

# **PROJECT DEVELOPMENT PHASE**

## **SPRINT 4**

### **Team ID: PNT2022TMID50335**

```
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).

```
!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_photoverticall.jpg
```

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  inflating:
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```
Dataset/Dataset/test_set/forest/091318_LH_forest_loss_main_FREE.jpg
```

```
  inflating: Dataset/Dataset/test_set/forest/1009821.jpg
```

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  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
```

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  inflating:
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```
Dataset/Dataset/test_set/forest/1556508284pexels_photo_1179229.jpeg
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  inflating:
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Dataset/Dataset/test_set/forest/16475617_web1_ForestHealth_VIB_190418_2.jpg
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  inflating: Dataset/Dataset/test_set/forest/18435324436_6a20e7fc70_k.jpg
```

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  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\_\_Vinita.JPG  
inflating: Dataset/Dataset/test\_set/forest/23769\_pcbkrdoss\_1500310327.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/2E215059\_55C7\_417B\_8DDD693AA6E416B4\_source.jpg  
g  
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.860x0\_q70\_crop\_scale.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/4fe3f4e45d6bb93070989b8bbb77d30e.jpg  
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Dataset/Dataset/test\_set/forest/4k\_timelapse\_heavy\_rain\_on\_mountain\_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/559672101517195076987621071193712n.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\_field\_green\_mountain\_forest.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/7\_18\_MedicineBowHikingFishing\_KL\_1319\_4003.jpg  
g  
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Dataset/Dataset/test\_set/forest/7ece9530\_9cf1\_11e9\_bf3c\_4fe6e6438142.jpg  
inflating: Dataset/Dataset/test\_set/forest/852554.jpg  
inflating: Dataset/Dataset/test\_set/forest/91ErlodmE5L.jpg  
inflating: Dataset/Dataset/test\_set/forest/91sALlLjdLL.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  
inflating:  
Dataset/Dataset/test\_set/forest/Dupont\_Forest\_Triple\_Falls\_Rob\_Travis\_2\_1.jpg

inflating:  
Dataset/Dataset/test\_set/forest/Fall\_Trees\_Alaskan\_Adventure\_by\_John\_Simeone.  
jpg  
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inflating:  
Dataset/Dataset/test\_set/forest/\_101542074\_gettyimages\_956391468.jpg  
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  
inflating:  
Dataset/Dataset/test\_set/forest/austria\_mountain\_forest\_landscape\_wallpaper\_1  
920x1200.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\_p  
hotos\_wallpaper\_download.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/beautiful\_morning\_mountain\_forest\_scenery\_fre  
e\_stock\_photos\_picjumbo\_DSC02176.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/beautiful\_mountain\_forest\_wallpaper\_1920x1200  
.jpg  
inflating: Dataset/Dataset/test\_set/forest/beech\_oak\_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\_2600x1733.jpg  
inflating:  
Dataset/Dataset/test\_set/forest/fantastic\_dark\_landscape\_of\_mountain\_forest\_i  
n\_clouds\_fog\_or\_mist\_picture\_id688948674.jpg

inflating:  
Dataset/Dataset/test\_set/forest/fb26e4420f3ae3b12788fffdea0fb132\_full1.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  
  inflating: Dataset/Dataset/test\_set/with fire/FORESTFIRE (1).jpg  
  inflating: Dataset/Dataset/test\_set/with fire/Fire\_2\_696x392.jpg  
  inflating: Dataset/Dataset/test\_set/with fire/Forest\_Fire (3).jpg  
  inflating: Dataset/Dataset/test\_set/with fire/Forest\_Fire (4).jpg  
  inflating: Dataset/Dataset/test\_set/with  
fire/Forest\_fire\_MNRF\_esize\_IMG\_6743.jpg  
  inflating: Dataset/Dataset/test\_set/with fire/GettyImages\_482867948.0.jpg  
  inflating: Dataset/Dataset/test\_set/with  
fire/GettyImages\_862092472\_1160x773.jpg  
  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  
  inflating: Dataset/Dataset/test\_set/with  
fire/Untitled\_design\_161\_866x487.jpg  
  inflating: Dataset/Dataset/test\_set/with fire/Uttarakhand\_forest\_fire.jpeg  
  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  
  inflating: Dataset/Dataset/test\_set/with fire/X80IR0GYSSG6RaiLcsXX.jpg  
  inflating: Dataset/Dataset/test\_set/with  
fire/b2683a16be44f230a90f50bb944315e994b43042e43df798bb4feaf27e0f8bc8.jpg  
  inflating: Dataset/Dataset/test\_set/with  
fire/climate\_change\_forest\_fire.jpeg  
  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  
  inflating: Dataset/Dataset/test\_set/with fire/f90\_fire\_1168x657.jpg  
  inflating: Dataset/Dataset/test\_set/with  
fire/file\_20190308\_155532\_1nvts27.jpg  
  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\_f85edb62de  
22.jpg  
  inflating: Dataset/Dataset/test\_set/with fire/forestfire.jpg

inflatng: Dataset/Dataset/test\_set/with  
fire/forestfire\_kApH\_\_621x414\_LiveMint.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/growing\_risk\_future\_wildfires\_adobestock\_199370851.jpeg  
inflatng: Dataset/Dataset/test\_set/with fire/header\_hypermaritime\_fire.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/horseshoe\_bay\_fire.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/image.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/in\_forestfire1\_(1).jpg  
inflatng: Dataset/Dataset/test\_set/with fire/in\_forestfires\_shutter.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/in\_forestfiress\_(1).jpg  
inflatng: Dataset/Dataset/test\_set/with fire/korea\_forest\_fire\_4.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/louisiana\_forest\_fire.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/maxresdefault.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/photo\_1555842027\_660d9d8df55b.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/ring\_of\_fire\_bailey\_colorado\_rocky\_mountain\_forest\_wildfire\_picture\_id15  
7384116.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/rsz\_1fire\_pix\_accumulation\_640\_1\_2.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/shutterstock\_48032821.jpg  
inflatng: Dataset/Dataset/test\_set/with fire/shutterstock\_710588224.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/skynews\_ashdown\_forest\_fire\_4653702.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/uttarakhand\_forest\_fire\_750x500.jpg  
inflatng: Dataset/Dataset/test\_set/with  
fire/wildfire\_header\_image\_1024x1024.jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (1).gif  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (1).jpeg  
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inflatng: Dataset/Dataset/train\_set/forest/with\_fire (10).jpeg  
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inflatng: Dataset/Dataset/train\_set/forest/with\_fire (100).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (101).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (102).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (103).jpg  
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inflatng: Dataset/Dataset/train\_set/forest/with\_fire (108).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (109).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (11).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (110).jpg  
inflatng: Dataset/Dataset/train\_set/forest/with\_fire (111).jpg

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inflating: Dataset/Dataset/train\_set/with fire/with fire (62).jpg  
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inflating: Dataset/Dataset/train\_set/with fire/with fire (90).jpg  
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inflating: Dataset/Dataset/train\_set/with fire/with fire (92).jpg  
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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

```
from keras.preprocessing.image import ImageDataGenerator
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)
train =
train_datagen.flow_from_directory('/content/drive/MyDrive/archive.zip
(Unzipped Files)/Dataset/Dataset/train_set',
target_size=(128,128),
batch_size=32,
class_mode='binary')

test =
train_datagen.flow_from_directory('/content/drive/MyDrive/archive.zip
(Unzipped Files)/Dataset/Dataset/test_set',
target_size=(128,128),
batch_size=32,
class_mode='binary')

```

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

**Found 121 images belonging to 2 classes.**

```

from keras.models import Sequential
from keras.layers import Convolution2D,MaxPooling2D,Dense,Flatten
import warnings
warnings.filterwarnings('ignore')

model = Sequential()
model.add(Convolution2D(32, (3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense(units=256,activation='relu'))
model.add(Dense(units=1,activation='sigmoid'))
model.summary()
Model: "sequential"

```

Layer (type)	Output Shape	Param #
=====		
conv2d (Conv2D)	(None, 126, 126, 32)	896
max_pooling2d (MaxPooling2D)	(None, 63, 63, 32)	0
flatten (Flatten)	(None, 127008)	0
dense (Dense)	(None, 256)	32514304

dense\_1 (Dense) (None, 1) 257

```
=====
Total params: 32,515,457
Trainable params: 32,515,457
Non-trainable params: 0
=====
```

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

```
y=model.fit_generator(train,steps_per_epoch=14,epochs=15,validation_data=test,validation_steps=4)
```

Epoch 1/15

14/14 [=====] - 131s 9s/step - loss: 4.9371 - accuracy: 0.6720 - mse: 0.2963 - val\_loss: 0.2203 - val\_accuracy: 0.9091 - val\_mse: 0.0644

Epoch 2/15

14/14 [=====] - 28s 2s/step - loss: 0.5698 - accuracy: 0.8624 - mse: 0.1162 - val\_loss: 0.3265 - val\_accuracy: 0.8926 - val\_mse: 0.0783

Epoch 3/15

14/14 [=====] - 28s 2s/step - loss: 0.3159 - accuracy: 0.9014 - mse: 0.0841 - val\_loss: 0.1184 - val\_accuracy: 0.9669 - val\_mse: 0.0242

Epoch 4/15

14/14 [=====] - 30s 2s/step - loss: 0.2330 - accuracy: 0.9197 - mse: 0.0627 - val\_loss: 0.1434 - val\_accuracy: 0.9504 - val\_mse: 0.0340

Epoch 5/15

14/14 [=====] - 28s 2s/step - loss: 0.2215 - accuracy: 0.9083 - mse: 0.0625 - val\_loss: 0.1117 - val\_accuracy: 0.9669 - val\_mse: 0.0301

Epoch 6/15

14/14 [=====] - 28s 2s/step - loss: 0.1681 - accuracy: 0.9312 - mse: 0.0508 - val\_loss: 0.1079 - val\_accuracy: 0.9835 - val\_mse: 0.0209

Epoch 7/15

14/14 [=====] - 28s 2s/step - loss: 0.1860 - accuracy: 0.9243 - mse: 0.0564 - val\_loss: 0.0969 - val\_accuracy: 0.9752 - val\_mse: 0.0185

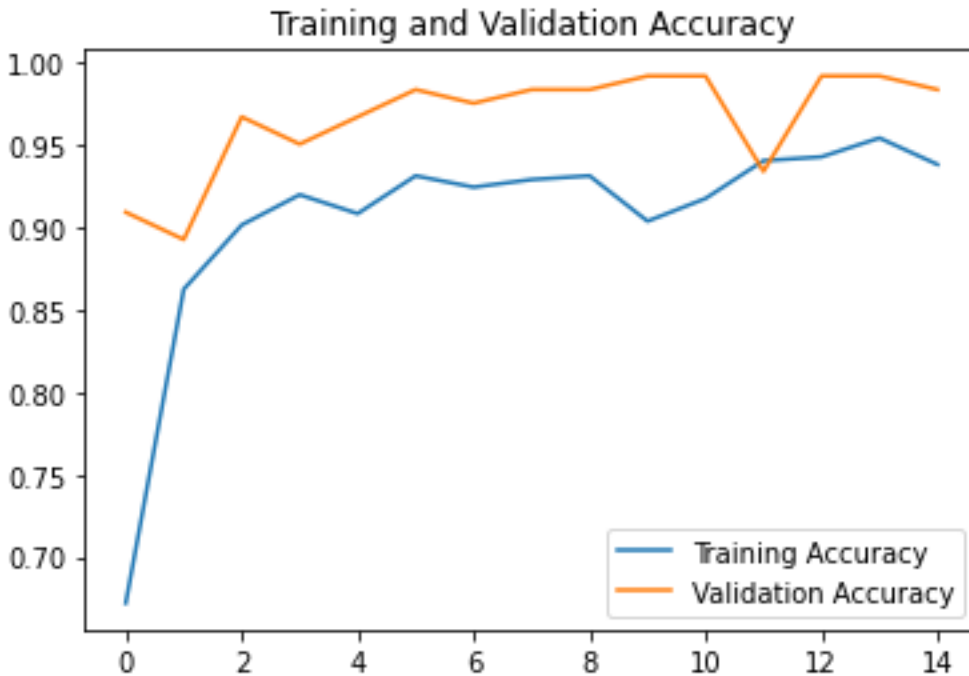
Epoch 8/15



```
14/14 [=====] - 28s 2s/step - loss: 0.1757 -  
accuracy: 0.9289 - mse: 0.0520 - val_loss: 0.0788 - val_accuracy: 0.9835 -  
val_mse: 0.0169  
Epoch 9/15  
14/14 [=====] - 27s 2s/step - loss: 0.1696 -  
accuracy: 0.9312 - mse: 0.0504 - val_loss: 0.0593 - val_accuracy: 0.9835 -  
val_mse: 0.0167  
Epoch 10/15  
14/14 [=====] - 28s 2s/step - loss: 0.2129 -  
accuracy: 0.9037 - mse: 0.0657 - val_loss: 0.0676 - val_accuracy: 0.9917 -  
val_mse: 0.0170  
Epoch 11/15  
14/14 [=====] - 28s 2s/step - loss: 0.1662 -  
accuracy: 0.9174 - mse: 0.0540 - val_loss: 0.0478 - val_accuracy: 0.9917 -  
val_mse: 0.0111  
Epoch 12/15  
14/14 [=====] - 28s 2s/step - loss: 0.1461 -  
accuracy: 0.9404 - mse: 0.0465 - val_loss: 0.1063 - val_accuracy: 0.9339 -  
val_mse: 0.0362  
Epoch 13/15  
14/14 [=====] - 28s 2s/step - loss: 0.1505 -  
accuracy: 0.9427 - mse: 0.0457 - val_loss: 0.0548 - val_accuracy: 0.9917 -  
val_mse: 0.0139  
Epoch 14/15  
14/14 [=====] - 27s 2s/step - loss: 0.1364 -  
accuracy: 0.9541 - mse: 0.0425 - val_loss: 0.0509 - val_accuracy: 0.9917 -  
val_mse: 0.0127  
Epoch 15/15  
14/14 [=====] - 29s 2s/step - loss: 0.1539 -  
