KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HX 8001-PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

EMERGING OF EARLY DETECTION OF FOREST FIRES

NALAIYA THIRAN PROJECT REPORT 2022

Submitted by

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Team ID: PNT2022TMID13480

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GitHub & Project Demo Link

1 INTRODUCTION

Nowadays,the techniques for fire detection in large forest areas are based on satellite images and forest guard posts. However,these methods are not suitable for local measurement of the relevant parameters involved in fire risk and, hence, in its early detection. For this purpose, distributed sensing systems as wireless sensor networks (WSN) can offer a suitable measurement resolution .A WSN consists of several sensing nodes which gather information from the surrounding environment and communicate with each other to send the measured data to a base station for further processing. The most important requirements to develop a WSN node are small form factor, to reduce the visual effect in the area where sensors are distributed. This system provides valuable near real-time and also historical data on the forest fires in Europe, the Middle East and North Africa. EFFIS is currently used and supported with data by 25 EU Member States and many other countries. If we compare these values with the average values of the EFFIS reports for the period 2006-2015, the number of forest fires has decreased by 13327 or almost 20%.

1.1 PROJECT OVERVIEW:

Recently, many solutions of different types have been developed forest fire detection and a fire management system have been

successfully developed and applied.It is a fact that wildfire detection and wildfire management must be differentiated in order to understand how to set up new fire detection and containment systems. Therefore, we divide forest fire detection and management systems into different classes. Some studies have combined wildfire suppression and detection methods. A research group has investigated forest fire prevention through root cause analysis. In addition, other studies have looked at private management systems for private forest areas. Although some wildfire management systems include wildfire detection, containment and suppression systems, detection is not their primary focus, so fire detection systems should be considered alone to establish more advanced detection systems. Wildfire detection systems can actually be divided into three main categories Likewise, temperature-based systems can be divided into two distinct categories: based on static and dynamic sensors and based on remote sensors. The latter uses tools such as radar, lidar (light detection and ranging), and sodar (sound detection and ranging). In the literature, many authors focus on early fire detection using image processing techniques on satellite images obtained from forests.

Although all are useful scientific studies and a number have been successfully applied, satellite based systems studies have limitations, including testing limited to private forest areas, high costs and the requirement of a suitable satellite.

1.2 PURPOSE:

Forest fires as of late have been annihilating both for normal biological system, biodiversity and woodland economy. With expanding populace weight and change in worldwide atmosphere situation, there is an expansion in level of fires that are a significant reason for declining Indian woodlands. As indicated by woodland study report of India, 50 % of backwoods regions in nation are fire inclined (going from 50 to 90 % in certain conditions of nation). Around 6 % of the woods are inclined to extreme fire harms. The reason for this planned framework is to manufacture a dependable fire location framework so as to know dynamic status of backwoods temperature in specific conditions. It is about the sensors and dynamic checking framework to dodge a significant fire and genuine harm to woods.

2 LITERATURE SURVEY

TITLE	AUTHOR & YEAR	JOURNAL NAME	REMARKS
Forest fire	Kaufmann, R. K. & Ullman, B 2020		The prediction price is accurate till there is a massive and sudden change in the actual data, where it becomes challenging to predict the exact new price The proposed model is power fulandhighly suggested because investors can use it not only to initiate trades but also as an effective tool to judge various strategies relating to investments.

TITLE	AUTHOR & YEAR	JOURNAL NAME	REMARKS
Climate Change	Ramakanta Mohanty & 2021		Reliability is the important factor in accessing the software quality. It is related withed fects and faults. If more faults are encountered, the reliability of software decreases. Therefore, Reliability is defined as the probability of a system or component to work properly for a particular period of time under certain conditions.

TITLE	AUTHOR & YEAR	JOURNAL NAME	REMARKS
Spot to the Futures Price	Herbert, John & 2021		Futures prices are unbiased predictors of crude oil A random walk characterization of commodity prices is not a particularly good one. This result contrasts with those found for other asset prices, notably foreign exchange rates. However, this result may partly be an artifact of our forecasting sample which encompasses a period of rising prices.

TITLE	AUTHOR & YEAR	JOURNAL NAME	REMARKS
Resue Price Movements	Coppola, A. & 2022		Tests cointegration for the petroleum futures basis series using rank test method. The nullhy pothesis of no cointegration for the basis is rejected at the 1ˢ level, which is supportive of the expectations hypothesis. This implies that there is no arbitrage opportunity on futures contracts over along period of time. Furthermore, we investigate that long-run nonlinear equilibrium relationship that exists within the petroleum spot and futures markets using non-parametric rank test proposed by Breitung

2.1 EXISTING PROBLEM:

The existing system for detecting fire are smoke alarms and heat alarms. The main disadvantage of the smoke sensor alarm and heat sensor alarms are that just one module is not enough to monitor all the potential fire prone places. The only way to prevent fire is too cautious at the time. Even if they are installed in every nook and corner, it just is not sufficient for an efficient output consistently. As the number of smoke sensor requirement increase the cost will also increase to its multiple. The proposed system can produce consistent and highly accurate alerts within seconds of accident of the fire. It reduces cost because only one software is enough to power the entire network of surveillance. Research is active on this field by data scientists and machine learning researchers. The real challenge is to minimize the error in detection of fire and sending alerts at the right time. The idea of this research is to fabricate a system through IoT sensors, which is arbitrarily spread in the forest and to make a self-sorted out powerful system between the sensors to cover all the enormous territories in the forest that will used to maintain a strategic distance from the fire harm whenever. The capacity of the sensor is to identify fire in the inclusion region between the time intermission of each 5-10 minutes. At the point when the fire is recognized the entirety of the sensor in the region will be dynamic and order to stop the normal assignment. The concept is to build early fire detector

using Arduino which is connected with different IoT sensors. Putting all efforts to develop a smarter system by connecting it to a webpage and monitoring the developed system statistics controlled by the Arduino programming. The use of latest technology can help to prevent the catastrophic accidents in forests. The aim is to early detect the fireplace in forest by considering the several factor like smoke, temperature, humidity, flame and based on the data we get from this programming, the forest department will be able to take an appropriate decision and the rescue team will be able to arrive on time at exact location. Consider, if it is a large region and it produces more carbon monoxide than the ordinary vehicle traffic. Surveillance of the danger areas and an early detection of fireplace can appreciably shorten the response time and additionally decrease the practicable injury as nicely as the fee of firefighting. Known rule applies here: 1 minute – 1 cup of water, 2 minutes - 100 liters of water, 10 minutes - 1000 liters of water. The goal is to notice the fireplace as quicker as possible, its actual localization and early notification to the fire devices. When fire starts then the flammable texture may likewise issues fuel to the hearth focal spot. The spot at that point will expand and more extensive.

2.2 REFERENCES:

1.Mueller, R. C. et al. Differential tree mortality in response to severe drought: evidence for long-term vegetation shifts. J. Ecol. 93 (2021).

2.Gaylord, M. L. et al. Drought predisposes piñon-juniper woodlands to insect attacks and mortality. New Phytol. 198, 567–578 (2021).

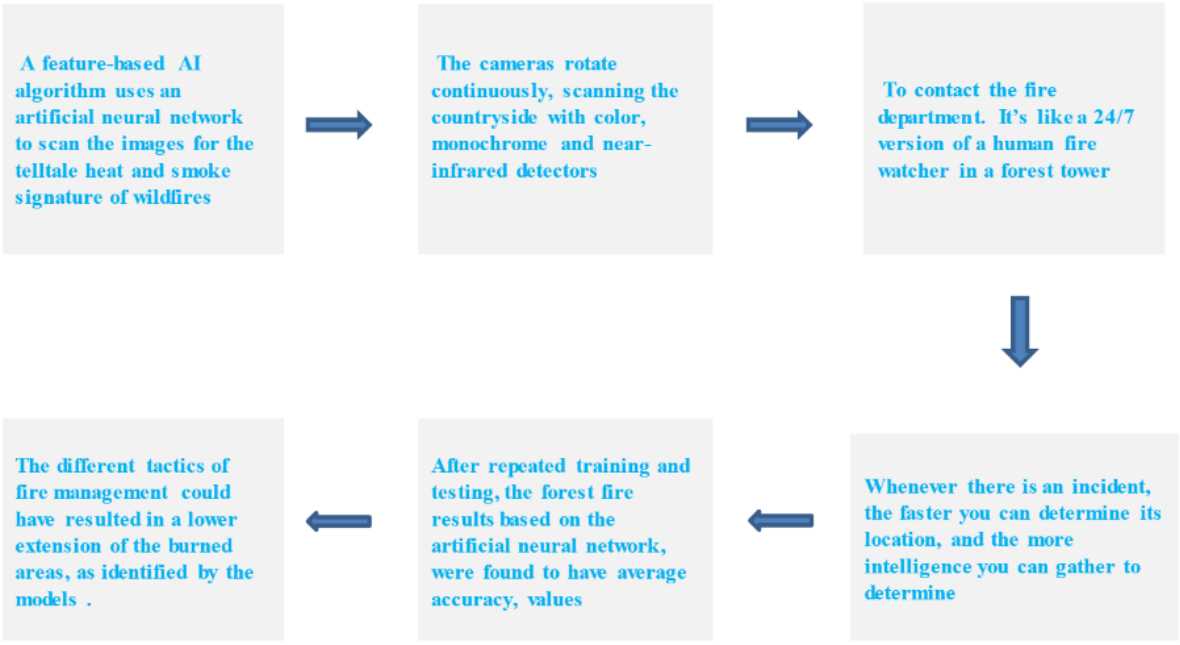
3.McDowell, N. et al. Mechanisms of plant survival and mortality during drought: why do some plants survive while others succumb to drought? New Phytol. 178, 719–739 (2021).

4.Vicente-Serrano, S. M. et al. Response of vegetation to drought time-scales across global land biomes. Proc. Natl Acad. Sci. USA 110, 52–57 (2022).

5.Novick, K., Katul, G., McCarthy, H. & Oren, R. Increased resin flow in mature pine trees growing under elevated CO2 and moderate soil fertility. Tree Physiol. 32, 752–763 (2022).

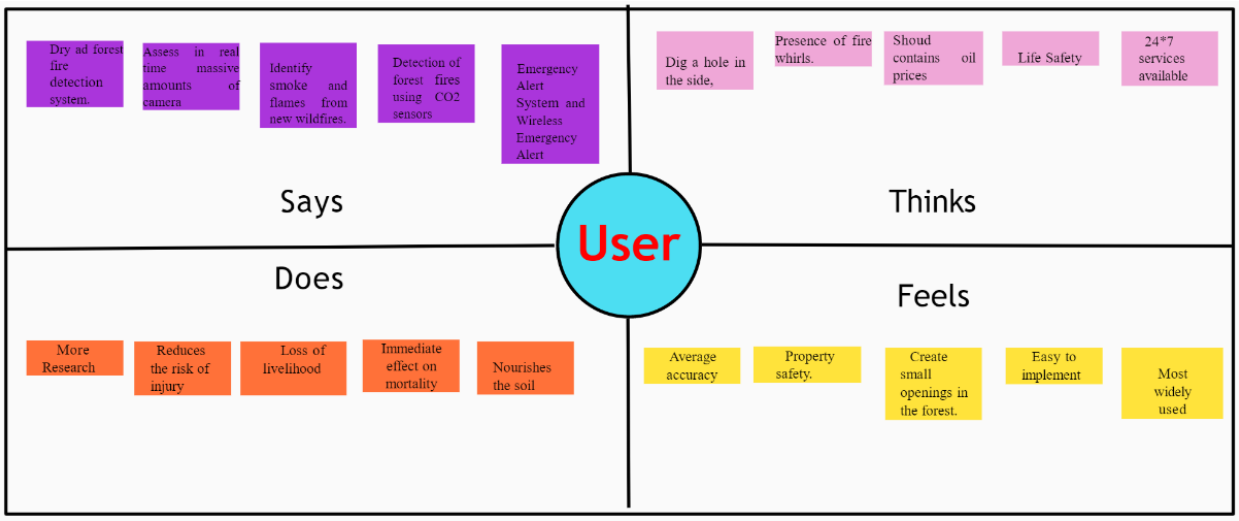
6.Camarero, J. J., Gazol A., Sangesa-Barreda, G., Oliva, J. & Vicente-Serrano, S. M. To die or not to die: early warnings of tree dieback in response to a severe drought. J. Ecol. 103, 44–57 (2022).

2.3 PROBLEM STATEMENT:

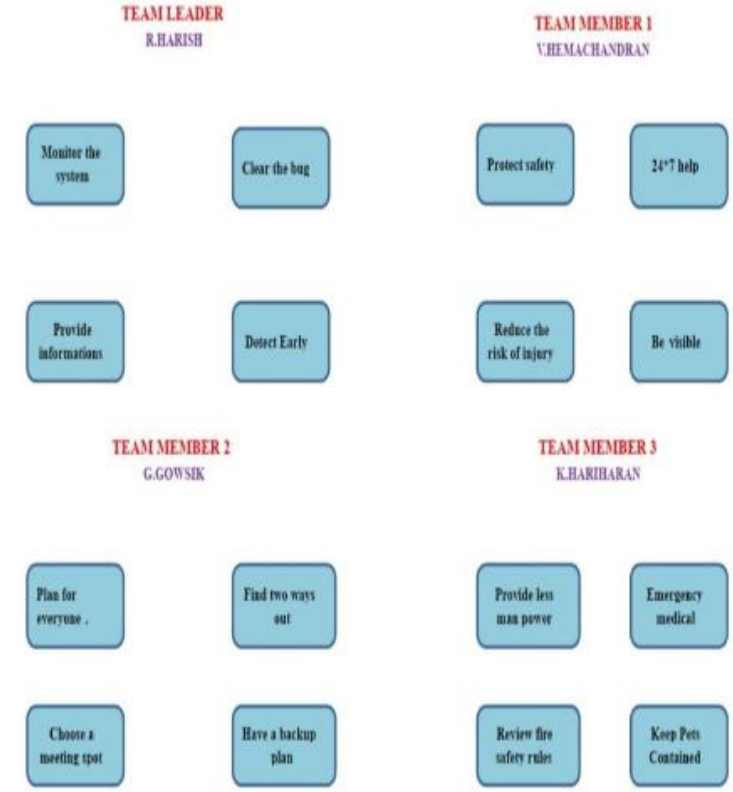


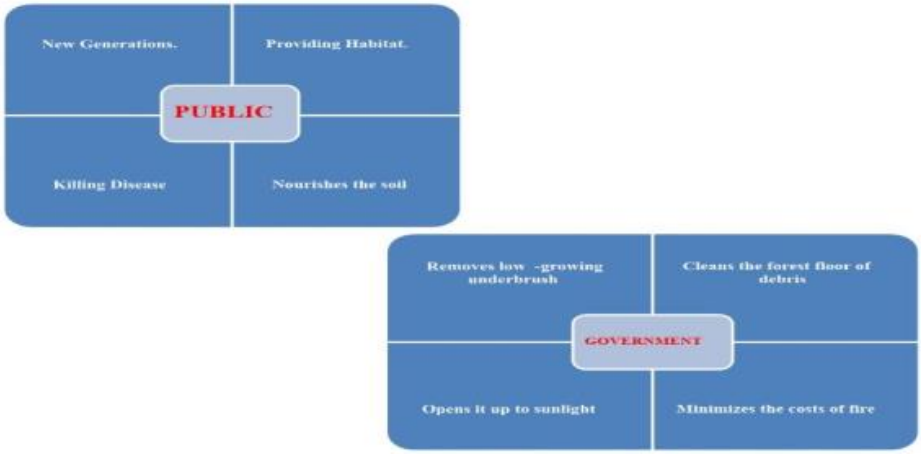
3 IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP:



