199b0ecb5f9dfcb7b7e22b65ba2

Successfully built playsound

Installing collected packages: playsound

Successfully installed playsound-1.3.0

In [21]:

```
#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
```

WARNING:playsound:playsound is relying on another python subprocess. Please use `pip install pygobject` if you want playsound to run more efficiently.

In [22]:

```
#load the saved model
model = load_model(r'forest2.h5')
#define video
video = cv2.VideoCapture('/content/Fighting Fire with Fire _ Explained in 30 Seconds.mp4')
#define the features
name = ['forest','with forest']
```

In [23]:

```
account_sid = 'ACd799efbbb20dd7f04c7212e051e8720c'
auth_token = '68f0332d56c9e386dd7ab82545597619'
client = Client(account_sid, auth_token)
```

```
message = client.messages \
    .create(
```

```
body='Forest fire is detected , stay alert',  
from_='+17088347615',  
to='+919360116782'  
)
```

```
print(message.sid)
```

```
SM1135bc703d5d174334a7603d0d223182
```

In [24]:

```
#import opencv library
```

```
import cv2
```

```
#import numpy
```

```
import numpy as np
```

```
#import images and load_model function from keras
```

```
from keras.preprocessing import image
```

```
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(r'forest1.h5')
```

```
video = cv2.VideoCapture('/content/Fighting Fire with Fire _ Explained in 30  
Seconds.mp4')
```

```
name = ['forest','with fire']
```

In []: