Emerging methods for early detection of forest fires

TEAM ID :PNT2022TMID35796

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Project Report

1. INTRODUCTION

i)Project Overview:

- Over the past few years, the number of wildfires or forest fire across the globe has increased drastically. Forest Fire is defined as any unplanned, uncontrolled fire that is directly or indirectly dependent on the lighting, volcanic eruptions, spontaneous combustion of dry vegetation and stubble burning.
- Forest fire is a threat to human life, animals and vegetation in the current scenario. In the traditional methods, immediate response and large detection area is not possible to detect fire at reduced cost .
- In general, the forest is an abode for several living and non-living resources, and also it controls the production of carbon dioxide. Forest fires are classified according to its motion, texture, and size.

ii)Purpose:

- To predict the forest fire early and to alarm the respected authorities to take immediate action.

2. **LITERATURE SURVEY**

i)Existing problem:

- In the past, forest fires were detected using watchtowers, which were not efficient because they were based on human observations. In recent history and even the present day, satellite image processing methods, wireless sensor network, optical sensors, CO_2 and gas sensor-based methods exist.
- But there are some drawbacks, such as inefficiency, power consumption, latency, accuracy and implementation costs for above methods.

ii)References:

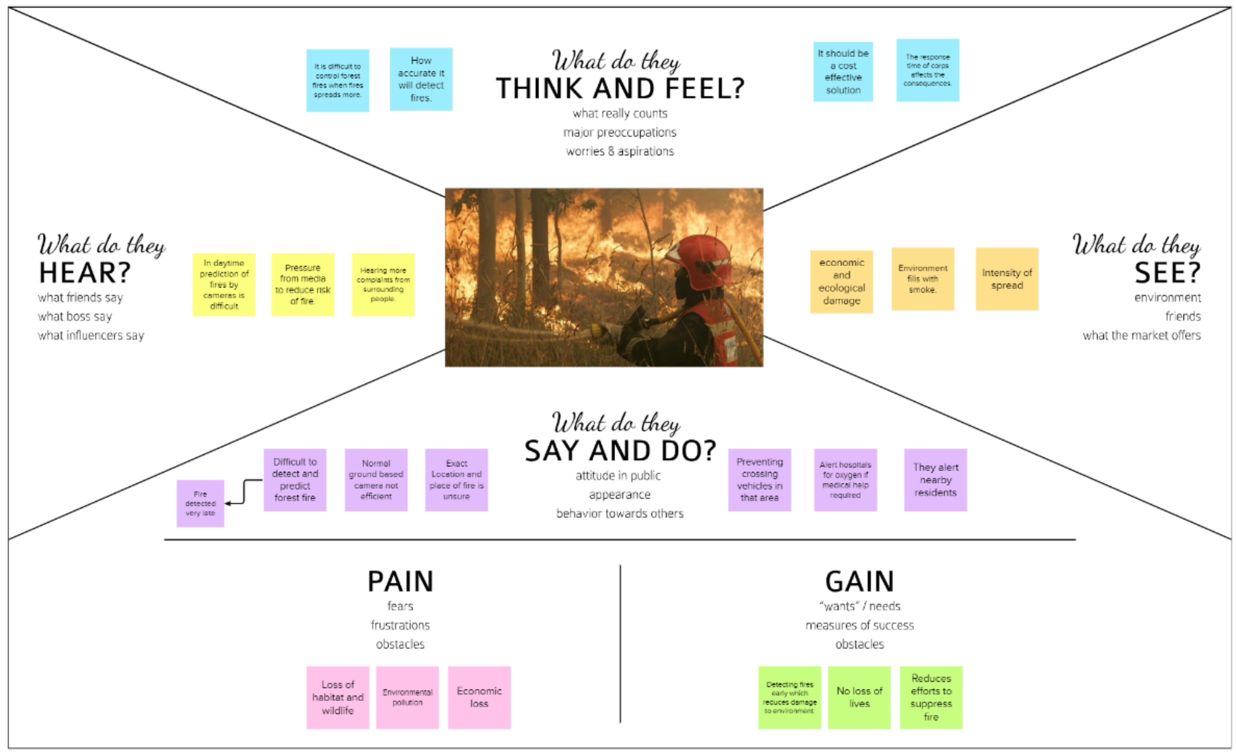
- G. Hristov, J. Raychev, D. Kinaneva and P. Zahariev, "Emerging Methods for Early Detection of Forest Fires Using Unmanned Aerial Vehicles and Lorawan Sensor Networks," 2018 28th EAEEIE Annual Conference (EAEEIE), 2018, pp. 1-9, doi: 10.1109/EAEEIE.2018.8534245.
- X. Yang, L. Tang, H. Wang and X. He, "Early Detection of Forest Fire Based on Unmaned Aerial Vehicle Platform," 2019 IEEE International Conference on Signal, Information and Data Processing (ICSIDP), 2019, pp. 1-4, doi: 10.1109/ICSIDP47821.2019.9173181.
- H. Soliman, K. Sudan and A. Mishra, "A smart forest-fire early detection sensory system: Another approach of utilizing wireless sensor and neural networks," SENSORS, 2010 IEEE, 2010, pp. 1900-1904, doi: 10.1109/ICSENS.2010.5690033.
- A. A. Khamukhin and S. Bertoldo, "Spectral analysis of forest fire noise for early detection using wireless sensor networks," 2016 International Siberian Conference on Control and Communications (SIBCON), 2016, pp. 1-4, doi: 10.1109/SIBCON.2016.7491654.
- https://www.bosch.com/stories/early-forest-fire-detection-sensors Assessment on the use of meteorological and social media information for forest fire detection and prediction in Riau, Indonesiahttps://www.mdpi.com/1306746 10.23919/MIPRO.2019.8756696

iii)Problem Statement Definition:

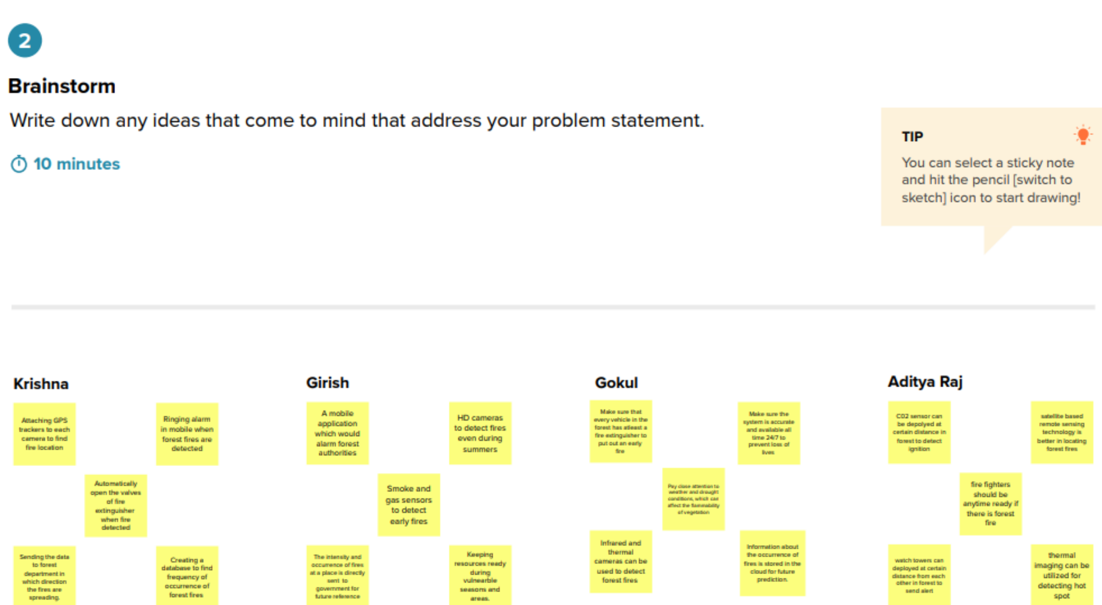
- Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives.
- It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods like Camera or Video-Based 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.

3. IDEATION & PROPOSED SOLUTION

a. Empathy Map Canvas



b. Ideation & Brainstorming



3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Mobile applications for alerting

- A mobile application which would alarm forest authorities
- Sending the data to forest department in which direction the fires are spreading.
- Ringing alarm in mobile when forest fires are detected

Sensor based fire detection

- C02 sensor can be depolyed at certain distance in forest to detect ignition
- Smoke and gas sensors to detect early fires

Preparedness measures for controlling fire

- fire fighters should be anytime ready if there is forest fire
- Make sure the system is accurate and available all time 24/7 to prevent loss of lives
- Keeping resources ready during vulnearble seasons and areas.
- Pay close attention to weather and drought conditions, which can affect the flammability of vegetation

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Data for future reference

- Information about the occurrence of fires is stored in the cloud for future prediction.
- Creating a database to find frequency of occurrence of forest fires
- The intensity and occurrence of fires at a place is directly sent to government for future reference

Locating forest fires

- Attaching GPS trackers to each camera to find fire location
- satellite based remote sensing technology is better in locating forest fires

Fire detection using cameras

- HD cameras to detect fires even during summers
- thermal imaging can be utilized for detecting hot spot
- Infrared and thermal cameras can be used to detect forest fires

Miscellaneous ideas

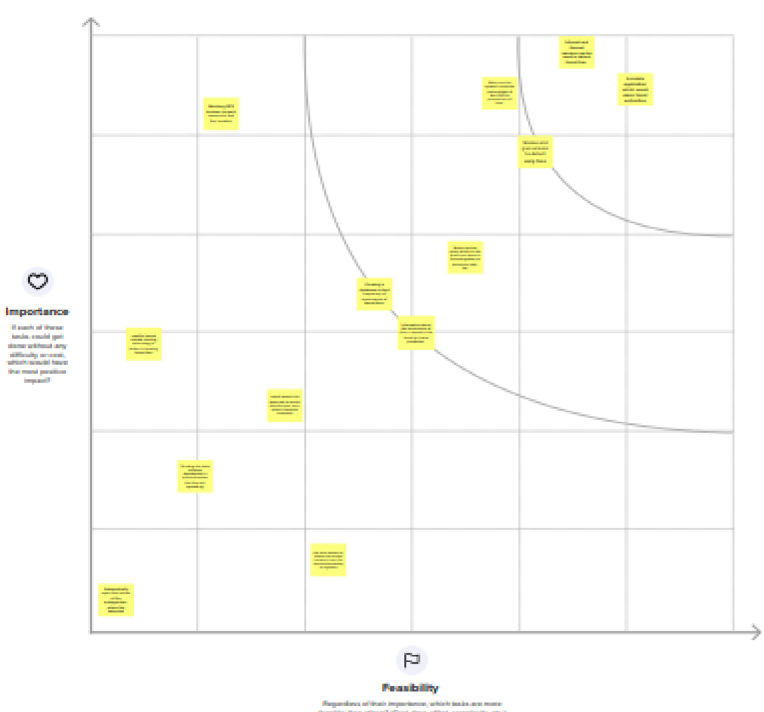
- watch towers can deployed at certain distance from each other in forest to send alert
- Make sure that every vehicle in the forest has atleast a fire extinguisher to put out an early fire
- Automatically open the valves of fire extinguisher when fire detected

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.

20 minutes



c. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	• Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. • To find forest fire detection and prediction approaches, with the goal of informing the local fire authorities.
2.	Idea / Solution description	• 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. • To achieve this, we classify images using a Convolutional Neural Network and use other open CV tools.
3.	Novelty / Uniqueness	• Decreasing the response time of total system i.e increasing the processing speed of the model.
4.	Social Impact / Customer Satisfaction	• Tribal people who live in forest and forest department authorities are benefited. • Saving the most essential Forest cover and the wildlife.
5.	Business Model (Revenue Model)	• We can generate revenue by Supply chain, power & supply, Fires stations and government by providing services.
6.	Scalability of the Solution	• We can further install smoke detecting sensors in highy prone areas to increase accuracy of fire detection. • Attaching GPS tracking to each cameras to find the exact location of fires.

d. Problem Solution fit

Project Title: Emerging methods for early detection of forest fires **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID35796

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Forest Department officials who will be immediately informed in case of forest fire detection.

Also educated tribals/forest living people may be our customers who can be alerted in right time.

6. CUSTOMER CONSTRAINTS — CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

The main constraint is that fires are detected very late and it becomes difficult to suppress and track the exact origin of fire.
It requires lot of water, gas and human resources to suppress huge fires. Also money spent is huge.

For forest living people, they fear to leave their cattles, properties alone in fear of fires.

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem
or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

In the past, forest fires were detected using watchtowers, which were not efficient because they were based on human observations.

In recent history and even the present day, satellite image processing methods, wireless sensor network, optical sensors, CO_2 and gas sensor-based methods exist.

But there are some drawbacks, such as inefficiency, power consumption, latency, accuracy and implementation costs for above methods.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

- **The main problem is forest fires are detected very late before which more damage is caused to our most valuable ecological resources.**
- **We propose a method for early detection of forest fires and intimation of authorities immediately.**
- **We also predict the probability of occurrence of forest fires in a particular area at a particular season.**

9. PROBLEM ROOT CAUSE — RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

These fires can be caused by natural reasons, such as high temperatures that can create spontaneous combustion of dry fuel such as sawdust, leaves, lightning, etc.,

They are also caused by human activities, such as unextinguished campfires, arson, inappropriately burned debris, etc.

Forest authorities need to extinguish fire as soon as possible to save lives, habitat and even our environment.

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

The customer needs to search for proper solution available in net or through various sources and find feasible methods.

They need to critically analyze the suitability and benefits of the solutions available and choose the most suited one for their requirements and particular scenario.

Also customers can spend free time to address various other problems in forest than these fires.

Focus on J&P, tap into BE, understand RC

4. REQUIREMENT ANALYSIS

i)Functional requirement:

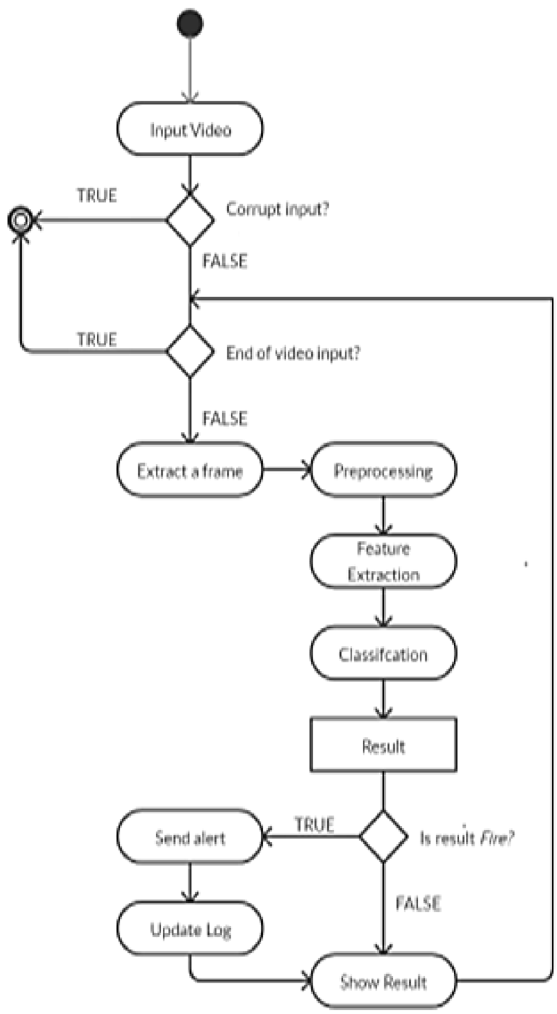
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Reporting	Gives Alarm whenever fire is detected and sends message to registered mail.
FR-4	Changing Volume	Alarm sound varies with respect to intensity of forest fire detected.
FR-5	Variable Coverage area	Coverage area can be varied by user.
FR-6	Stores data	Stores information about frequency of occurrence of forest fires and this data can be accessed by registered user.

ii)Non-Functional requirements:

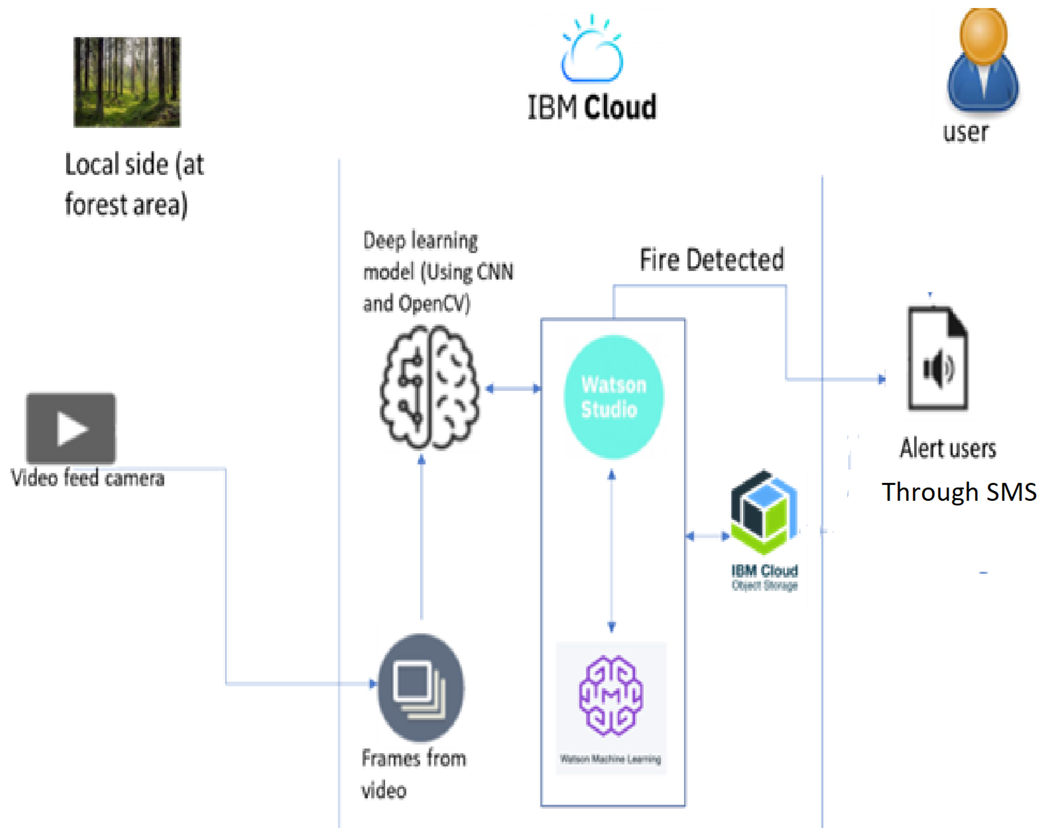
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	System would be user friendly and there is no need for user to know technical things to understand system.
NFR-2	**Security**	Data stored in system can be accessed only by Administrator.
NFR-3	**Reliability**	System automatically returns to normal state once alarm gets turn off which reduces hardware usage and failures.
NFR-4	**Performance**	With high Accuracy and low Response time Performance is improved.
NFR-5	**Availability**	The Proctoring will be available for 24/7.
NFR-6	**Scalability**	The range of each camera can be scalable by making sure that ranges of two different cameras won't be overlap to detect location.

5. **PROJECT DESIGN**

a. Data Flow Diagrams:



b. Solution & Technical Architecture



c. User Stories

User Story Number	User Story / Task	Acceptance criteria	Priority	Release
USN-1	As a user, I can register for the application and give my phone number/mail to receive alert message	I can receive confirmation email that I am successfully registered	High	Sprint-1
USN-2	As a user, I should be able to receive alert whenever forest fire is detected.	I can get an alert message when fire is actually detected.	Very High	Sprint-1
USN-3	As a user, I should have a user interface to monitor the live video stream from cameras installed at remote places	I can monitor the live happenings in the forest through a web application.	Low	Sprint-4
USN-4	As a user, I can log into the application by entering email & password	I can log in and view my dashboard.	Medium	Sprint-2
USN-5	As a user,I need to get support from developers in case of forest fire and failure of service provided	I can have safe user experience and all the issues raised is sorted	Medium	Sprint-3
USN-6	As a user I must be able to access the website at any time	I can view my dashboard at my demand on any time	Medium	Sprint-2
USN-7	As a user I must receive detailed report of intensity of forest fire and also where exactly fire is detected.	I can receive the accurate location of forest fire and able to solve the problem at right time.	High	Sprint-3
USN-8	As a user I want detailed data of where fire is occurring frequently and the application should make predictions also in future.	I can be confident when and where fire occurs and confidently make necessary arrangements for it at correct time.	medium	Sprint-4

6. PROJECT PLANNING & SCHEDULING

a. Sprint Planning & Estimation

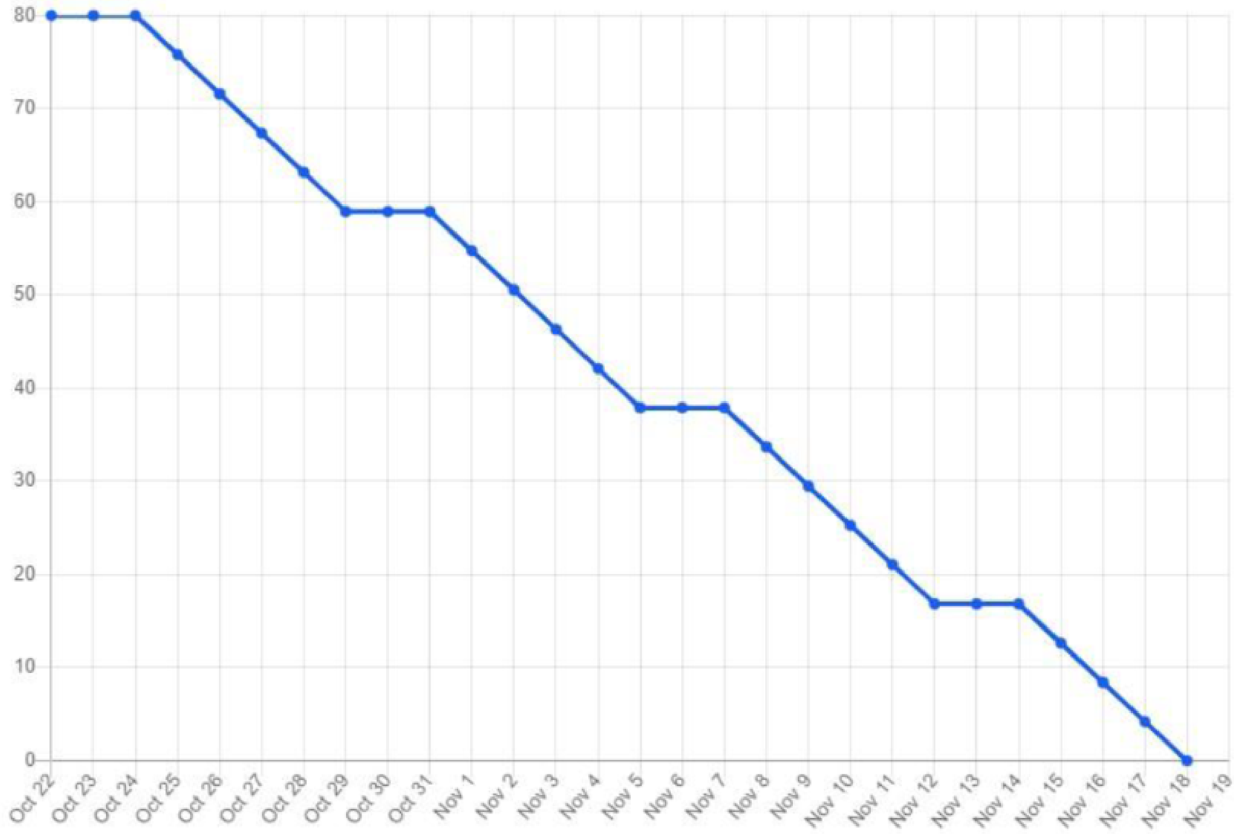
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Building IBM Watson Assistant	USN-1	Downloading the data set and performing image preprocessing.	2	High	Krishna sai B, Girish K.B
Sprint-1		USN-2	The dataset should be made available in cloud .	1	Medium	Gokul S, Aditya raj K
Sprint-2	Modelling	USN-3	Developing a Model and verifying the accuracy.	2	High	Aditya raj K , Krishna sai B
Sprint-2		USN-4	Creating a secure database to store forest fire images.	2	Medium	Girish K.B, Gokul S
Sprint-3	User Interface and Testing	USN-5	Doing video processing of live camera and sending alert message.	1	High	Krishna sai B, Girish K.B
Sprint-3		USN-6	Users can access their dashboard and other details can be updated.	2	Low	Aditya raj K, Gokul S
Sprint-4	Model Improvision	USN - 7	The dataset should be increased in order to improve accuracy	2	High	Krishna sai B, Aditya raj K
Sprint-4		USN - 8	The input image should have high resolution	1	Low	Gokul S
			Gain information about the shortcomings from the feedback provided and improve service	1	Low	Girish K.B

b.Sprint Delivery Schedule:

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	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

c.Reports from JIRA:

BURNDOWN CHART:



7. CODING & SOLUTIONING (Explain the features added in the project along with code)

a. Feature 1

- Data Collection is done from site - https://www.kaggle.com/arbethi/forest-fire?select=Dataset
- The dataset consists of 434 train images belonging to two classes with fire(152) and without fire(282) and 120 test images (with fire: 48 , without fire :72). Thus it is a binary classification problem.Initially image preprocessing is done by importing the Image data generator library and giving various parameters to it.
- It is a CNN model , which was trained for 25 epochs with input image size of (256,256) and batch size of 32 (using mini batch gradient descent algorithm).
- The model is tested using test images and also through input video if fire is detected by using the openCV library.

b. Feature 2

- Alert through TWILIO service :After loading the model and accesing the twilio account with the authentication token and Account SID , this will open one video frame pop up on your desktop/laptop screen.
- Video will provide with different test images of a forest fire or normal forest images, the model detects, if there is any forest fire in the video stream. If the FOREST FIRE DETECTED then an alert message will be sent to higher authorities(or the receipients mobile numbers - SMS service) and with a sound, else it returns NO FIRE DETECTED.
- Also a buzzer beeping sound is received in the local system for alerting whenever fire is detected.This is done by using the playsound library in our code.

c. Database Schema (if Applicable):

- The database used is IBM Cloud Object Storage. Here we store the dataset zip files and the test images and videos.
- We store the model trained in IBM watson studio in the Cloud Object Storage. This trained model is deployed in IBM cloud using the watson machine learning service, which can be downloaded in local system for further usage.

8. TESTING

a. Test Cases

Section	TotalCases	Not Tested	Fail	Pass
Detection model	4	0	1	3
Client Application(Sending alert messages)	5	0	0	5
Miscellaneous conditions(Images similar to fire)	1	0	1	0
Exception Reporting	0	0	0	0
Final Report Output	10	0	0	8

b. User Acceptance Testing

Test scenarios and functions:

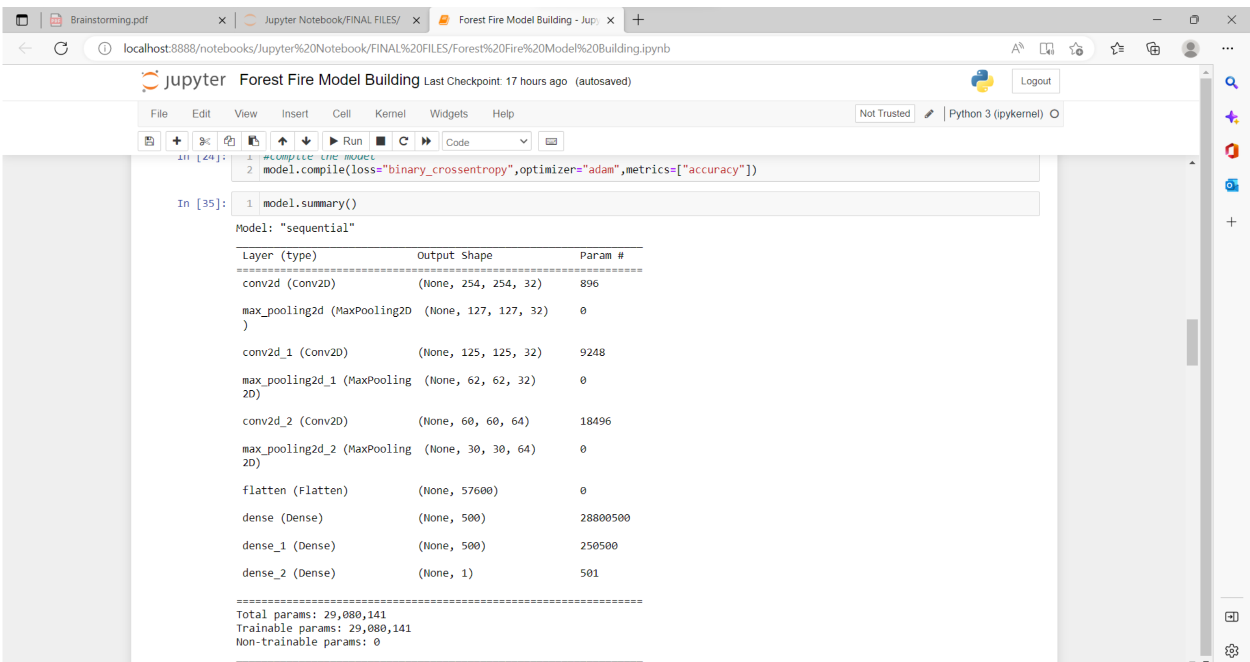
- Verify the user is able to understand the working of the model.
- Verify the user can upload the upload the test Video which should be analysed for live detection of forest fire.
- Verify the system has maximum accuracy in determining more correct prediction with high probability.
- Verify the output and if fire detected make sure the alert messages are sent to the registered receipients.
- Make the system and model it to be available for more number of users and upgrade it to alarm more people in the vulnerable areas of fire.