3.2 IDEATION & BRAINSTORMING:

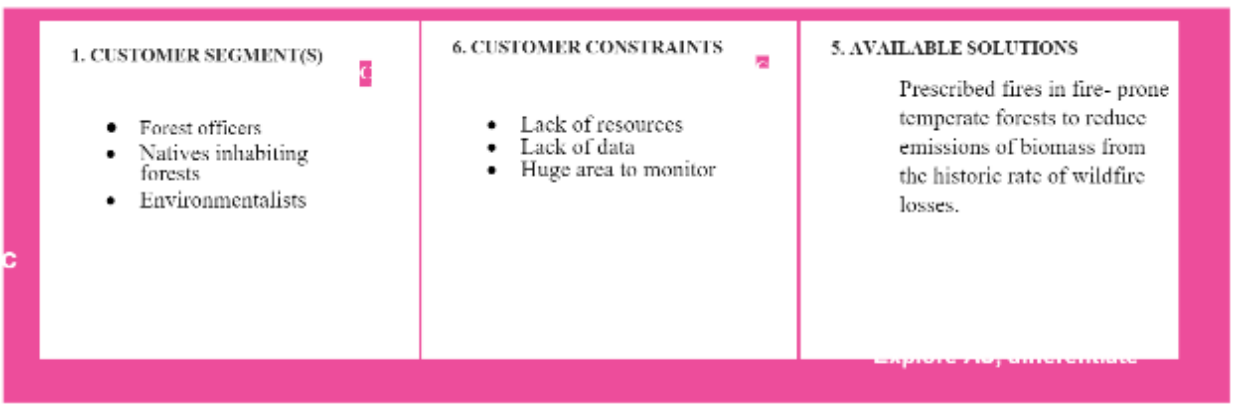


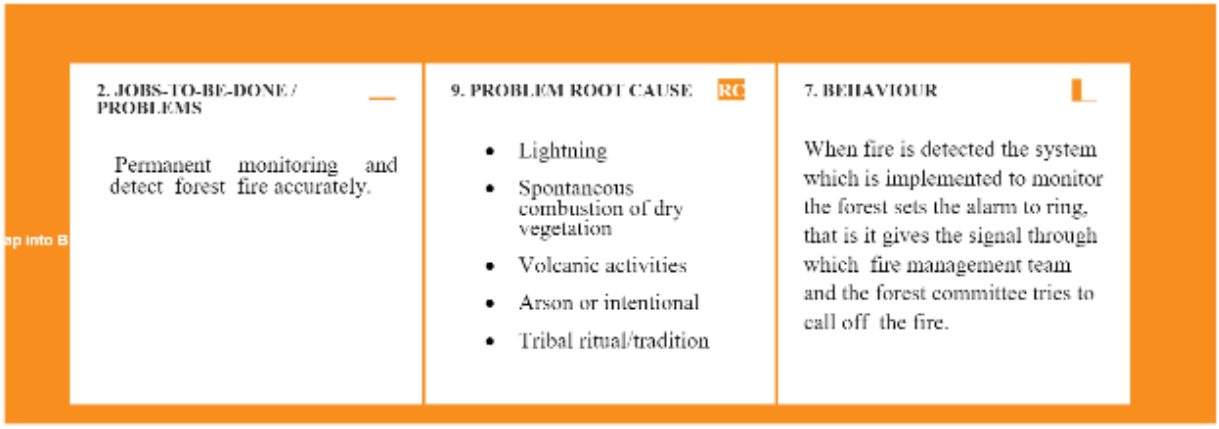


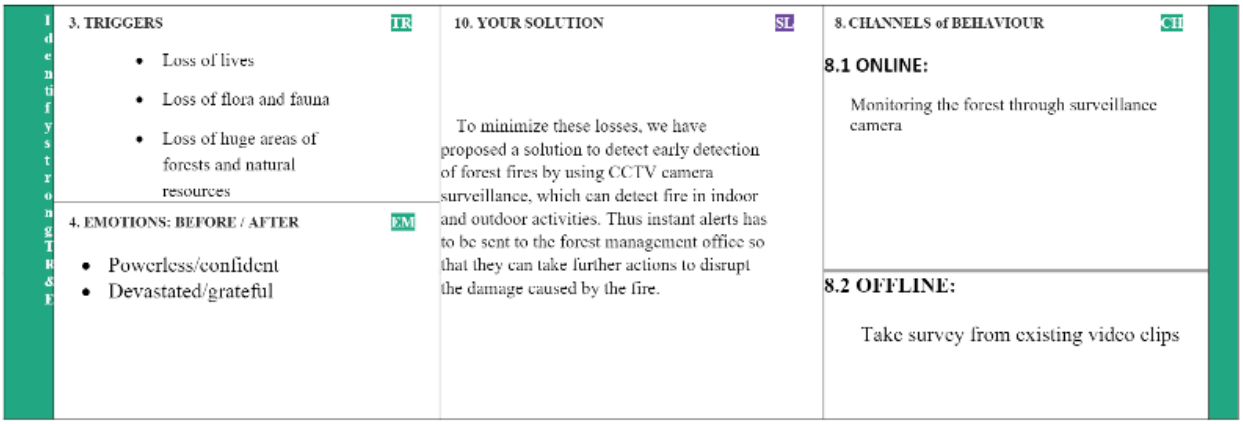
3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	A forest fire risk prediction algorithm, based on support vector machines, is presented. The algorithm depends on previous weather conditions in order to predict the fire hazard level of a day.
•	Idea / Solution description	The UAVs also utilize the benefits from AI and are equipped with on-board processing capabilities. This allows them to use computer vision methods for recognition and detection of smoke or fire.
•	Novelty / Uniqueness	Computer programs that use artificial intelligence can predict the development of fire. For example, it can identify locations with conditions suitable for the next wildlife.
•	Social Impact / Customer Satisfaction	Blocked roads and railway lines, electricity, mobile and land telephone lines cut, destruction of homes and industries.
•	Business Model (Revenue Model)	The proposed method was implemented using the Python programming language on a Core i3 CPU and 8GB RAM.
•	Scalability of the Solution	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 REQUIREMENTS:

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Register through Website
FR-2	User Search	Continuous monitoring through camera
FR-3	Detection	Fire is detected through model
FR-4	Alert	Alert the forest officials through Notifications

4.2 NON FUNCTIONAL REQUIREMENTS:

FR No.	Non-Functional Requirement	Description
NFR-1	**Reliability**	The prediction of the forest fire is 87% accurate
NFR-2	**Security**	Instant live feed with alert of the situation
NFR-3	**Availability**	Available at 24*7 time

5 PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS:

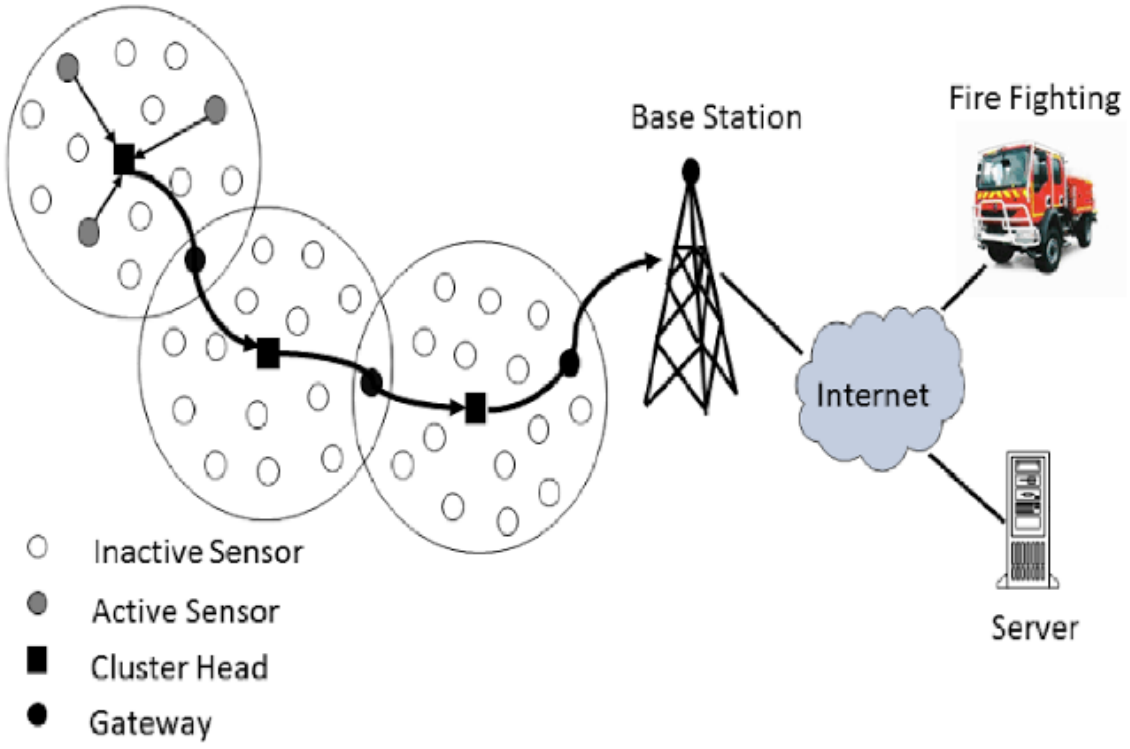
DataFlowDiagrams:

1. COLLECTDATA
2. EVALUATEDATASET
3. IMPLEMENTALGORITHMS
4. EVALUATETHEACCURACYOFEACHALGORITHMS
5. DISPLAYRESULTS

5.2 SOLUTION &TECHNICAL ARCHITECTURE:

Forest and urban fires have been and still are serious problem for many countries in the world. Currently, there are many different solutions to fight forest fires.These solutions mainly aim to mitigate the damage caused by the fires, using methods for their early detection. Here ,we discuss a new approach

for fire detection and control, in which modern technologies are used.we propose a platform that uses Unmanned Aerial Vehicles which constantly patrol over potentially threatened by fire areas.



5.3 USER STORIES:

UserType	FunctionalRequirement(Epic)	UserStoryNumber	UserStory/Task	Acceptancecriteria	Priority	Release
Environmentalist	Collectthedata	USN-1	As an Environmentalist,it is necessary to collect the data of the forest which includes temperature,humidity,wind and rain of the forest	It is necessary to collect the right data else the prediction may become wrong	High	Sprint-1
		USN-2	Identify algorithms that can be used for prediction	To collect the algorithm to identify the accuracy level of each algorithm	Medium	Sprint-2
		USN-3	Identify the accuracy of each algorithms	Accuracy of each algorithm-calculated so that it is easy to obtain the most accurate output	High	Sprint-2
		USN-4	Evaluate the Dataset	Data is evaluated before processing	Medium	Sprint-1
		USN-5	Identify accuracy,precision,recall of each algorithms	These values are important for obtaining the right output	High	Sprint-3
		USN-6	Outputs from each algorithm are obtained	It is highly used to predict the effect and to take precautionary measures.	High	Sprint-4

