Emerging Methods for Early Detection ofForest Fires

PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project entitled**"EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES"** is the bonafide work of

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. There are typically about 100,000 wildfires in the United States every year. Over 9 million acres of land have been destroyed due to treacherous wildfires. Regardless of the reasons for the ignition of the forest fires, they normally cause withering damage to both nature and humans.

Forest fires are also considered as a main contributor to the air pollution, due to the fact that during every fire huge volume of gases and particle mater are released in the atmosphere. To fight forestfires, different solutions were employed throughout the years. They ware primaryaimed at the early detection of the fires. The simplest of these solutions is the formation of a network of observance posts - both cheap and easy to accomplish, but also time-consuming for the involved people.

It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods like Camera or Video-Based approach. Satellites can be an important source of data prior to and also during the Fire due to its reliability and efficiency. The various real-time forest fire detection and prediction approaches, with the goal of informing the local fire authorities.

The constant evolution of the info and communication applied science has led to the debut of a new generation of solutions for early detection and even prevention of forest fires. ICT-based networks of cameras and sensors and even satellite-based solutions were developedand used in the last decades. These solutions have greatly decreased the direct involvement of humans in the forest fire detection process, but have also proven to be expensive and hard to maintain.

1.2 PURPOSE

Detection of forest fire and smoke in wild land areas is done through remote sensing- based methods such as satellites, high-resolution static cameras fixed on the ground, and unmanned aerial vehicles Optical/thermal cameras deployed on the observation towers togetherwith the other sensors such as smoke, temperature, and humidity sensors might detect the hazards in the closed environment rather than in the open environment as these sensors need vicinity to the fire or smoke.

The information obtained through these sensors is not appropriate. Distance covered by these methodscould be limited,and to cover a largearea, more sensorshave to be deployed thatmight incur expenses. Through the deployment of UAV, large areas could be covered, and the images with high spatial and temporal resolutions could be captured properly.

2 LITERATURE SURVEY

2.1 EXISTING PROBLEM

Literature survey-1

Different fire detection techniques have been proposed for safety and protection of the people and environment.

- Wavelet based smoke detection-smoke detection in video sequences
- Covariance method - flame detection.
- Neural Network -produces accurate result as it uses temperature, smoke density and CO concentration

Literature survey-2

The proposed system uses YCbCr colour spaces. Because YCbCr colour space separates luminance from chrominance, hence it is robust to changing illumination than other colour spaces like RGB and rgb (normalized RGB). The proposed method not only separates fire

flame pixels but also separates high temperature fire centre pixels by taking in to account of statistical parameters of fire image in YCbCr colour space like mean and standard deviation

Literature survey-3

This paper proposes a large-scale monitoring system and deep learning-based forest fire detection model that can detect forest fires from video frames captured by UAV drones. The proposed CNN model successfully detects forest fires with 97.29% accuracy.

2.2 REFERENCES

1) Author Name - Ms.Tamil Mathi, Dr.L.Latha - A SURVEY ON FOREST FIRE DETECTION

2) Author Name - Priyadarshini Hanamaraddi - A Literature Study on Image Processing for Forest Fire Detection

3) Author Name - Abhay Chopde , Ansh Magon , Shreyas Bhatkar - Forest Fire Detection and Prediction from image processing using RCNN

2.3 PROBLEM STATEMENT DEFINITION

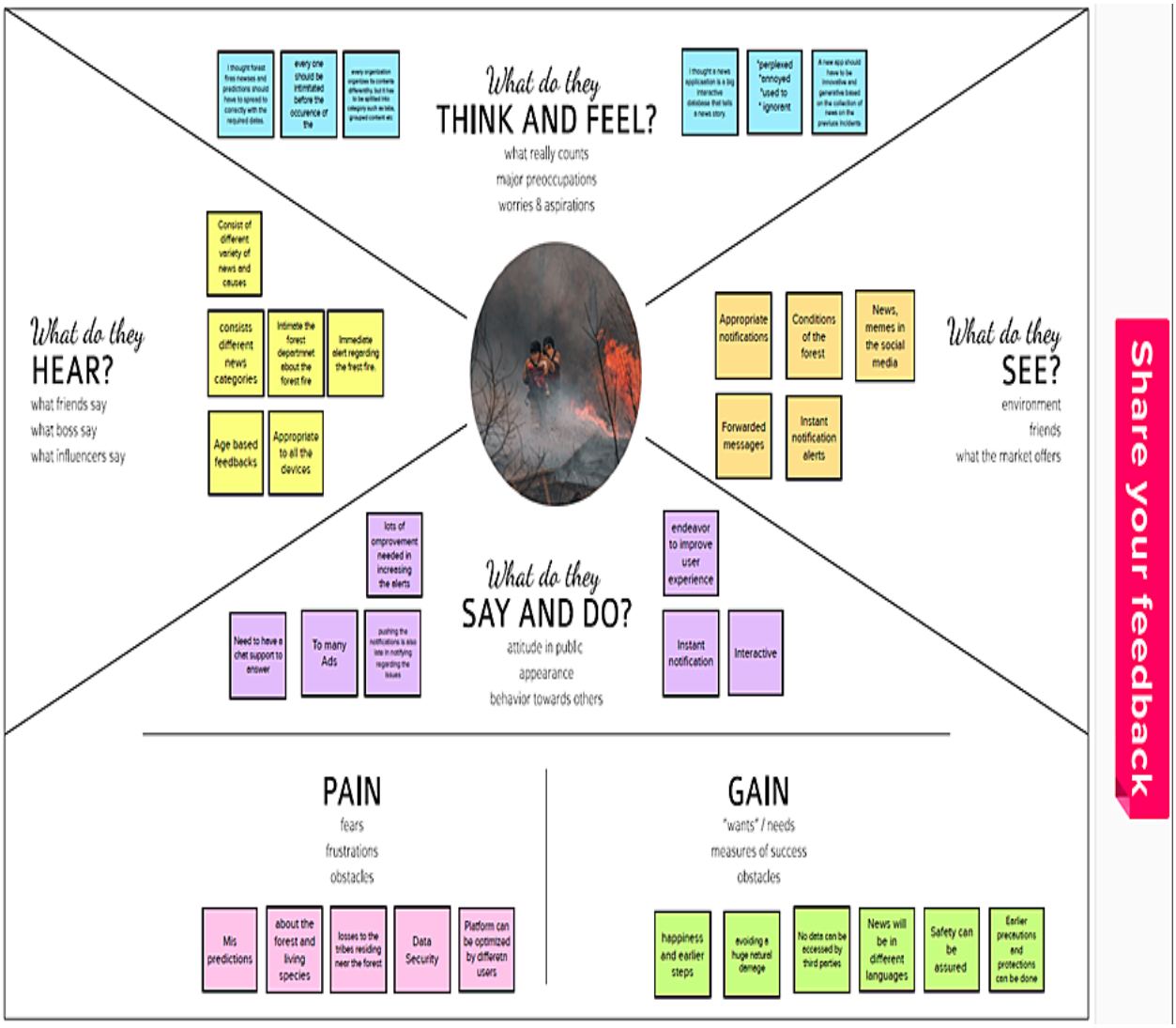
S.No.	Parameter	Description
1.	Problem Statement (problem to be solved)	Forest fires are one of the most vulnerable natural disaster. It affects thousand acres of land and natural resources, which also affects the thousands of living organisms and affects the livelihood of tribes and other forest workers.

2.	Idea / Solution description	The earlier detection of forest fires requires 24/7 monitoring of the forest which is not possible manually. To avoid the delay and manual monitoring 1. We can use image processing to monitor forest. 2. Use computer vision methods for recognition and detection of smoke or fire, based on the still images or the video input from the drone cameras
3.	Novelty / Uniqueness	1. Real time computer detects the forest fires at the earliest before being spread or to occur. 2. Satellite images of forests will be processed for identifying the fire.
4.	Social Impact / Customer Satisfaction	Early detection will helps to 1. Prevent the loss of natural resources and wildlife. 2. It can prevent the livelihood of the surroundings and the people getting affected after the occurrence of forest fires.
5.	Business Model (Revenue Model)	1. The proposed method was implemented using the Python programming language on a Corei3 or greater. 1. The prediction might be right and the can have high reliability.
6.	Scalability of the Solution	1. In future we can include machine learning and robotics many other advance technologies to detect the smoke coming from the forest. 1. Computer vision models enable land cover classification and

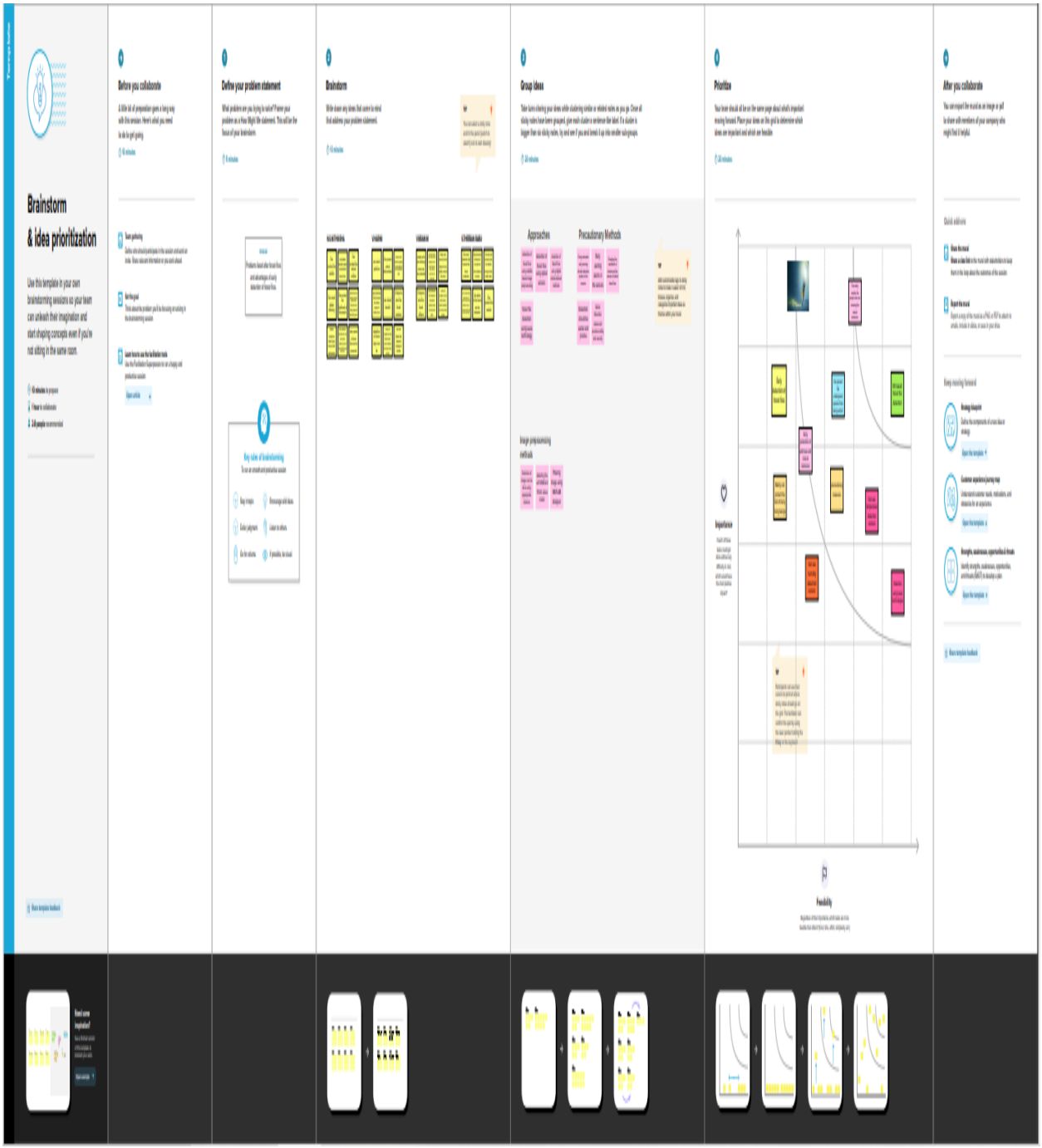
		smoke detection from satellite and ground cameras.