accuracy: 0.9381 - mse: 0.0474 - val_loss: 0.0587 - val_accuracy: 0.9835 -  
val_mse: 0.0156
```

```
model.save('ffd_model.h5')
```

```
import matplotlib.pyplot as plt  
epochs = range(0,15)  
plt.plot(epochs, y.history['accuracy'], label='Training Accuracy')  
plt.plot(epochs, y.history['val_accuracy'], label='Validation  
Accuracy')  
plt.legend()  
plt.title('Training and Validation Accuracy')  
plt.show()
```



```

from keras.models import load_model
import cv2
import numpy as np
from PIL import Image
from keras.utils import img_to_array
model = load_model('/content/ffd_model.h5')
def prediction(img_path):
    i = cv2.imread(img_path)
    i = cv2.cvtColor(i, cv2.COLOR_BGR2RGB)
    img = Image.open(img_path)
    img = img.resize((128,128))
    x = img_to_array(img)
    x = np.expand_dims(x,axis=0)
    pred = model.predict(x)
    plt.imshow(i)
    print("%s"%("FOREST FIRE DETECTED! SMS SENT!" if pred==[[1.]] else "NO
FOREST FIRE DETECTED"))

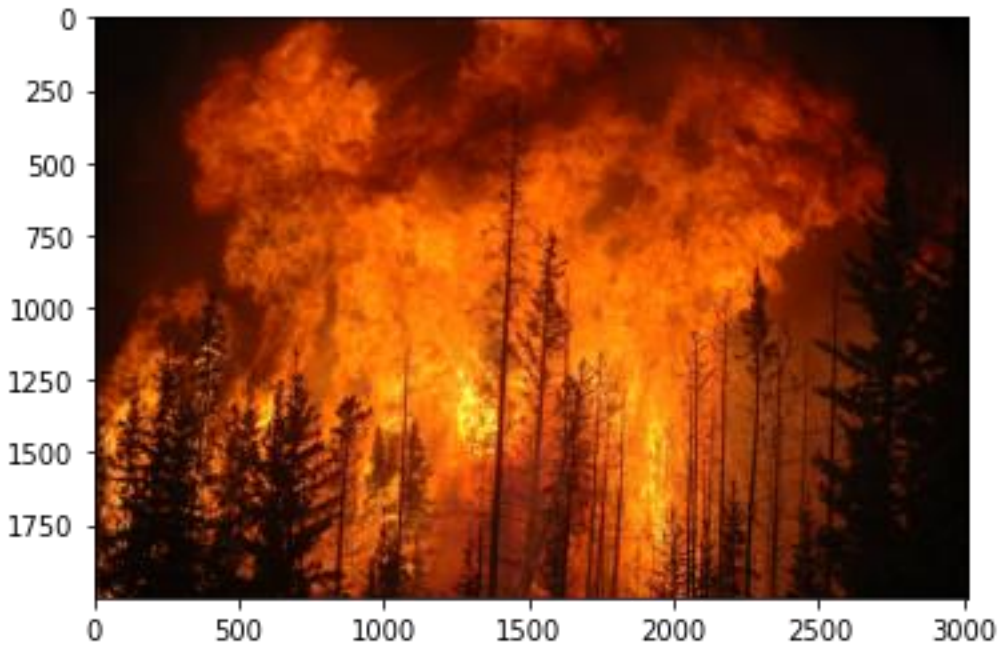
```

In [ ]:

```

prediction(r'/content/drive/MyDrive/demo_image 1.jpg')
1/1 [=====] - 0s 89ms/step
FOREST FIRE DETECTED! SMS SENT!

```



```
prediction(r'/content/drive/MyDrive/demo_image 2.jpg')  
1/1 [=====] - 0s 38ms/step  
NO FOREST FIRE DETECTED
```



```
prediction(r'/content/Dataset/Dataset/test_set/with fire/599857.jpg')  
1/1 [=====] - 0s 40ms/step  
FOREST FIRE DETECTED! SMS SENT!
```



```
prediction(r'/content/Dataset/Dataset/test_set/with  
fire/How_to_Protect_Your_Home_From_Forest_Fire_1024x588.jpg')
```

```
1/1 [=====] - 0s 37ms/step  
FOREST FIRE DETECTED! SMS SENT!
```



```
prediction(r'/content/Dataset/Dataset/test_set/forest/0.72918000_1559733279_forests1_gettyimages_.jpg')
```

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

```
NO FOREST FIRE DETECTED
```