6 PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	03 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

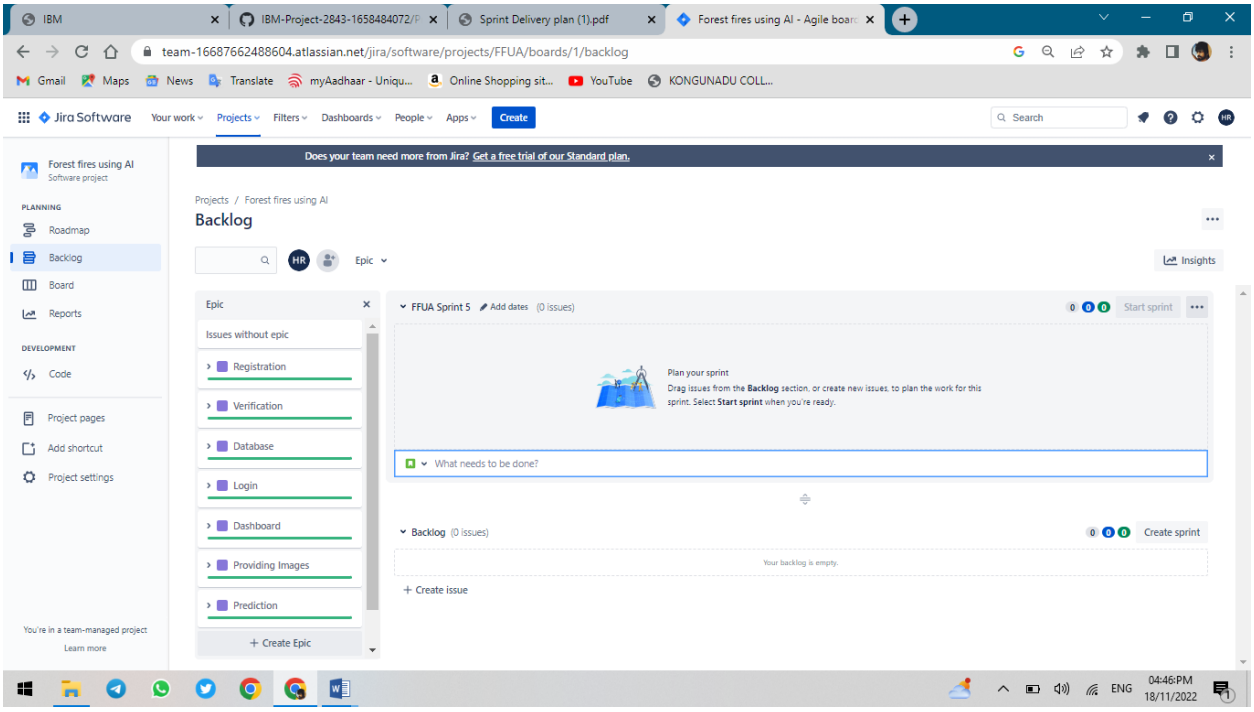
Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

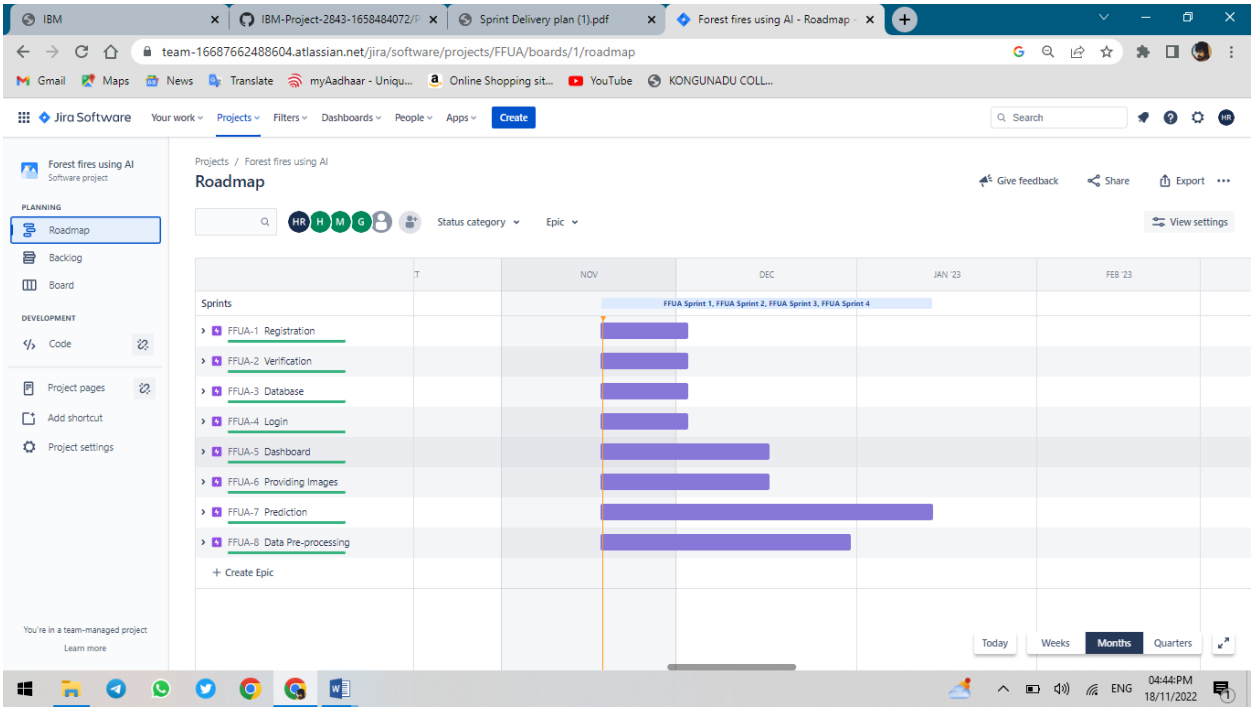
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