9. RESULTS

a. Performance Metrics

Training Accuracy - 0.9654
Validation Accuracy – 0.991

Model Performance Testing:



```
In [24]:  1  #compile the model
          2  model.compile(loss="binary_crossentropy",optimizer="adam",metrics=["accuracy"])

In [35]:  1  model.summary()

Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 254, 254, 32)      896

 max_pooling2d (MaxPooling2D  (None, 127, 127, 32)     0
 )

 conv2d_1 (Conv2D)           (None, 125, 125, 32)      9248

 max_pooling2d_1 (MaxPooling  (None, 62, 62, 32)       0
 2D)

 conv2d_2 (Conv2D)           (None, 60, 60, 64)        18496

 max_pooling2d_2 (MaxPooling  (None, 30, 30, 64)       0
 2D)

 flatten (Flatten)           (None, 57600)             0

 dense (Dense)               (None, 500)               28800500

 dense_1 (Dense)             (None, 500)               250500

 dense_2 (Dense)             (None, 1)                 501

=================================================================
Total params: 29,080,141
Trainable params: 29,080,141
Non-trainable params: 0
_________________________________________________________________
```

Values:

```
Layer (type)                Output Shape              Param #
=================================================================
conv2d (Conv2D)             (None, 254, 254, 32)      896
max_pooling2d (MaxPooling2D  (None, 127, 127, 32)     0
)
conv2d_1 (Conv2D)           (None, 125, 125, 32)      9248
```

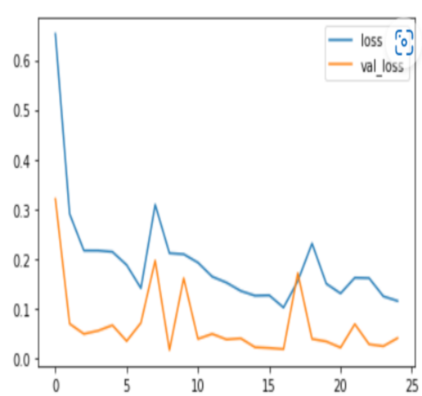
```
max_pooling2d_1 (MaxPooling  (None, 62, 62, 32)       0
2D)
conv2d_2 (Conv2D)           (None, 60, 60, 64)        18496
max_pooling2d_2 (MaxPooling  (None, 30, 30, 64)       0
2D)
flatten (Flatten)           (None, 57600)             0
dense (Dense)               (None, 500)               28800500
dense_1 (Dense)             (None, 500)               250500
dense_2 (Dense)             (None, 1)                 501
=================================================================
Total params: 29,080,141
Trainable params: 29,080,141
Non-trainable params: 0
```

Loss graph for the model:

In [34]:

```python
import matplotlib.pyplot as plt
plt.plot(h.history['loss'])
plt.plot(h.history['val_loss'])
plt.legend(['loss', 'val_loss'])
```

