PROJECT REPORT.

Project Name: **EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES.**

Team id: **PNT2022TMID07050**

Team members: **DEVI SRAVANTHI GUBBALA -TEAM LEAD.**
AKSHARA YUVARAJ
DIVYASRI.P
ESTHER JANET.S

1.INTRODUCTION

1.1 Project overview

Wildfire, also called forest fire, bush or vegetation fire, can be described as any uncontrolled and non-prescribed combustion or burning of plants in a natural setting such as a forest, grassland, brush land or tundra, which consumes the natural fuels and spreads based on environmental conditions (e.g., wind, topography). 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. 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 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. This is a huge problem which needs to be tackled and thus through this project we provide a way to tackle the issue.

1.2 Purpose

The purpose of the project is to detect the forest fire earlier.

2.LITERATURE SURVEY

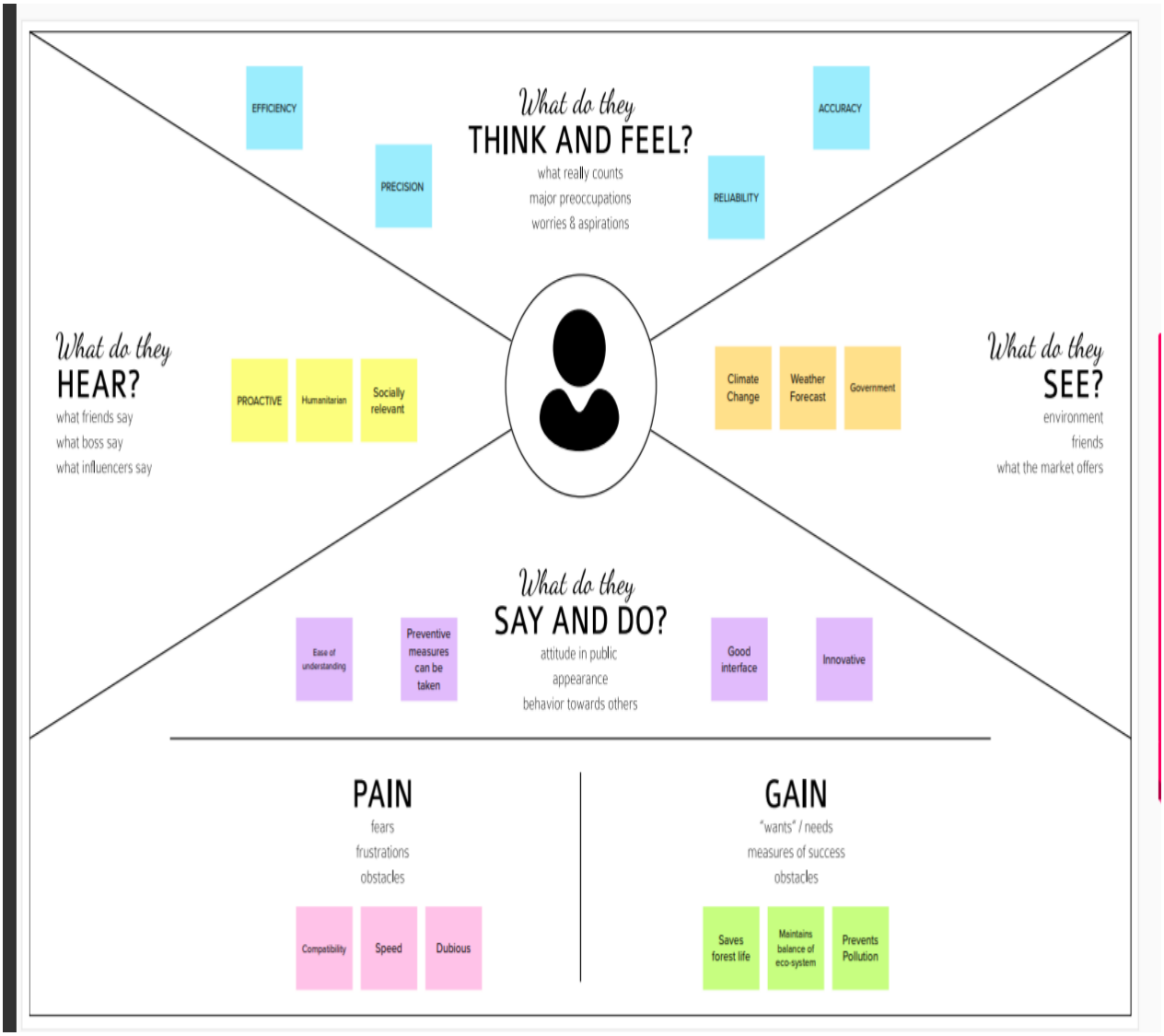
2.1 Reference

S. NO	TITLE	AUTHOR	YEAR
1.	Image Processing for Forest Fire Detection.	Priyadharshini	2016
2.	Forest fire prediction and detection system.	Faroudja Abid	2020

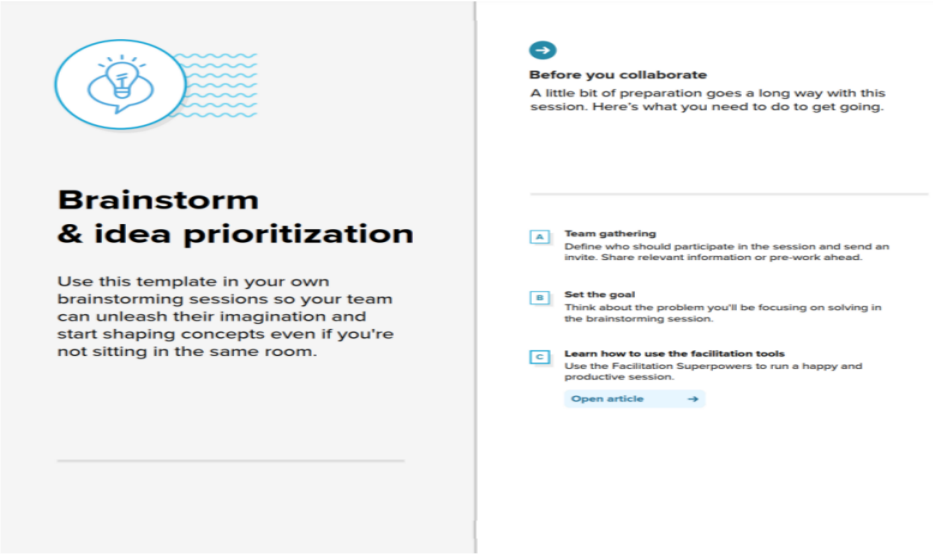
3.	systematic approaches in managing forest fires	AdityaDhall	2020

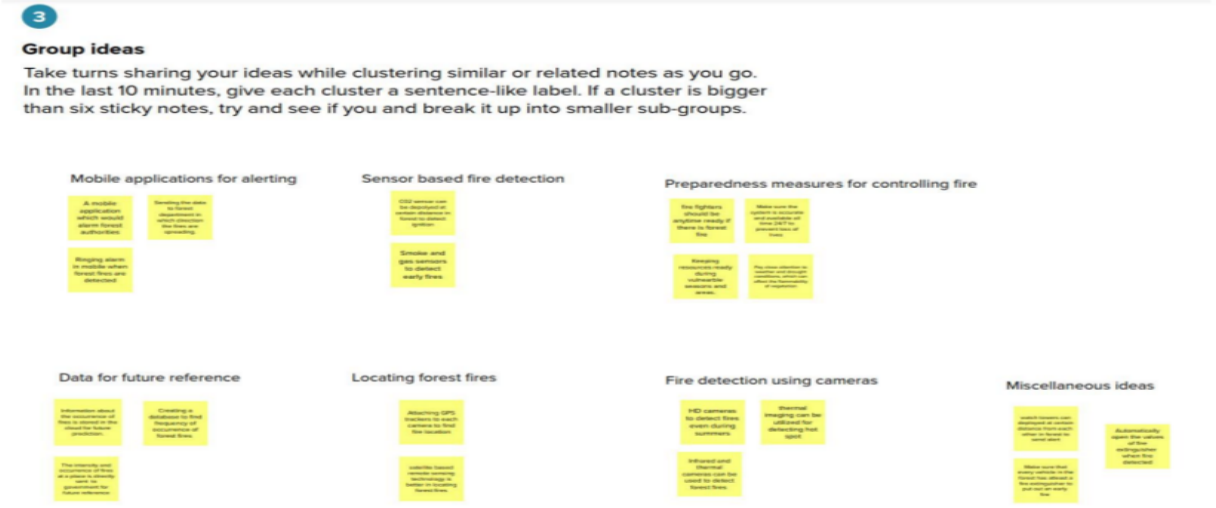
3.IDEATION & PROPOSED SOLUTION

3.1 Empathy map



3.2 Ideation & Brainstorming

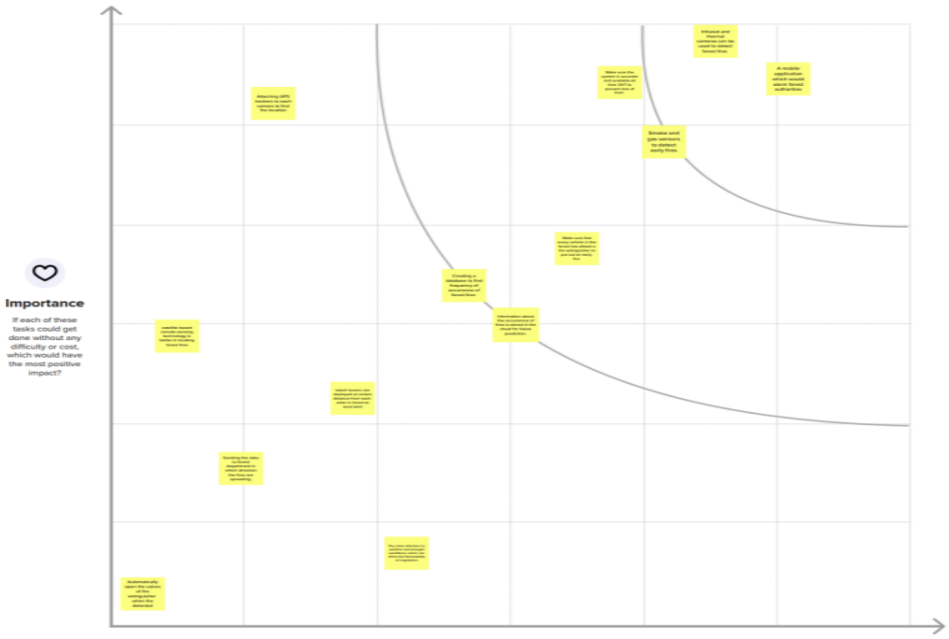




4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

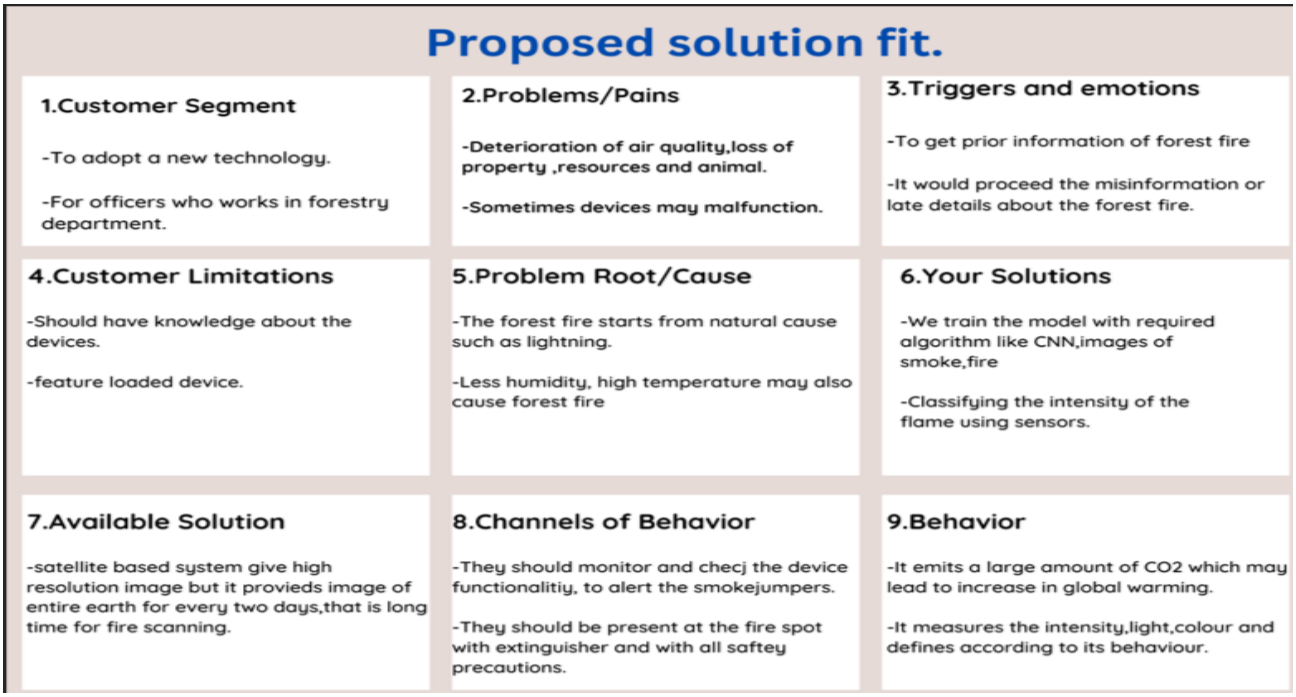


3.3 Proposed solution

S.NO:	PARAMETERS	REPRESENTATION
1.	**Problem Statement (Description of an issue to be addressed)**	• Fire was one of the first and greatest invention of man. But these days due to global warming and climate change, fires have become very violent and destructive. • Forest fires are one such evil looming the Earth destroying all the flora and fauna with the devastating fumes and flares it carries with itself. • Recent forest fires in California is an evident example of the intensity of the issue and the immediate action that needs to be taken.
2.	**Plan of Design and Execution**	• The propose a platform that uses Unmanned Aerial Vehicles (UAVs), which constantly patrol over potentially threatened by fire areas. • The UAVs also utilize the benefits from Artificial Intelligence(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, based on the still images or the video input from the drone cameras. • The system is designed for monitor the causing factors of forest fires such as temperature, humidity , air pressure level,oxygen and Carbon dioxide on the surface of air. • The user interacts with a web camera to read the video.

		• Once the input image from the video frame is sent to the model, if the fire is detected, it is showcased on the console, and alerting sound will be generated and an alert message will be sent to the Authorities. • We classify images using a Convolutional Neural Network and use other open CV tools.
3.	**Peculiarity/ Novelty**	• Makes use of real time monitoring and allows pre-cursors to potential issues (such as corrosion) to be flagged up and immediately be addressed before major issues occur.
4.	**Social Outlook / Customer Friendly**	• Will warn the customers before any fire outbreak. • Prevents any potential devastation and issues precautions. • Protects the flora and fauna from any unfortunate accidents. • Saves forest and human life prevents desertification.
5.	**Business Model**	• Focuses more on sensor probes, wireless sensor networks and machine learning which makes the deployment more easier.
6.	**Feasibility of Solution**	• Cost effective • More performance measure • Economical • Accurate • Effective • Reliable • Socially intact

3.4 Problem solution fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

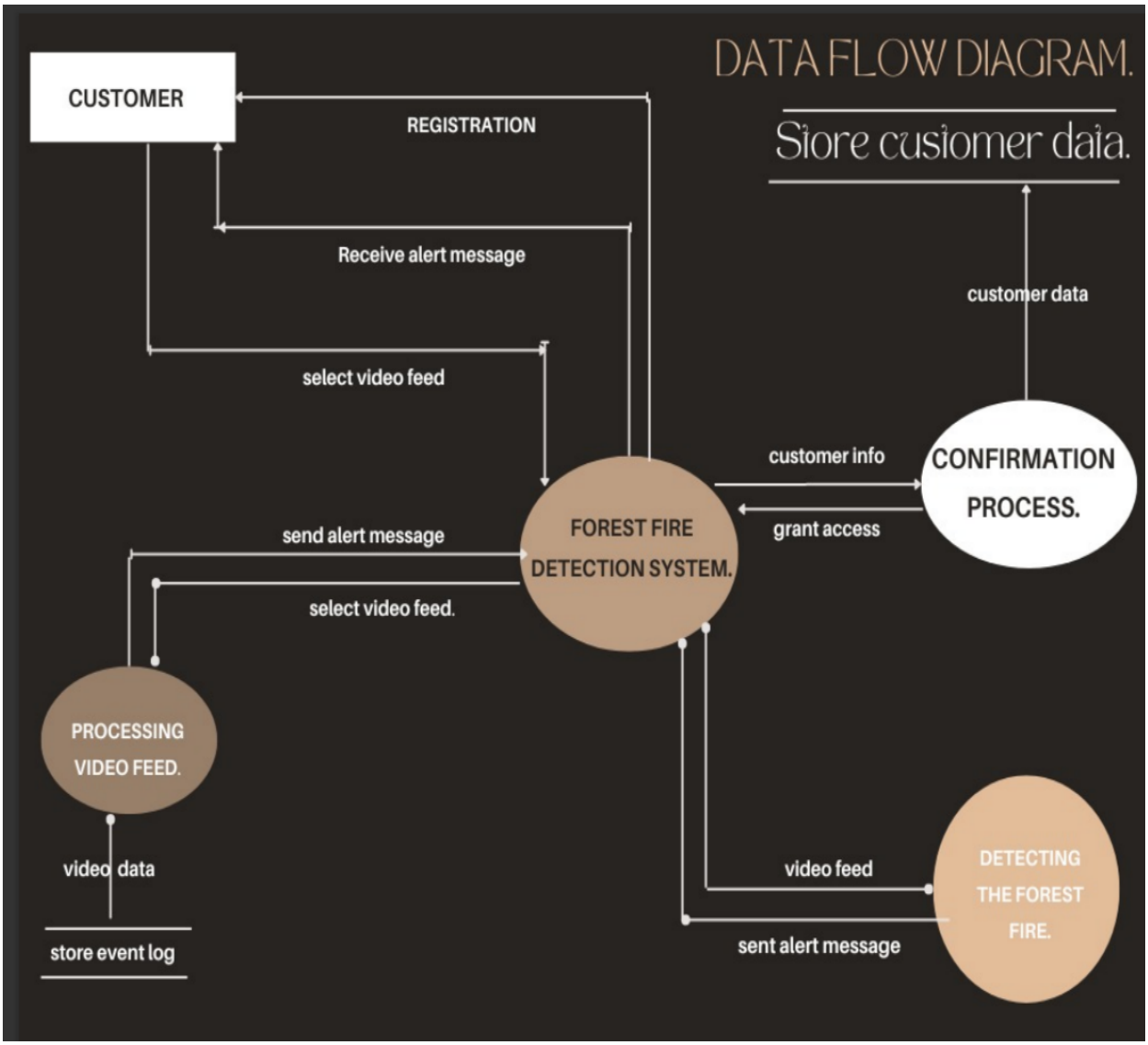
FR. NO.	Functional Requirement	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through wildfire portal.
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Data Prediction	Scientists create computer models to predict wildfire potential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

4.2 Non-Functional requirement

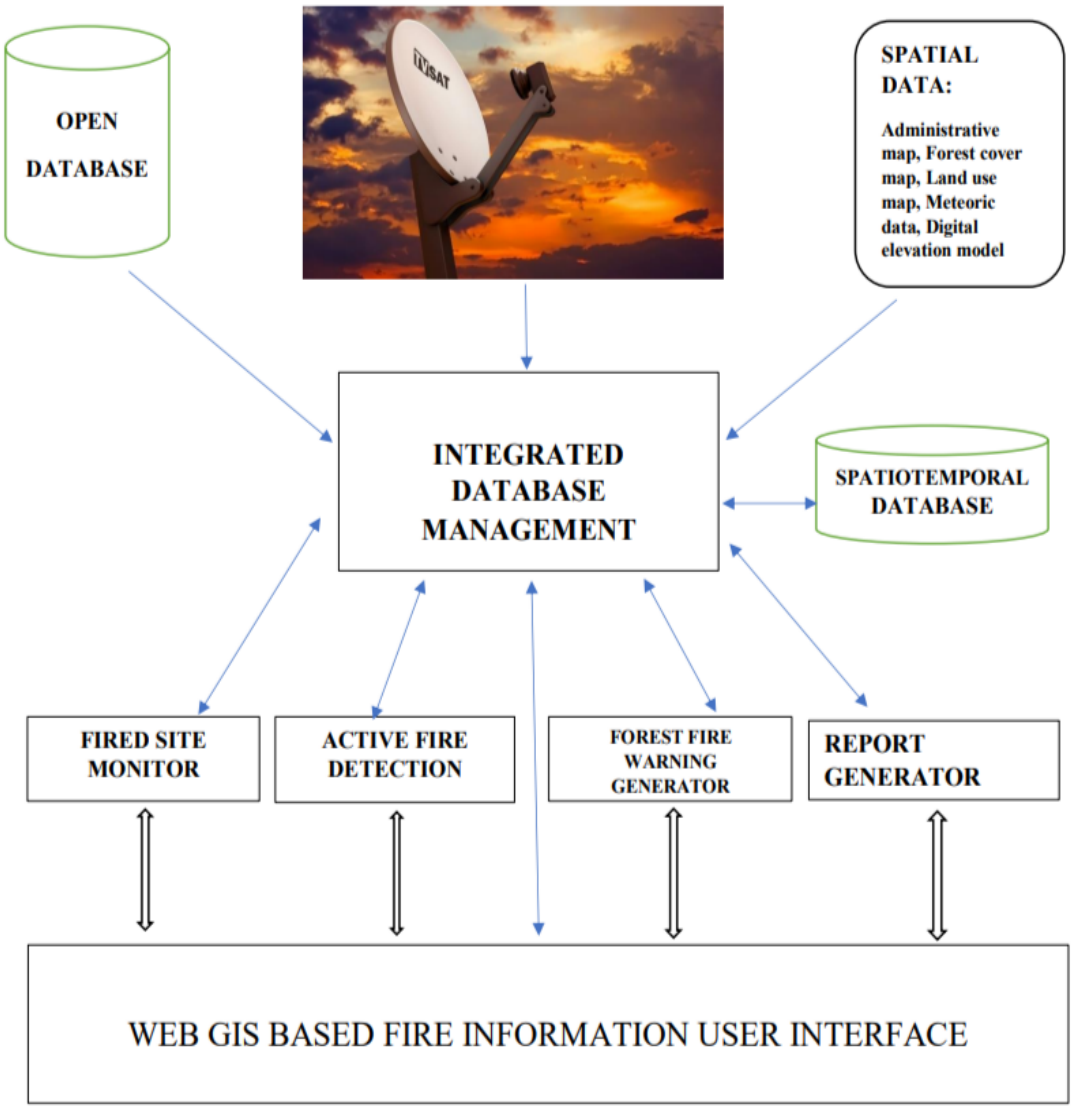
FR. NO.	Non-Functional Requirement	Description
NFR-1	Usability	Many methods have been proposed to detect forest fires, such as camera-based systems, WSN-based systems, and machine learning coating-based systems, with both positive and negative aspects and performance figures of detection.
NFR-2	Protection	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 drones is to gather situational consciousness, which can be used 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 Data Flow Diagrams



5.2 Solution Architecture



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Image Processing	USN-1	Processing the image to find the fire is detectedor not.	1	Medium	1.Devi Sravanti 2.Esther 3.Divya Sri 4.Akshara
Sprint-1		USN-2	The output would have to give high accuracy.	2	High	1.Devi Sravanti 2.Esther 3.Divya Sri 4.Akshara
Sprint-2	Video Processing	USN-3	The drone videos will be split into frames todetect the fire.	3	High	1.Devi Sravanti 2.Esther 3.Divya Sri 4.Akshara
Sprint-3	Alerting	USN-4	After the fire is detected the alert message haveto be sent.	2	High	1.Devi Sravanti 2.Esther 3.Divya Sri 4.Akshara
Sprint-4	Location tracking	USN-5	The exact location of the drone will be predictedand sent along with the alert message.	2	High	1.Devi Sravanti 2.Esther 3.Divya Sri 4.Akshara

6.2 Sprint delivery schedule

Project Tracker, Velocity & Burndown Chart:

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	25 Oct 2022	30 Oct 2022	30	30 Oct 2022
Sprint-2	20	6 Days	1 Nov 2022	06 Nov 2022	20	06 Nov 2022
Sprint-3	20	6 Days	08 Nov 2022	13 Nov 2022	20	13 Nov 2022
Sprint-4	20	6 Days	15 Nov 2022	20 Nov 2022	20	20 Nov 2022

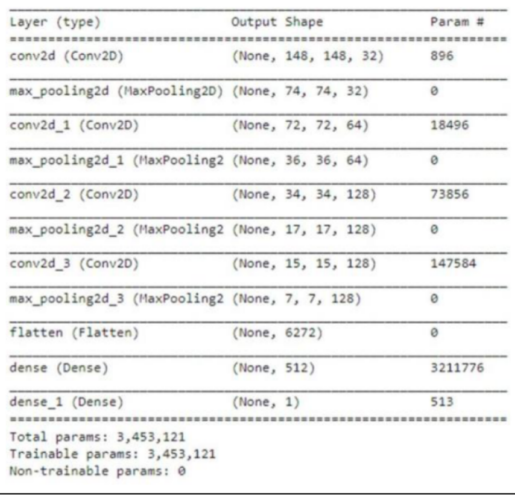
Velocity:

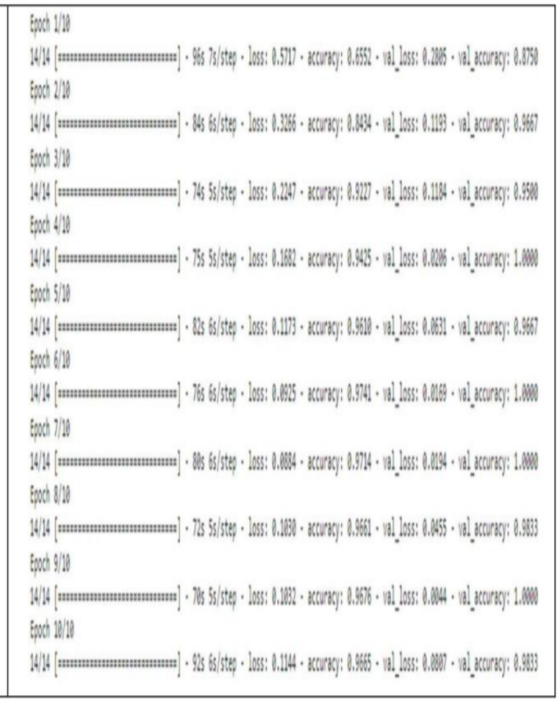
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's now calculate the team's average velocity (AV) periteration unit (story points per day)

$$AV = \text{Sprint duration} / \text{Velocity}$$
$$= 20/6 = 3$$

7. TESTING AND RESULTS

7.1 Performance Testing

S. No	Parameter	Values	Screenshot
1.	Model Summary	3,453,213	

2.	Accuracy	Training Accuracy - 0.9663 Validation Accuracy -0.9795	

7.2 User acceptance testing

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	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

7.3 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

8. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

➤ The proposed system detects the forest fire at a faster rate compared to existing system. It has enhanced data collection feature.
➤ The major aspect is that it reduces false alarm and also has accuracy due to various sensors present.
➤ It minimize the human effort as it works automatically. This is very low-cost due to which can be easily accessed.
➤ The main objective of our project is to receive an alert message through an app to the respective user.

DISADVANTAGES:

➤ The electrical interference diminishes the potency of radio receiver.
➤ The main drawback is that it has less coverage range areas

8.CONCULSION

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. Based on this data the firefighting staff can be guided on target to block fire before 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.

9.FUTURE SCOPE

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

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

➔ This project has endless potential and can always be enhanced to become better. enforce this concept in the real world will benefit several industries and reduce the workload on many workers, enhancing overall work efficiency.