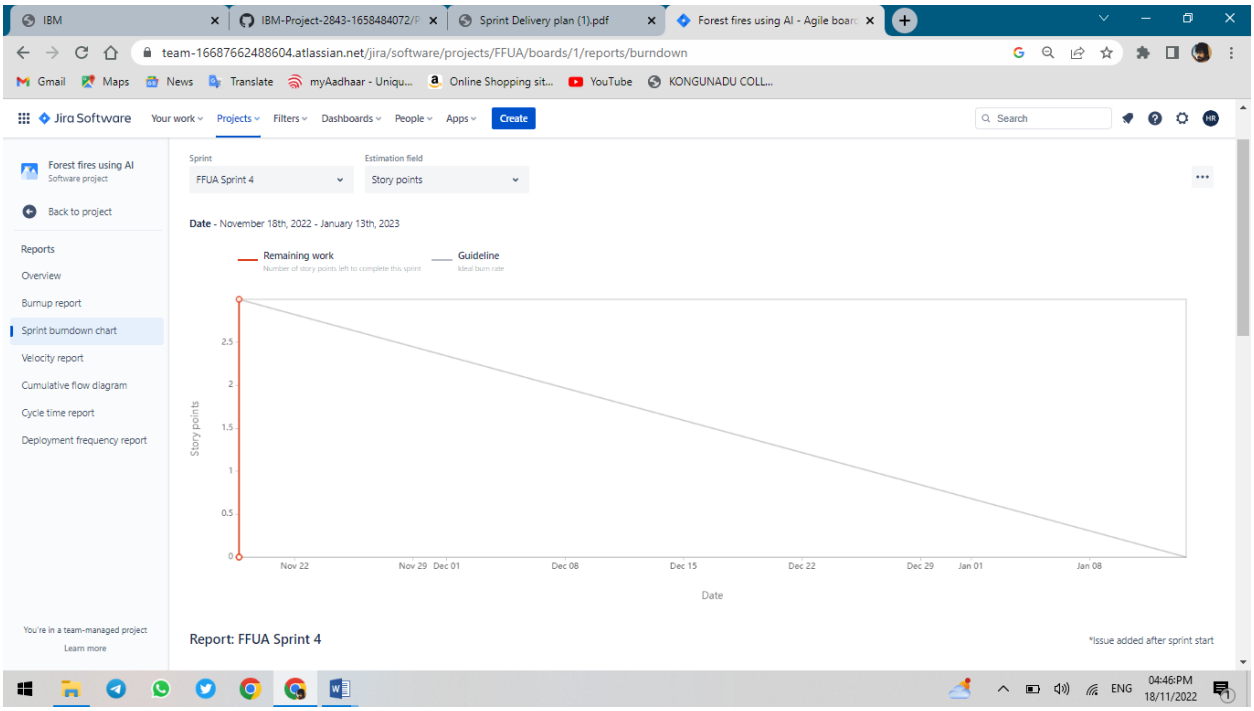
6.2 SPRINT DELIVERY SCHEDULE:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	5	High	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-1		USN-2	As a user, I can register for the application through Mobile number.	3	Low	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-1		USN-3	As a user, I can register for the application through Gmail	4	Medium	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	5	High	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-2	Dashboard	USN-5	As a user, I can check my account details on the dashboard.	1	Low	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-2	Providing images	USN-6	As a user, I can check for forest fire by either providing images or Camera	5	High	Gowsik G Harish R
Sprint-4	Prediction	USN-7	As a user, I can view whether the forest is on fire or not	5	High	Gowsik G Harish R Hemachandran V Hariharan k
Sprint-3	Data Pre-Processing	USN-8	As a admin, I should clean and pre-process data using pandas.	5	High	Gowsik G Harish R Hemachandran V Hariharan k

6.3 REPORTS FROM JIRA:




IBM
IBM-Project-2843-1658484072/P
Sprint Delivery plan (1).pdf
Forest fires using AI - Roadmap
team-16687662488604.atlassian.net/jira/software/projects/FFUA/boards/1/roadmap
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Forest fires using AI
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / Forest fires using AI
Roadmap
Give feedback
Share
Export
Status category
Epic
View settings
NOV
DEC
JAN '23
FEB '23
Sprints
FFUA Sprint 1, FFUA Sprint 2, FFUA Sprint 3, FFUA Sprint 4
FFUA-1 Registration
FFUA-2 Verification
FFUA-3 Database
FFUA-4 Login
FFUA-5 Dashboard
FFUA-6 Providing Images
FFUA-7 Prediction
FFUA-8 Data Pre-processing
Create Epic
Today
Weeks
Months
Quarters
ENG
04:44:PM
18/11/2022


IBM
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Sprint Delivery plan (1).pdf
Forest fires using AI - Agile boar
team-16687662488604.atlassian.net/jira/software/projects/FFUA/boards/1/reports/burndown
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Forest fires using AI
Software project
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Velocity report
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Sprint
FFUA Sprint 4
Estimation field
Story points
Date - November 16th, 2022 - January 13th, 2023
Remaining work
Guideline
Story points
2.5
2
1.5
1
0.5
0
Nov 22
Nov 29
Dec 01
Dec 08
Dec 15
Dec 22
Dec 29
Jan 01
Jan 08
Date
Report: FFUA Sprint 4
*Issue added after sprint start
ENG
04:46:PM
18/11/2022

7 CODING & SOLUTIONING

7.1 FEATURE 1:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Forest Fire Detector</title>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <link
      rel="stylesheet"
      href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css"
    />
    <link rel="stylesheet" href="static\style.css" />
    <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>
    <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></scrip
t>
  </head>
  <body>
    <div class="container">
      <nav class="navbar navbar-light" style="background-color:aliceblue">
        <h1 class="nav-title">
          IBM - Emerging Methods for Early Detection of Forest Fire
        </h1>
        <p class="nav-para">
          KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY
        </p>
      </nav>
    </div>

    <div class="container">
      <div class="jumbotron bg-primary" class="aside1">
        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.
</div>
<aside class="jumbotron bg-primary">
  <b class="pred">Team ID :</b> PNT2022TMID13480
  <br />
  <b class="pred">Team Size :</b> 4
  <br />
  <b class="pred">Team Leader :</b> HARISH R<br />
  <b class="pred">Team member 1 :</b> GOWSIK G <br />
  <b class="pred">Team member 2 :</b> HEMACHANDRAN V <br />
  <b class="pred">Team member 3 :</b> HARAIHARAN K <br />
</aside>

<br /><br />
<form
  class="form-horizontal"
  action="/submit1"
  method="post"
  enctype="multipart/form-data"
>
  <div class="file-upload form-group">
    <div class="file-select">
      <label class="file-select-button control-label col-sm-2" for="pwd">
        Upload Your Image :
      </label>

      <input
        type="file"
        class="form-control"
        placeholder="Hours Studied"
        name="my_image"
        id="pwd"
      />
    </div>
  </div>

  <div class="form-group">
    <div class="col-sm-offset-2 col-sm-2">
      <button type="submit" class="btn btn-success">Predict</button>
    </div>
```

```
      </div>
    </form>

    {% if prediction %}
    <img
      src="{{img_path}}"
      height="300px"
      width="300px"
      border-radius="5px"
    />
    <br /><br />

      <h2>I think Given Image Having : <b class="pred"> {{prediction}} </b></h2>

      {% endif %}
    </div>
  </body>
</html>
```

7.2 FEATURE 2:

```
/* ===== Google Font Import - Poformsins ===== */
@import
url("https://fonts.googleapis.com/css2?family=Poppins:wght@300;400;500;600;700&display=swap");

* {
  margin: 0;
  padding: 0;
  box-sizing: border-box;
  font-family: "Poppins", sans-serif;
}

.nav-title {
```

```
  color: orangered;
  text-align: center;
}
.nav-para {
  color: blue;
  text-align: center;
  font-size: 25px;
  color: blue;
}
.container {
  width: 80%;
}
.aside1 {
  float: right;
  width: 300px;
  height: 300px;
  position: absolute;
  left: 550px;
  top: 300px;
}
aside {
  float: right;
  width: 300px;
  height: 300px;
  position: absolute;
  left: 550px;
  top: 440px;
}