Out[34]: <matplotlib.legend.Legend at 0x2aa1e531b80>




```
Epoch 1/25
14/14 [==============================] - 76s 5s/step - loss: 0.6528 -
accuracy: 0.6697 - val_loss: 0.3201 - val_accuracy: 0.9167
```

```
Epoch 2/25

14/14 [==============================] - 64s 5s/step - loss: 0.2900 -
accuracy: 0.8730 - val_loss: 0.0686 - val_accuracy: 0.9750

Epoch 3/25

14/14 [==============================] - 62s 4s/step - loss: 0.2161 -
accuracy: 0.9145 - val_loss: 0.0482 - val_accuracy: 1.0000

Epoch 4/25

14/14 [==============================] - 63s 4s/step - loss: 0.2161 -
accuracy: 0.9053 - val_loss: 0.0545 - val_accuracy: 0.9833

Epoch 5/25

14/14 [==============================] - 67s 5s/step - loss: 0.2135 -
accuracy: 0.9145 - val_loss: 0.0656 - val_accuracy: 0.9917

Epoch 6/25

14/14 [==============================] - 66s 5s/step - loss: 0.1870 -
accuracy: 0.9169 - val_loss: 0.0337 - val_accuracy: 0.9917

Epoch 7/25

14/14 [==============================] - 64s 4s/step - loss: 0.1402 -
accuracy: 0.9330 - val_loss: 0.0705 - val_accuracy: 0.9750

Epoch 8/25

14/14 [==============================] - 65s 5s/step - loss: 0.3087 -
accuracy: 0.8868 - val_loss: 0.1961 - val_accuracy: 0.9583

Epoch 9/25

14/14 [==============================] - 65s 5s/step - loss: 0.2108 -
accuracy: 0.9284 - val_loss: 0.0156 - val_accuracy: 1.0000

Epoch 10/25

14/14 [==============================] - 79s 6s/step - loss: 0.2088 -
accuracy: 0.9169 - val_loss: 0.1604 - val_accuracy: 0.8833

Epoch 11/25

14/14 [==============================] - 85s 6s/step - loss: 0.1918 -
accuracy: 0.9192 - val_loss: 0.0380 - val_accuracy: 0.9917

Epoch 12/25

14/14 [==============================] - 86s 6s/step - loss: 0.1635 -
accuracy: 0.9400 - val_loss: 0.0481 - val_accuracy: 1.0000
```

```
Epoch 13/25

14/14 [==============================] - 87s 6s/step - loss: 0.1515 -
accuracy: 0.9376 - val_loss: 0.0370 - val_accuracy: 1.0000

Epoch 14/25

14/14 [==============================] - 75s 5s/step - loss: 0.1348 -
accuracy: 0.9607 - val_loss: 0.0391 - val_accuracy: 1.0000

Epoch 15/25

14/14 [==============================] - 94s 7s/step - loss: 0.1252 -
accuracy: 0.9538 - val_loss: 0.0212 - val_accuracy: 1.0000

Epoch 16/25

14/14 [==============================] - 80s 6s/step - loss: 0.1259 -
accuracy: 0.9561 - val_loss: 0.0197 - val_accuracy: 1.0000

Epoch 17/25

14/14 [==============================] - 74s 5s/step - loss: 0.1013 -
accuracy: 0.9677 - val_loss: 0.0174 - val_accuracy: 1.0000

Epoch 18/25

14/14 [==============================] - 72s 5s/step - loss: 0.1547 -
accuracy: 0.9654 - val_loss: 0.1707 - val_accuracy: 0.9333

Epoch 19/25

14/14 [==============================] - 68s 5s/step - loss: 0.2305 -
accuracy: 0.9238 - val_loss: 0.0380 - val_accuracy: 0.9750

Epoch 20/25

14/14 [==============================] - 66s 5s/step - loss: 0.1493 -
accuracy: 0.9400 - val_loss: 0.0328 - val_accuracy: 0.9917

Epoch 21/25

14/14 [==============================] - 68s 5s/step - loss: 0.1297 -
accuracy: 0.9584 - val_loss: 0.0205 - val_accuracy: 1.0000

Epoch 22/25

14/14 [==============================] - 64s 5s/step - loss: 0.1613 -
accuracy: 0.9515 - val_loss: 0.0678 - val_accuracy: 0.9833

Epoch 23/25

14/14 [==============================] - 61s 4s/step - loss: 0.1606 -
accuracy: 0.9469 - val_loss: 0.0272 - val_accuracy: 1.0000
```

```
Epoch 24/25

14/14 [==============================] - 63s 5s/step - loss: 0.1239 -
accuracy: 0.9538 - val_loss: 0.0234 - val_accuracy: 0.9917

Epoch 25/25

14/14 [==============================] - 88s 6s/step - loss: 0.1145 -
accuracy: 0.9654 - val_loss: 0.0396 - val_accuracy: 0.9917
```

10. ADVANTAGES

- Detecting early forest fires would reduce environmental pollution and save many lives .
- System would be user friendly and there is no need for user to know technical things to understand system.

DISADVANTAGES

- This model was trained with limited Open source dataset with limited training images, thus predictions may be inaccurate for diverse condtions.
- Here, the project is done with just one camera/test video but in reality we need to install cameras in various places of forest and we also need to exactly identify location of camera where fire is detected.
- The users (forest department officials) of our application should have a proper user interface to get registered and access more data and store the records for future predictions.

11. CONCLUSION

A Deep Learning based Convolutional Neural Network (CNN) model is presented to detect a forest fire. The following techniques such as Image Collection, Preprocessing, Image Classification, Model building and video streaming and alerting is done. Initially, the images in the dataset are pre-processed, and fed into the CNN for feature extraction and detection.

i) **FUTURE SCOPE**:

- The scope of using video frames in the detection of fire using cnn is challenging as well as innovative. If this system with less error rate can be implemented at a large scale like in bigfactories, houses, forests, it is possible to prevent damage and loss due to random fire accidents by making use of the Surveillance systems.
- The proposed system can be developed to more advanced system by integrating wireless sensors for added protection and precision. The algorithm shows great promise in adapting to various environment.
- Future studies may focus on deploying the model into Database and cloud storage and using necessary support packages to detect the real time fire by making challenging and specific scene understanding datasets for fire detection methods and detailed experiments with Large datasets and training models.

12. APPENDIX

Source Code:

https://drive.google.com/drive/folders/1BFEEKo7k9-e0xz6gI2C5a__aIpgz4YVQ?usp=share_link

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-565-1658307029

Project Demo Link:

https://drive.google.com/drive/folders/1aaLAtMJQB7r2Q5Z3vMvD_FHLdPwDyYsD?usp=share_link

************************************** **THANK YOU** **