3 IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING:



3.3 PROPOSED SOLUTION:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (problem to be solved)	Forest fires are one of the most vulnerable natural disaster. It affects thousand acres of land and natural resources, which also affects the thousands of living organisms and affects the livelihood of tribes and other forest workers.
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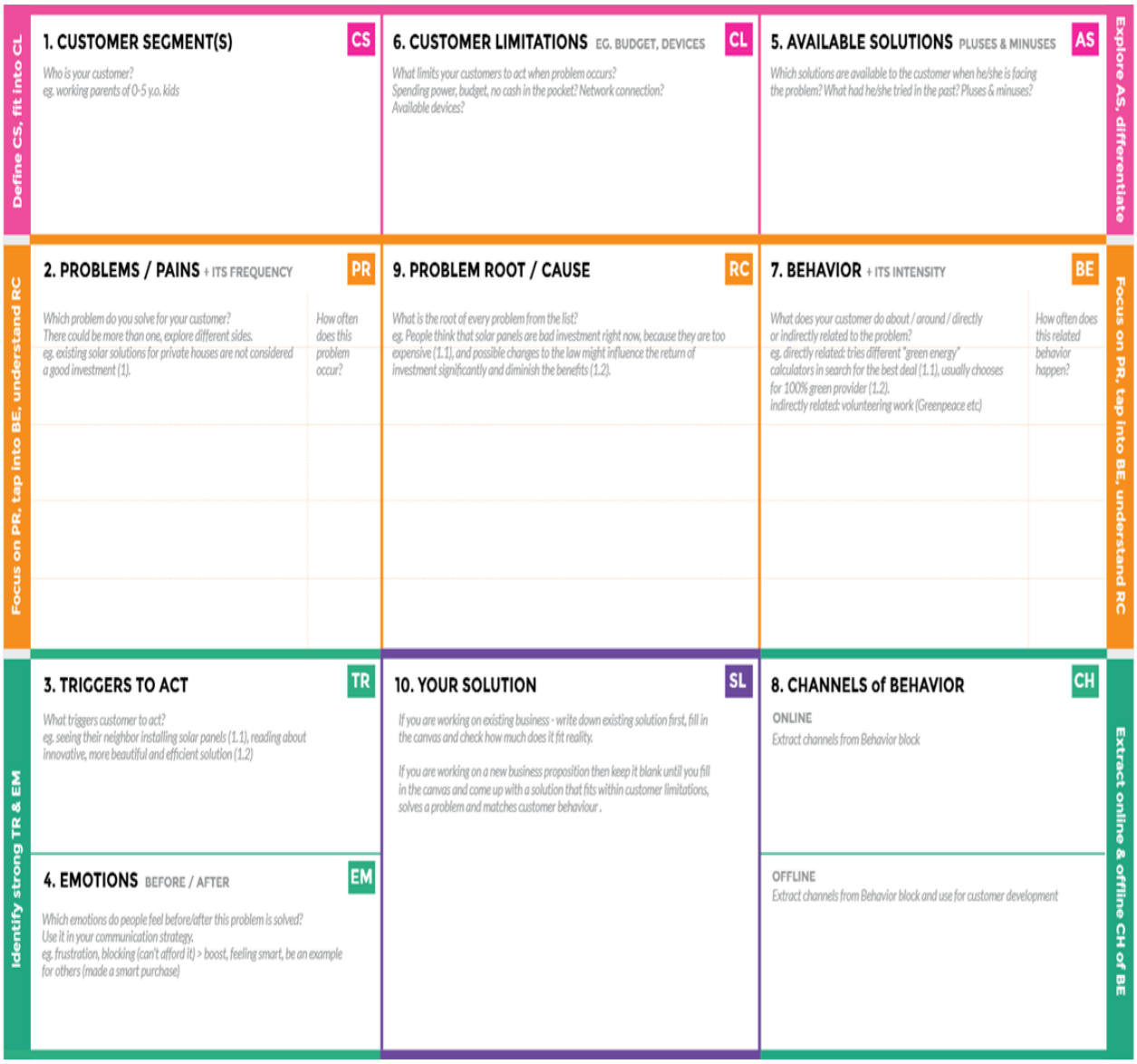
6.	Scalability of the Solution	2. In future we can include machine learning and robotics many other advance technologies to detect the smoke coming from the forest. 2. Computer vision models enable land cover classification and smoke detection from satellite and ground cameras.

3.4 PROBLEM SOLUTION FIT



4 REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

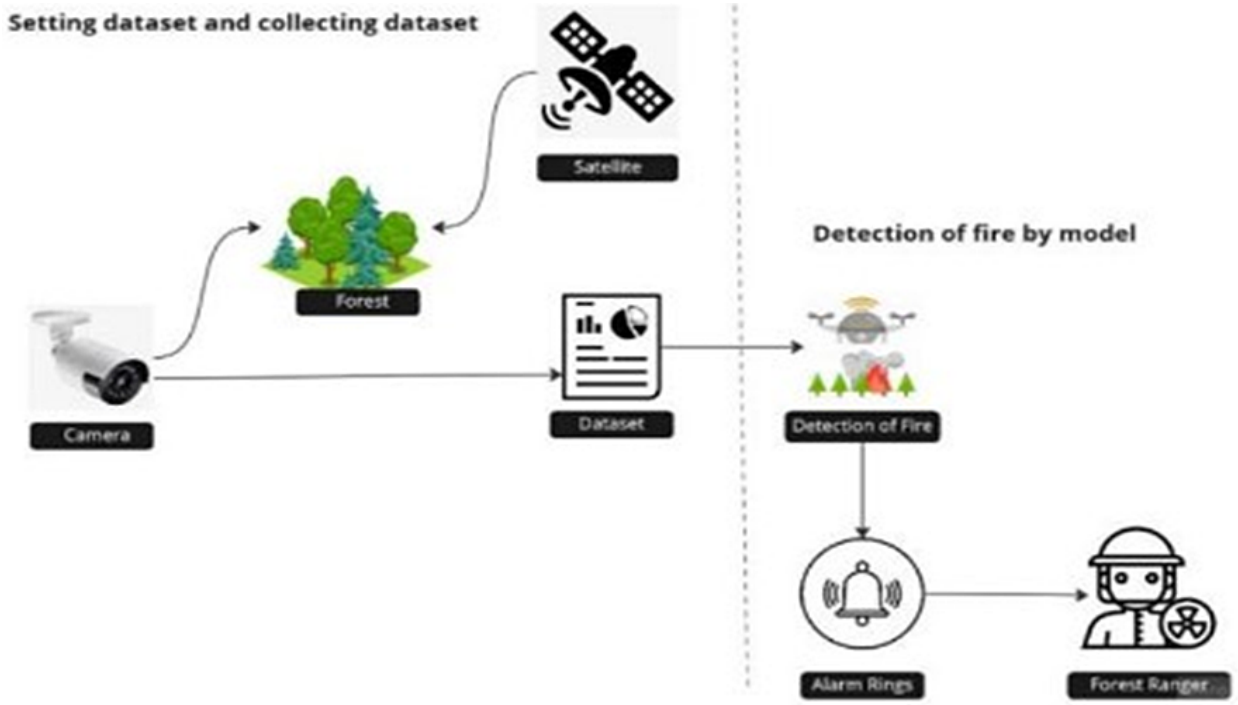
FR. NO.	Functional Requirement	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registrationthrough wildfire portal.
FR-2	User Confirmation	Confirmation via Email Confirmation viaOTP
FR-3	Data Prediction	Scientists create computer models to predictwildfire potential under a range of potential climate futures. Usingdifferent projections oftemperature and downfall, scientists predict where and when wildfires are likely to occur

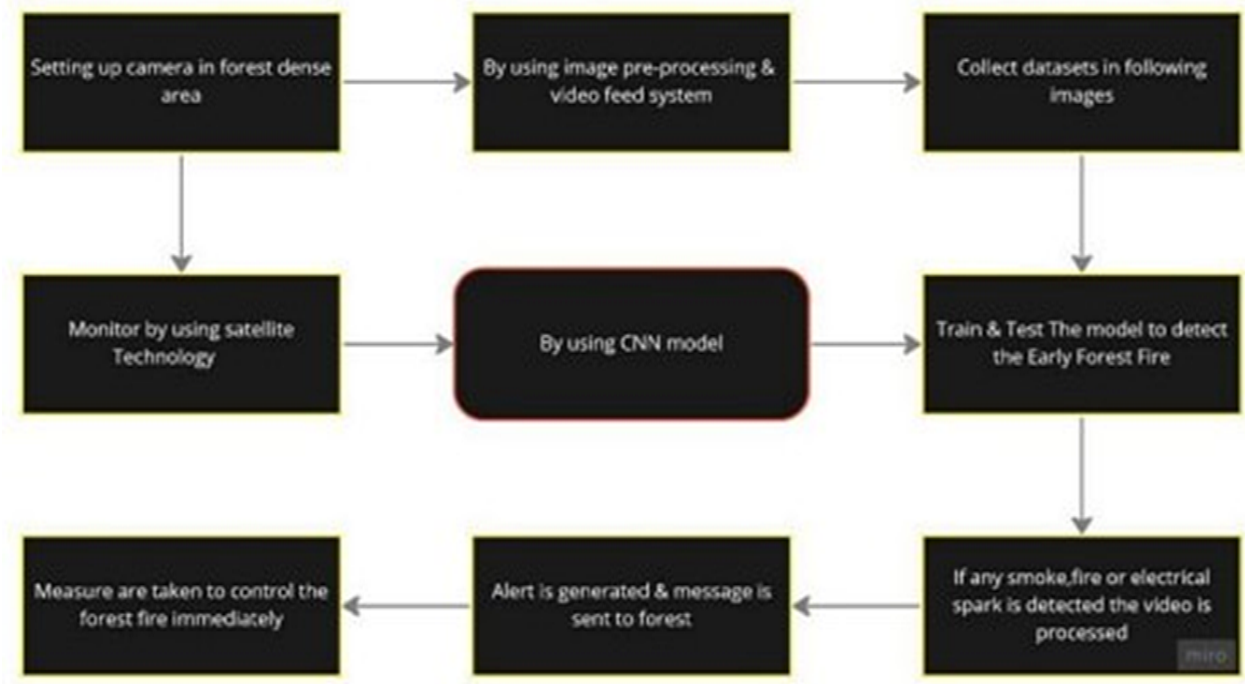
4.2 NON- FUNCTIONAL REQUIREMENTS

FR. NO.	Non-Functional Requirement	Description
NFR-1	Usability	Many methods have been proposed to detect forest fires, such as camera-based systems, WSN-based systems, and machine learning coating-based systems,with both positive and negative aspects and performance figures of detection.
NFR-2	Protection	We have designed this project to secure the forest from wild fires.
NFR-3	Performance	In the event of a fire, the primary objective of using dronesis to gather situational consciousness, which can beused to direct the efforts of the firefighters in locating and controlling hot spots. Just like urban fires, forest fires to require monitoring so that firefighters know what they are dealing with.

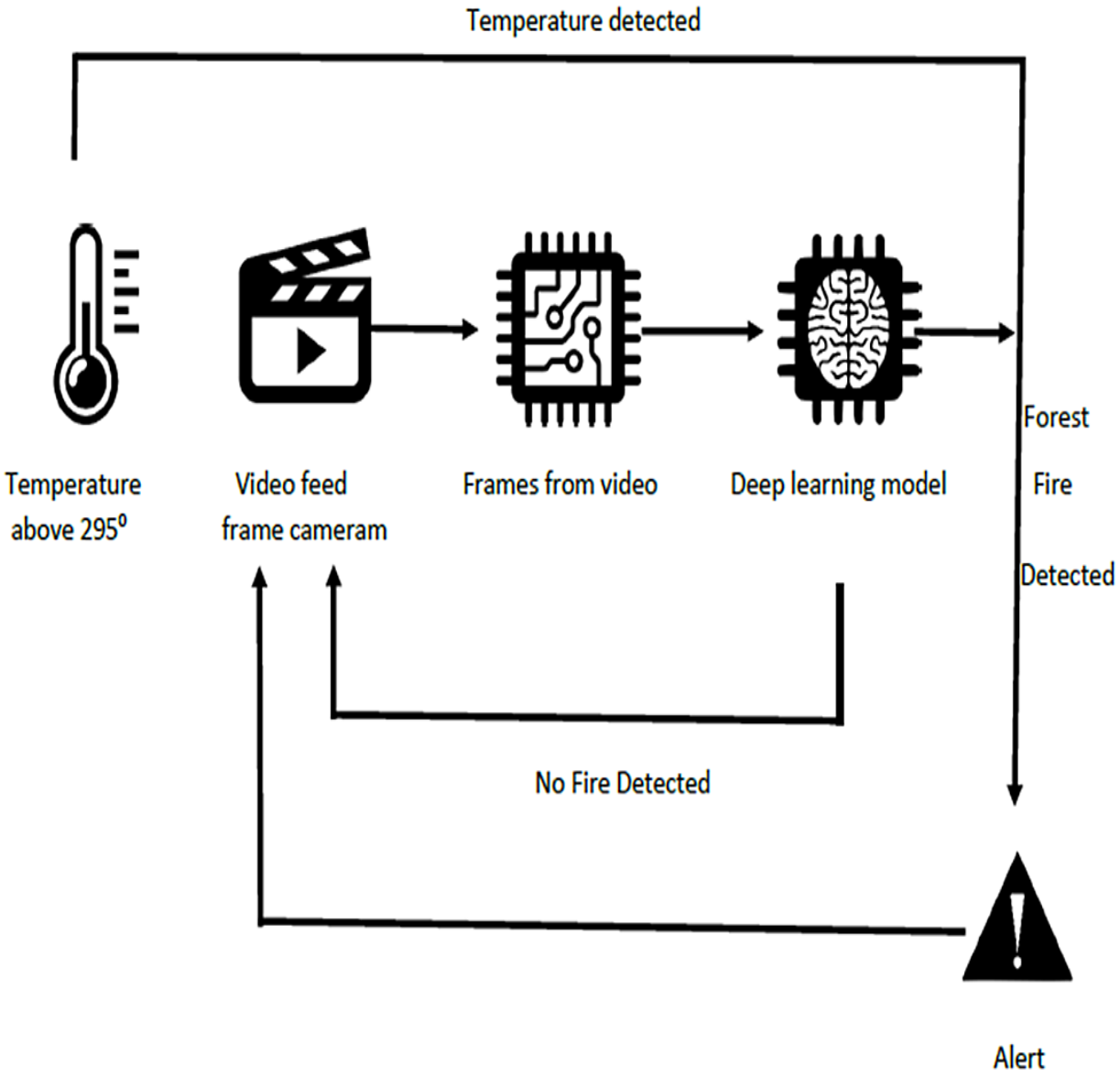
5 PROJECT DESIGN

5.1 DATAFLOW DIAGRAMS





5.2 SOLUTION & TECHNICAL ARCHITECTURE



6 PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User StoryNumber	User Story / Task	Story Points	Priority	Team Members
Sprint-1	DATA COLLECTION	USN-1	Data collected by sensors aboard orbiting satellites, carriedaboard aircraft, or installed on the ground provide a wealth of data that can be used to assess conditions before a burn and track the movement of a wildfire innear real-time.	10	High	N.S.NITHIKSHA V.HARINI M.VIKRAM S.THEEBAN BABU
Sprint-1	IMAGE PREPROCESSING	USN-2	Image processing-Image processing technique automatically detect forest fires around the world by using infrared(IR) images sourced from satellites and CNN used for image recognition and tasks that involve the processing of pixel data.	7	Medium	N.S.NITHIKSHA V.HARINI M.VIKRAM S.THEEBAN BABU
Sprint-2	TRAINING AND TESTING	USN-3	The model is trained for detecting the fire by training withreal time workand the testing is done according the accuracy of the model	10	high	N.S.NITHIKSHA V.HARINI M.VIKRAM S.THEEBAN BABU

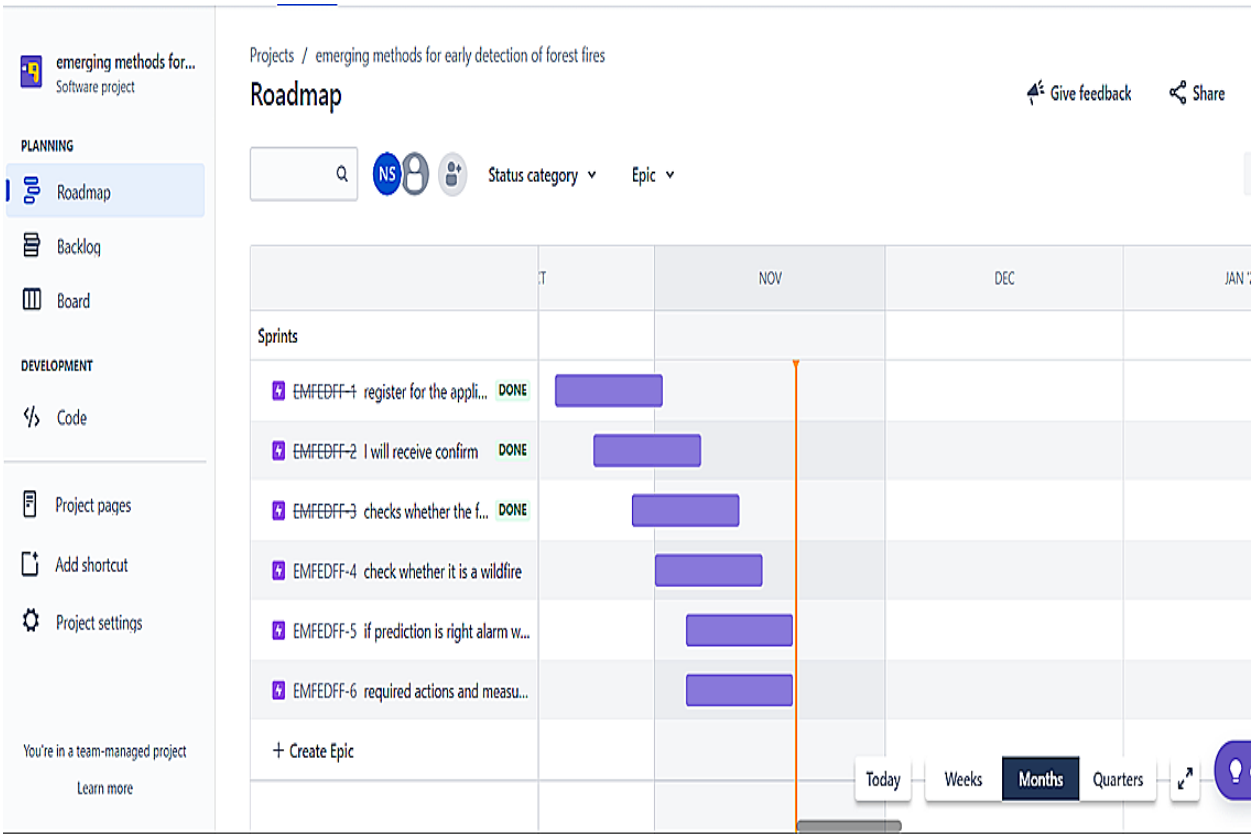
Sprint-3	REVIEWING THE MODEL	USN-4	The main task is to check that the model is efficient to work in real time to ensurethere is no error in the model	7	Medium	N.S.NITHIKSHA V.HARINI M.VIKRAM S.THEEBAN BABU
Sprint-4	IMPLEMENTATION	USN-5	After completing every step the model is implemented on the forestand the quickresponses is collected from forest organization	10	High	N.S.NITHIKSHA V.HARINI M.VIKRAM S.THEEBAN BABU

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on PlannedEnd Date)	Sprint ReleaseDate(Actual)

Sprint-1	20	6 Days	24 Oct 2022	27 Oct 2022	8	27 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	7	08 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	8	16 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	7	20 Nov 2022

6.3 REPORT FROM JIRA



7 CODING & SOLUTIONING (EXPLAIN THE FEATURES ADDED IN THE PROJECT ALONG WITH CODE)

7.1 FEATURE 1

In [2]:
```
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
```

In [3]:
```
#defining the parameters
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)
```

In [6]:
```
#
x_train =train_datagen.flow_from_directory('C:/Users/nithi/OneDrive/Desktop/project ibm/Dataset/train_set',
                                           target_size=(150,150),
                                           batch_size = 32,
                                           class_mode = 'binary')
```

```
Found 458 images belonging to 2 classes.
```

In [7]:
```
x_test = test_datagen.flow_from_directory('C:/Users/nithi/OneDrive/Desktop/project ibm/Dataset/test_set',
                                          target_size=(150,150),
                                          batch_size=32,
                                          class_mode ='binary')
```

```
Found 122 images belonging to 2 classes.
```

7.2 FEATURE 2

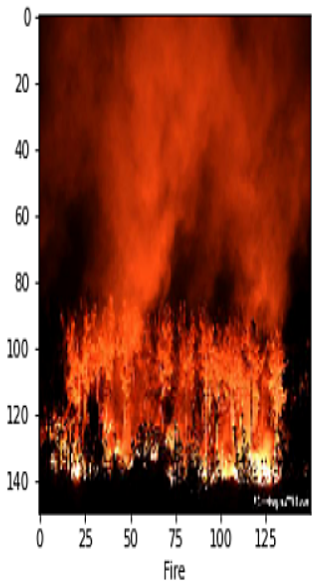
In [205]:
```
pred =np.argmax(x,axis=1)
if pred[0].all()==1:
       account_sid='AC73b617c990de0f236a076c8b62159383'
       auth_token='a61c60722933897f61a555b0a6d84b09'
       Client = Client(account_sid, auth_token)
       message= client.messages\
       .create(body="Forest fire is detected, stay alert and stay safe",
              from_= "+15134808332",
              to="8825499159")
       print(message.sid)
       print('Fire Detected')
       print('SMS SENT!')
       playsound('C:/Users/nithi/OneDrive/Desktop/project ibm/Melody Message.mp3')
else:
   print('NO DANGER')
   #break
video.release()
cv2.destroyAllWindows()
```

```
NO DANGER
```

7.3 FEATURE 3

In [152]:
```
predictImage("C:/Users/nithi/OneDrive/Desktop/project ibm/Dataset/test_set/with fire/19464620_401.jpg")
```

```
1/1 [==============================] - 1s 817ms/step
[[1.]]
```



In [95]:
```
pip install twilio
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting twilio
  Downloading twilio-7.15.3-py2.py3-none-any.whl (1.4 MB)
Requirement already satisfied: PyJWT<3.0.0,>=2.0.0 in c:\programdata\anaconda3\lib\site-packages (from twilio) (2.1.0)
Requirement already satisfied: requests>=2.0.0 in c:\programdata\anaconda3\lib\site-packages (from twilio) (2.27.1)
Requirement already satisfied: pytz in c:\programdata\anaconda3\lib\site-packages (from twilio) (2021.3)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\programdata\anaconda3\lib\site-packages (from requests>=2.0.0->twili
```

8 TESTING

FeatureType	Component	Test Scenario	Steps To Execute	Expected Result	Actual Result	Status
UI	Home Page	Display the Emerging Methods of Forest Fires	Enter URL(http://127.0.0.1:5000)	Displaying the Home Page	Home Page displayed	**Pass**
UI	Home Page	Displayed thePrediction Forest Fires	1.Enter URL(http://127.0.0.1:5 000) 2.Content of the Home Page shouldbe Displayed	Displaying the content of Home page	Content of Homepage is displayed	**Pass**
Functional	Home	Checks whether the Dropthe Image Here! Button is visible	Enter URL(http://127.0.0.1:5000) Content of the Home Page shouldbe Displayed 3.Click Drop the Image Here! Button	Displays the Button	Drop theImage Here! Button ispops up.	Pass
Functional	Predicted page	Display the PredictionPage and Choose Image Button	Enter URL(http://127.0.0.1:5000) Content of the Home Page should be Displayed 3.Click Drop the Image Here! Button 4.Click Choose Image	Displays the Prediction Page and theChooseImage Button	Predicti on page displayed. Chooseimage button was clicked.	Pass

8.2 USER ACCEPTANCE TESTING

DEFECT ANALYSIS

Resolution	severity 1	severity 2	severity 3	badness 4	subtotal
ByDesign	1	1	2	0	4
Duplicate	0	0	0	0	0
External	0	0	2	1	3
Fixed	4	2	4	1	11
Not Reproduced	0	0	0	0	0
Skipped	0	0	1	1	2
Won't Fix	0	0	0	1	1
Totals	5	3	9	4	21

TEST CASE ANALYSIS

Section	Total Cases	Not tested	Fail	Pass
Client Application	10	0	0	10
Security	2	0	0	2
Performance	2	0	0	2
Exception Reporting	2	0	0	2
Final Report Output	3	0	0	3

9 RESULTS

9.1 PERFORMANCE METRICES

S. No	Parameter	Values	Screenshot
1.	Model Summary	3,453,121	Layer (type) Output Shape Param # conv2d (Conv2D) (None, 148, 148, 32) 896 max_pooling2d (MaxPooling2D) (None, 74, 74, 32) 0 conv2d_1 (Conv2D) (None, 72, 72, 64) 18496 max_pooling2d_1 (MaxPooling2 (None, 36, 36, 64) 0 conv2d_2 (Conv2D) (None, 34, 34, 128) 73856 max_pooling2d_2 (MaxPooling2 (None, 17, 17, 128) 0 conv2d_3 (Conv2D) (None, 15, 15, 128) 147584 max_pooling2d_3 (MaxPooling2 (None, 7, 7, 128) 0 flatten (Flatten) (None, 6272) 0 dense (Dense) (None, 512) 3211776 dense_1 (Dense) (None, 1) 513 Total params: 3,453,121 Trainable params: 3,453,121 Non-trainable params: 0
2.	Accuracy	Training Accuracy - 0.9665 Validation Accuracy -0.9833	Epoch 1/10 14/14 [==========] - 98s 7s/step - loss: 0.5717 - accuracy: 0.6552 - val_loss: 0.2095 - val_accuracy: 0.8750 Epoch 2/10 14/14 [==========] - 84s 6s/step - loss: 0.3266 - accuracy: 0.8434 - val_loss: 0.1153 - val_accuracy: 0.9667 Epoch 3/10 14/14 [==========] - 74s 5s/step - loss: 0.2247 - accuracy: 0.9127 - val_loss: 0.1184 - val_accuracy: 0.9500 Epoch 4/10 14/14 [==========] - 75s 5s/step - loss: 0.1682 - accuracy: 0.9435 - val_loss: 0.0286 - val_accuracy: 1.0000 Epoch 5/10 14/14 [==========] - 82s 6s/step - loss: 0.1273 - accuracy: 0.9638 - val_loss: 0.0631 - val_accuracy: 0.9667 Epoch 6/10 14/14 [==========] - 76s 6s/step - loss: 0.0925 - accuracy: 0.9741 - val_loss: 0.0168 - val_accuracy: 1.0000 Epoch 7/10 14/14 [==========] - 80s 6s/step - loss: 0.0884 - accuracy: 0.9734 - val_loss: 0.0154 - val_accuracy: 1.0000 Epoch 8/10 14/14 [==========] - 72s 5s/step - loss: 0.1050 - accuracy: 0.9602 - val_loss: 0.0455 - val_accuracy: 0.9833 Epoch 9/10 14/14 [==========] - 70s 5s/step - loss: 0.1021 - accuracy: 0.9676 - val_loss: 0.0044 - val_accuracy: 1.0000 Epoch 10/10 14/14 [==========] - 92s 6s/step - loss: 0.1344 - accuracy: 0.9665 - val_loss: 0.0807 - val_accuracy: 0.9833

10 ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1. The proposed system detects the forest fire at a faster rate compared to existing system. It has enhanced data collection feature.
2. The major aspect is that it reduces false alarm and also has accuracy due to varioussensors present.
3. It minimises the human effortas it works automatically. This is very low-cost due towhich can be easily accessed.
4. The main objective of our project is to receive an alert message through an app to therespective user.

DISADVANTAGE:

5. Theelectrical interference diminishes the potency of radio receiver.
6. Themain drawback is that it has less coverage range areas.

11 CONCLUSION

This type of system is the first of its kind to ensure no further damage is then to forests when there is fire breakout and instantly a message is sent to the user through the App. Immediate response or early warning to a fire breakout is mostly the only ways to avoid losses and biology, cultural heritage damages to a great extent. Therefore, the most important goals in fire surveillance are quick and authentic detection of fire. It is so much easier to suppress fire while it is in its early stages. info about progress of fire is highly valuable for managing fire.

During all its stages. Basedon this data the firefighting staff can be guided on target to block firebefore it reaches cultural heritage sites and to suppress it quickly by utilise required firefighting equipment and vehicles. With further research and invention, this project can be implemented in various forest areas so that we can save our forests and maintain great environs.

12 FUTURE SCOPE

This project is far from complete and there is a lot of room for betterment. Some of thebetterment that can be made to this project are as follows:

Additional pump can be added so that it automatically sends water when there is a firebreakout. Also industrial sensors can be used for better ranging and accuracy.

This projecthas endless potentialand can always be enhancedto become better.Enforce thisconcept in the real world will benefit several industries and reduce the workload on many workers, enhancing overallwork efficiency.

13 APPENDIX

TEMPLATE

digital.html

```
<!DOCTYPE html>
<html>

<head>
    <title>Early Detection of Forest Fires</title>

    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width,
initial-scale=1">
    <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/css/
bootstrap.min.css">
    <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.m
in.js"></script>
    <script
src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></
script>
    <link rel="stylesheet"
href="https://www.w3schools.com/w3css/4/w3.css">
```

```
        <link rel="stylesheet" href="/static/style.css">
        <style>

        </style>
</head>

<body style="background-color:black;">
        <!-- <div class="header">Early Detection of Forest
Fires</div> -->
        <div class="container text-center mb-10"
style="padding-top:50px;">
                <div>
                        <h1 style="font-size: 46px; color:
white;">EARLY DETECTION OF <span
style="color:firebrick">FOREST FIRES
                                </span></h1>
                </div>
        </div>

        <section class="site-section" id="section-about"
style="padding-top: 200px;">
                <div class="container">
                        <div class="row mb-5 align-items-center">
                                <div class="row mb-5">
                                        <div class="section-heading text-
```

```
center text-align">
                                    <h2 style="color:
red;">PREDICTION <strong
style="color:#FFD700;">FOREST FIRE</strong></h2>
                                </div>
                                <p style="color: white;"> Forest
fires are increasing in prevalence, damaging ecosystems, and
                                    costing lives.
                                    Early detection systems are vital
to preventing the detrimental impact of these fires that
                                    rapidly spread across
landscapes.
                                    Over recent years, several
optical systems have been developed that can act as early
warning
                                    systems.</p>

                                <p style="color: white;"> Forest
fires are a major Environmental issue,Creating economic
and
                                    ecological damage while
endangering human lives
                                </p>
                            </div>
                            <div class="row mb-5" style="padding-
left: 450px;">
```

```
                    <a href="#section2"> <button
class="button button3 text-center">DROP THE IMAGE
HERE!</button> </a>
                    <style>
                        .button {
                            background-color:
#4CAF50;
                            /* Green */
                            border: none;
                            color: white;
                            padding: 16px 32px;
                            text-align: center;
                            text-decoration: none;
                            display: inline-block;
                            font-size: 16px;
                            margin: 4px 2px;
                            transition-duration: 0.4s;
                            cursor: pointer;
                            border-radius: 4px;
                        }


                        .button3 {
                            background-color: white;
                            color: black;
```

```
                    border: 2px solid #f44336;
                }

                .button3:hover {
                    background-color: #f44336;
                    color: white;
                }
            </style>
        </div>
    </div>

    </div>
</section>

</div>


<div class="predictimg" id="section2"
style="background-color:beige;">
    <section id="main">
        <div class="text-center mb-8">
            <p>
                <h2 class="mb-5" style="font-
size:25px; font-weight: bolder;">PREDICTION ON <span
style="color:firebrick;">IMAGE </span></h2>
```

```
                    <h3 style="font-size:25px; font-weight: bolder;"> CLICK ON CHOOSE AND <span style="color: firebrick;"> UPLOAD THE IMAGE .... </span></h3>
                    </p>

                </div>

            </section>

            <div class="container border border-danger rounded ">
                <div class="text-center">
                    <h4 class="mb-5" style="font-size:25px; font-weight: bolder;">UPLOAD YOUR IMAGE</h4>

                    <form action="http://localhost:5000/" id="upload-file" method="post" enctype="multipart/form-data">
                        <label for="imageUpload" class="button button3">
                            CHOOSE IMAGE
                        </label>
                        <input type="file" name="image" id="imageUpload" accept=".png, .jpg, .jpeg">
                    </form>
```

```
                    <div class="image-section mb-5"
style="display:none; padding-left:400px;">
                        <div class="img-preview">
                            <div id="imagePreview">
                            </div>
                        </div>
                    </div>

                    <div class="image-section mb-5"
style="display:none;">
                        <div>
                            <button type="button"
class="button button3" id="btn-
predict">PREDICT!</button>
                        </div>
                    </div>

                    <div class="loader "
style="display:none;"></div>
                    <div >
                        <h4 class="text-center " >
                            <span id="result" class="alert
alert-primary mb-10" role="alert" style="font-size:35px;">
```

```
</span>
                                </h4>
                            </div>

                        </div>

                    </div>
                </div>
                <script>
                    window.onscroll = function () { myFunction() };

                    $(document).ready(function () {
                        // Init
                        $('.image-section').hide();
                        $('.loader').hide();
                        $('#result').hide();

                        // Upload Preview
                        function readURL(input) {
                            if (input.files && input.files[0]) {
                                var reader = new FileReader();
                                reader.onload = function (e) {

$('#imagePreview').css('background-image', 'url(' +
e.target.result + ')');
```

```
                    $('#imagePreview').hide();
                    $('#imagePreview').fadeIn(650);
                }

reader.readAsDataURL(input.files[0]);
            }
        }
        $("#imageUpload").change(function () {
            $('.image-section').show();
            $('#btn-predict').show();
            $('#result').text('');
            $('#result').hide();
            readURL(this);
        });

        // Predict
        $('#btn-predict').click(function () {
            var form_data = new
FormData($('#upload-file')[0]);

            // Show loading animation
            $(this).hide();
            $('.loader').show();

            // Make prediction by calling api /predict
```

```
                $.ajax({
                    type: 'POST',
                    url: '/predict',
                    data: form_data,
                    contentType: false,
                    cache: false,
                    processData: false,
                    async: true,
                    success: function (data) {
                        // Get and display the result
                        $('.loader').hide();
                        $('#result').fadeIn(600);
                        $('#result').text('PREDICTION
: ' + data);
                        console.log('Success!');
                    },
                });
            });

        });
    </script>



</body>
```

```
</html></title>
</head>
<body>

</body>
</html>
```

app.py

```
from __future__ import division, print_function
import os
import numpy as np
import tensorflow as tf
from tensorflow.keras.preprocessing import image
from tensorflow.keras.models import load_model
from flask import Flask, request, render_template
from werkzeug.utils import secure_filename
from twilio.rest import Client

global graph
# graph=tf.get_default_graph()
# Define a flask app
app = Flask(__name__)
model = load_model('forest1.h5')
```

```
@app.route('/', methods=['GET'])
def index():
    # Main page
    return render_template('digital.html')


@app.route('/predict', methods=['GET', 'POST'])
def upload():
    if request.method == 'POST':
        # Get the file from post request
        f = request.files['image']

        # Save the file to ./uploads
        basepath = os.path.dirname(__file__)
        file_path = os.path.join(
            basepath, 'uploads', secure_filename(f.filename))
        f.save(file_path)
        img1 = image.load_img(file_path, target_size=(150,
150))

        y = image.img_to_array(img1)
        x = np.expand_dims(y, axis=0)
        val = model.predict(x)
```

```
        print(val)
        if val == 1:
            send_message()
            result = "Fire"
        elif val == 0:
            result = "No Fire"
        return result


def send_message():
    < --- "Enter your Twilio address" -->




    if __name__ == '__main__':
        app.run(threaded=False)
```

style.css

```
predictimg{
    background-color: #565961;
    background-size: cover;
    background-position:center;
```

```
    background-attachment:absolute;
    height:100%;
    margin-top:49.6%;
}

#showcase{
height:300px;
margin-bottom:30px;
}
html {
scroll-behavior: smooth;
}
#main{
float:center;
color:black;
width:100%;
padding:0 30px;
padding-top:7%;
box-sizing: border-box;
font-family:Georgia, serif;
text-align:center;
}
```

```
#sidebar{
float:right;
width:50%;
background-color: transparent;
color:#000;
font-family:Georgia, serif;
padding-left:0px;
padding-right:0px;
padding-top:1px;
box-sizing: border-box;
}
.img-preview {
width: 300px;
height: 300px;
position: relative;
border: 5px solid #F8F8F8;
box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
margin-top: 1em;
margin-bottom: 1em;
}

.topnav-right a.active {
background-color: #565961;
color: white;
```

```
}

.topnav-right {
float: right;
padding-right:100px;
}

.img-preview>div {
width: 100%;
height: 100%;
background-size: 300px 300px;
background-repeat: no-repeat;
background-position: center;
}

input[type="file"] {
display: none;
}


.loader {
border: 8px solid #f3f3f3; /* Light grey */
border-top: 8px solid #161616;
border-radius: 50%;
width: 50px;
```

```
height: 50px;
animation: spin 1s linear infinite;
}

@keyframes spin {
0% { transform: rotate(0deg); }
100% { transform: rotate(360deg); }
}
```

GITHUB & PROJECT DEMO LINK

GITHUB LINK

IBM-EPBL/**IBM-Project-31285-1660198652**

PROJECTDEMO LINK

https://drive.google.com/file/d/1-S2I2zGDTYGBLFLOBwzZMyZdMCqICPJU/view?usp=share_link