.file-upload {
  display: block;
  text-align: center;
  font-family: Helvetica, Arial, sans-serif;
  font-size: 12px;
}
.file-upload .file-select {
  display: block;
  border: 2px solid #dce4ec;
  color: #042301;
  cursor: pointer;
```

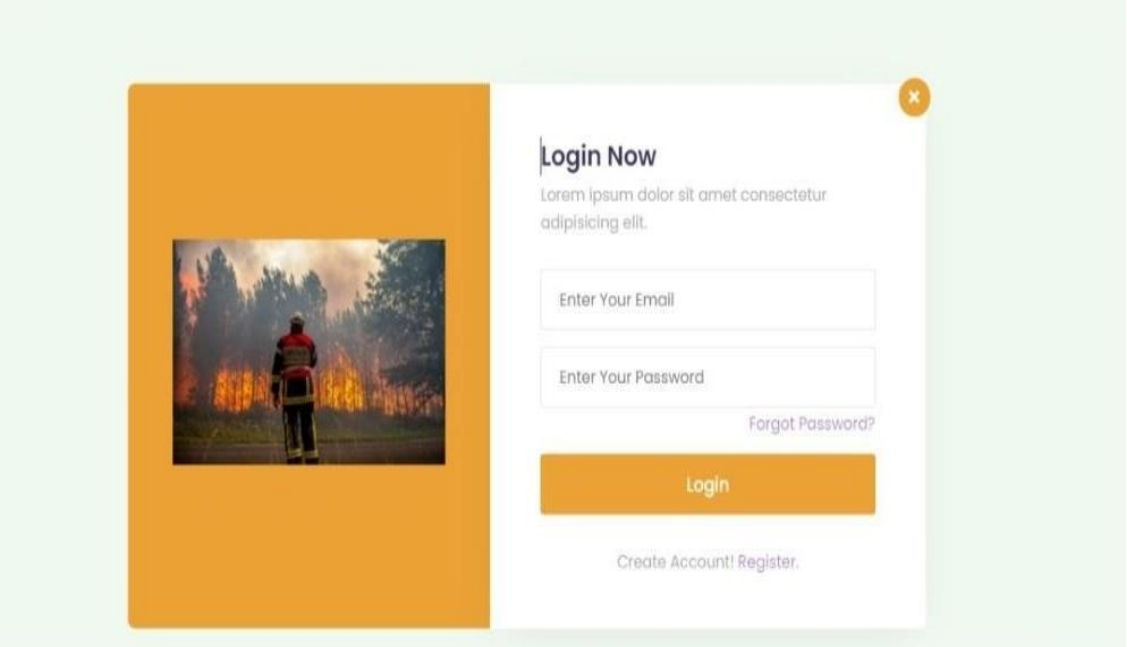
```
  height: 40px;
  line-height: 40px;
  text-align: left;
  background: #ffffff;
  overflow: hidden;
  position: relative;
}
.file-upload .file-select .file-select-button {
  background: #dce4ec;
  padding: 0 10px;
  display: inline-block;
  height: 40px;
  line-height: 40px;
}
.file-upload .file-select .file-select-name {
  line-height: 40px;
  display: inline-block;
  padding: 0 10px;
}
.file-upload .file-select:hover {
  border-color: #345e35;
  transition: all 0.2s ease-in-out;
  -moz-transition: all 0.2s ease-in-out;
  -webkit-transition: all 0.2s ease-in-out;
  -o-transition: all 0.2s ease-in-out;
}
.file-upload .file-select:hover .file-select-button {
  background: #042301;
  color: #ffffff;
  transition: all 0.2s ease-in-out;
  -moz-transition: all 0.2s ease-in-out;
  -webkit-transition: all 0.2s ease-in-out;
  -o-transition: all 0.2s ease-in-out;
}
.file-upload.active .file-select {
  border-color: #3fa46a;
  transition: all 0.2s ease-in-out;
  -moz-transition: all 0.2s ease-in-out;
  -webkit-transition: all 0.2s ease-in-out;
  -o-transition: all 0.2s ease-in-out;
```

```
}
.file-upload.active .file-select .file-select-button {
  background: #3fa46a;
  color: #ffffff;
  transition: all 0.2s ease-in-out;
  -moz-transition: all 0.2s ease-in-out;
  -webkit-transition: all 0.2s ease-in-out;
  -o-transition: all 0.2s ease-in-out;
}
.file-upload .file-select input[type="file"] {
  z-index: 100;
  cursor: pointer;
  position: absolute;
  height: 100%;
  width: 100%;
  top: 0;
  left: 0;
  opacity: 0;
  filter: alpha(opacity=0);
}
.file-upload .file-select.file-select-disabled {
  opacity: 0.65;
}
.file-upload .file-select.file-select-disabled:hover {
  cursor: default;
  display: block;
  border: 2px solid #dce4ec;
  color: #042301;
  cursor: pointer;
  height: 40px;
  line-height: 40px;
  margin-top: 5px;
  text-align: left;
  background: #ffffff;
  overflow: hidden;
  position: relative;
}
.file-upload .file-select.file-select-disabled:hover .file-select-button {
  background: #dce4ec;
  color: #666666;
```

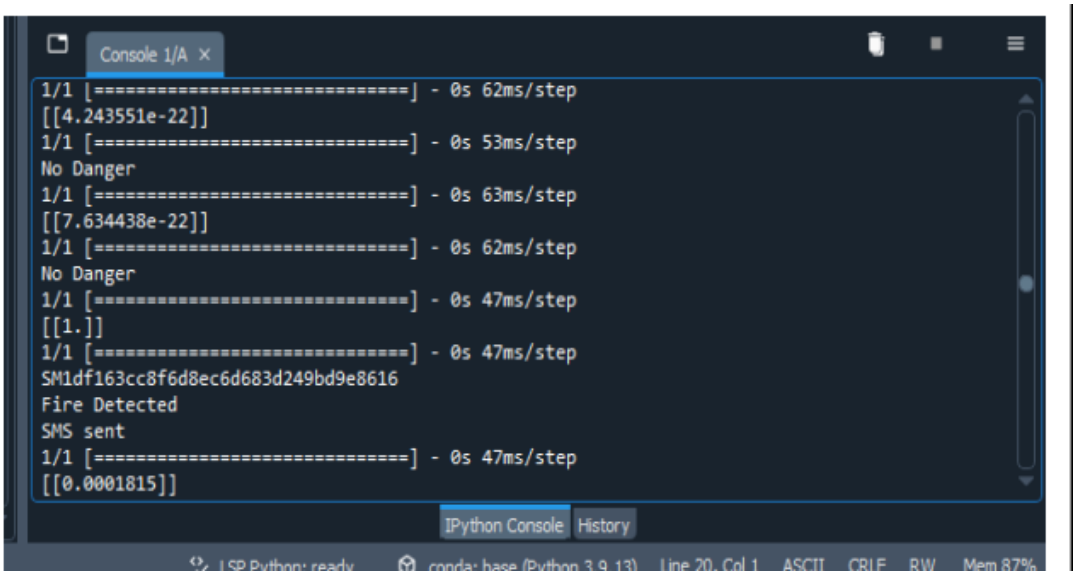
```
  padding: 0 10px;
  display: inline-block;
  height: 40px;
  line-height: 40px;
}
.file-upload .file-select.file-select-disabled:hover .file-select-name {
  line-height: 40px;
  display: inline-block;
  padding: 0 10px;
}
.pred {
  color: red;
}
```

8 TESTING

8.1 TEST CASES:

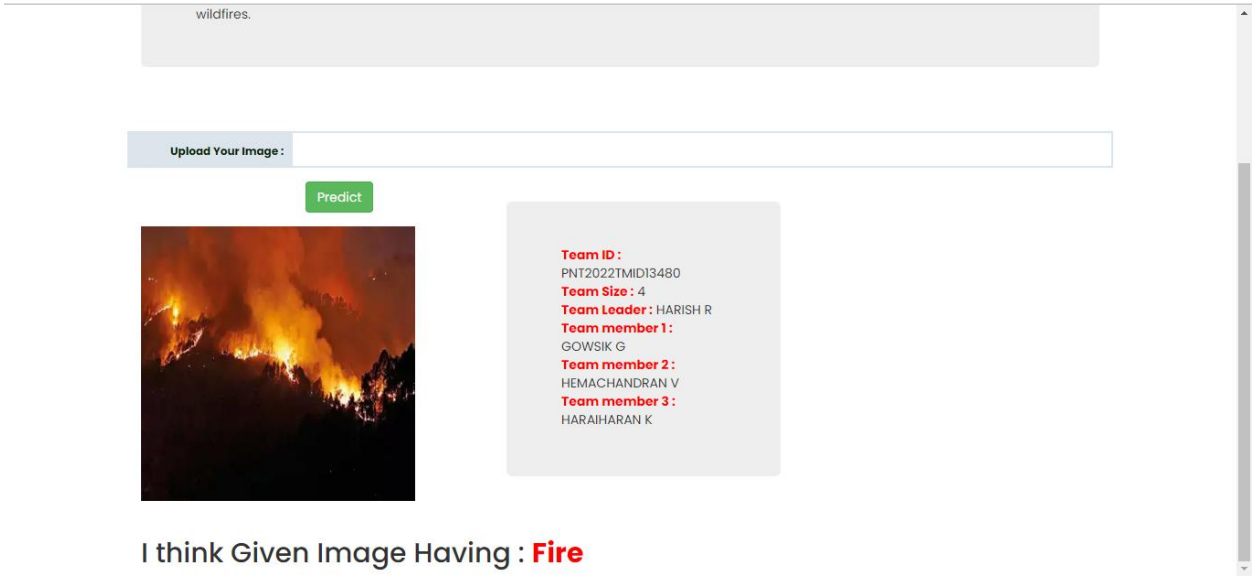


8.2 USER ACCEPTANCE TESTING:



9 RESULTS

9.1 PERFORMANCE METRICS:



10 ADVANTAGES AND DISADVANTAGES

10.1 ADVANTAGES:

- More dynamic and wider detection as compared to fixed sensors.
- To detect poaching,and monitor comprehensive animal deaths.
- Proposed methods are very convenient and can easily detect.
- Reduction in cost.
- Fast Response.

10.2 DISADVANTAGES:

- Possibility of lack of appropriate animals for special forests.
- Use of batteries create environmental pollution , introducing extra radiation and cadmium to the forest and animals.
- Determining climate conditions , daily temperature differences , seasonal normal temp values are problematic.
- Soil damage which can result in erosion.

11 CONCLUSION

New wireless technologies and new satellite tracking systems can be adapted to increase the efficiency of the system .New sensors can be produced or existing sensors can be improved to increase robustness of the proposed system. A number of investigations can be made regarding animal behavior in case of fire to improve system reliability. The aspects of using wireless sensor networks for forest tree monitoring and alerting using rare event detection with ultra low power consumption. In this prototype, two sensors (mercury sensor & temperature sensor) which work well for the detection of fire and tree theft were selected, and mesh protocol was used for alert routing and event detection Network lifetime and latency estimation for the deployment scenario showed the implementation feasibility of such a monitoring system for deforestation application.

12 FUTURE SCOPE

Development of Micro-Electrical Systems (MEMS), wireless network systems are expected to be widely in use.MEMS are the combination of electrical devices and mechanical structures at an extremely small scale. Many remarches need to be done so as to implemem MEMS in WSN More over, loT is expected to have dramatic impact in Curves in near future. WSNs will be integrated into end innumerable sensor nodes will join the Internet. They will cooperate with other nodes to sense and to monitor the environment. To overcome disadvantages and looking for implementation of Automatic Fire detection.

Eg: Smart driver system.

13 APPENDIX

SOURCE CODE:

```
import cv2

import matplotlib.pyplot as plt
import numpy as np
from flask import Flask, render_template, request
from IPython.display import Audio
from playsound import playsound
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
from twilio.rest import Client

app = Flask(__name__)
```

```
model = load_model('forest1.h5')



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:
    message="No Fire"
  elif val==1:
    account_sid='AC960529e897e4c5424527a77b53756372'
    auth_token='2ed5897dc64f2763f9f94779165a4629'
    client=Client(account_sid,auth_token)
    message=client.messages \
      .create(
          body="Forest fire is detected ,stay alert",
          from_='+1 314 937 6720',
          to='+91 9487626593')
    message="Fire"
  return message




# routes
@app.route("/", methods=['GET', 'POST'])
def main():
  return render_template("index.html")



@app.route("/about")
def about_page():
  return "Please subscribe  Artificial Intelligence Hub..!!!"

@app.route("/submit1", methods = ['GET', 'POST'])
```

```
def get_output():
  if request.method == 'POST':
    img = request.files['my_image']

    img_path = "static/" + img.filename
    img.save(img_path)

    p = predictImage(img_path)

  return render_template("index.html", prediction = p, img_path = img_path)

@app.route("/submit2", methods = ['GET', 'POST'])
def new_get_output():
  if request.method == 'POST':
    img = request.files['my_image']

    img_path = "static/" + img.filename
    img.save(img_path)

    p = predictVideo(img_path)

  return render_template("index.html", prediction = p, img_path = img_path)


if __name__ =='__main__':

  app.run(debug=True)
```

GITUHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-2843-1658484072

DEMO VIDEO LINK:

https://youtu.be/zDMAcdH9sJs