Emerging Methods for Early Detection of Forest Fires

PROJECT REPORT

Submitted by

TEAM ID : **PNT2022TMID17719**

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Project Report

1. Introduction

1.1 Project Overview

This project focused on earlier detection of forest fires with deep learning techniques. The goal of this project is to protect human safety, property, and natural resources. Early discovery of forest fires can have a big impact on how well they are controlled. Different scholars have developed a variety of methods for detecting forest fires. There are numerous ways to find out when a forest fire will start. a fire detection technique for the use of IR cameras for UAV - based forest fire surveillance. The effectiveness and dependability of detecting forest fires are enhanced by this method. In order to achieve these goals we need to complete the following tasks:

1. Data collection
2. Image pre processing
3. Model building
4. Video streaming and alerting

1.2 Purpose

Forest fires have escalated over the past few decades as a result of deforestation and climate change. Forest fires have an impact on a variety of vegetation and wildlife. This issue can be effectively resolved with the use of technology. For forest fire management to work, detection of forest fires is essential. The goal of this research is to provide deep learning methods for reasonably priced forest fire prediction.

2. Literature Survey

2.1. Existing Problem

The limitations of some of the methods are

1. Take more time to detect
2. Due to unbalanced training and test set the learning model of developed CNN can be affected.

Hristov et al[1], proposed two different emerging solutions for early detection of forest fires.The first of these solutions involves the use of unmanned aerial vehicles (UAVs) with specialized cameras. Several different scenarios for the possible use of the drones for forest fire detection will be presented and analysed, including a solution with the use of a combination between a fixed-wind and a rotary-wing UAVs. In the next chapter of the paper, the possibilities for development of systems for early forest fire detection using LoRaWAN sensor networks was discussed. Advantage is greater potential. Demerit is this solution is still under development.

Tran et al[2], proposed a solution to construct a model for early fire detection and damage area estimation for response systems based on deep learning. Neural architecture search-based object detection (DetNAS) is implemented for searching optimal backbone. Backbone networks play a crucial role in the application of deep learning-based models, as they have a significant impact on the performance of the model. A large-scale fire dataset with approximately 400,000 images is used to train and test object-detection models. Then,the searched light-weight backbone is compared with well-known backbones, such as ResNet, VoVNet and FBNetV3. Advantage is it gives great accuracy. Demerit ist is likely to overfit the training set and provide incorrect predictions on the test set because of the lack of training data.

Moulehi et al[3] proposed robust tracking method for fire regions using an artificial neural network (ANN) based approach combined with a hybrid geometric active contour (GAC) model based on Bayes error energy functional for forest wildfire videos is implemented An estimation function is built with local and global information collected from three color spaces (RGB, HIS and YCbCr) using Fisher's Linear Discriminant analysis (FLDA) and a trained ANN in order to get a preliminary fire pixel classification in each frame. This function is used to compute initial curves and the level set evolution parameters to control the active contour model providing a refined fire segmentation in each processed frame. Merit is accuracy for fire detection (93.2%) Demerit is it take more time to detect fire.

Larionov et al[4], proposed a convolutional neural network for automated wildfire detection on high- resolution aerial photos is presented. Two databases of satellite RGB- images with different spatial resolution containing 1457 and 393 high-resolution images, respectively, were prepared for training and testing the neural network. Various techniques of data augmentation are used to enlarge training and test sets generated by data windowing. U- Net neural network with the ResNet34 as encoder was used in research. Neural network training was learning using the NVIDIA DGX-1 supercomputer. Merit is robustness and accurate Demerit is due to unbalanced training and test set the learning model of developed CNN can be affected.

Zhan et al[5], proposed a method that the Adjacent layer composite network is proposed toenhance the extraction of smoke features with high transparency and no clear edges, andSoftPool in it is used to retain more feature information of smoke. Recursive feature pyramid with deconvolution and dilated convolution (RDDFPN) is proposed to fuse shallow visualfeatures and deep semantic information in the channel dimension to improve the accuracy of long-range aerial smoke detection. Global optimal nonmaximum suppression (GO-NMS) sets the objective function to globally optimize the selection of anchor frames to adapt to the aerial photography of multiple smoke locations in forest fire scenes. Merit is it improved feature extraction capability.

2.2 References

1. Georgi Hristov , Jordan Raychev , Diyana Kinaneva, Plamen Zahariev " Emerging methods for early detection of forest fires using unmanned aerial vehicles and LoRaWAN sensor networks", 2018.

2. DAI QUOC TRAN 1, MINSOO PARK 1, YUNTAE JEON 1, JINYEONG BAK 2, AND SEUNGHEE PARK 1, "Forest-Fire Response System Using Deep-Learning-Based Approaches With CCTV Images and Weather Data", VOLUME 10, June 2022.

3.Aymen Mouelhi, Moez Bouchouicha, Mounir Sayadi, Eric Moreau,"Fire Tracking in Video Sequences Using Geometric Active Contours Controlled by Artificial Neural Network" , 2020

4. Vladimir Khryashchev Roman Larionov,"Wildfire Segmentation on Satellite Images usingDeep Learning", 2020.

5. Jialei Zhan a, Yaowen Hu a, Guoxiong Zhou , Yanfeng Wang b, Weiwei Cai a, Liujun Li,"Ahigh-precision forest fire smoke detection approach based on ARGNet" 2022

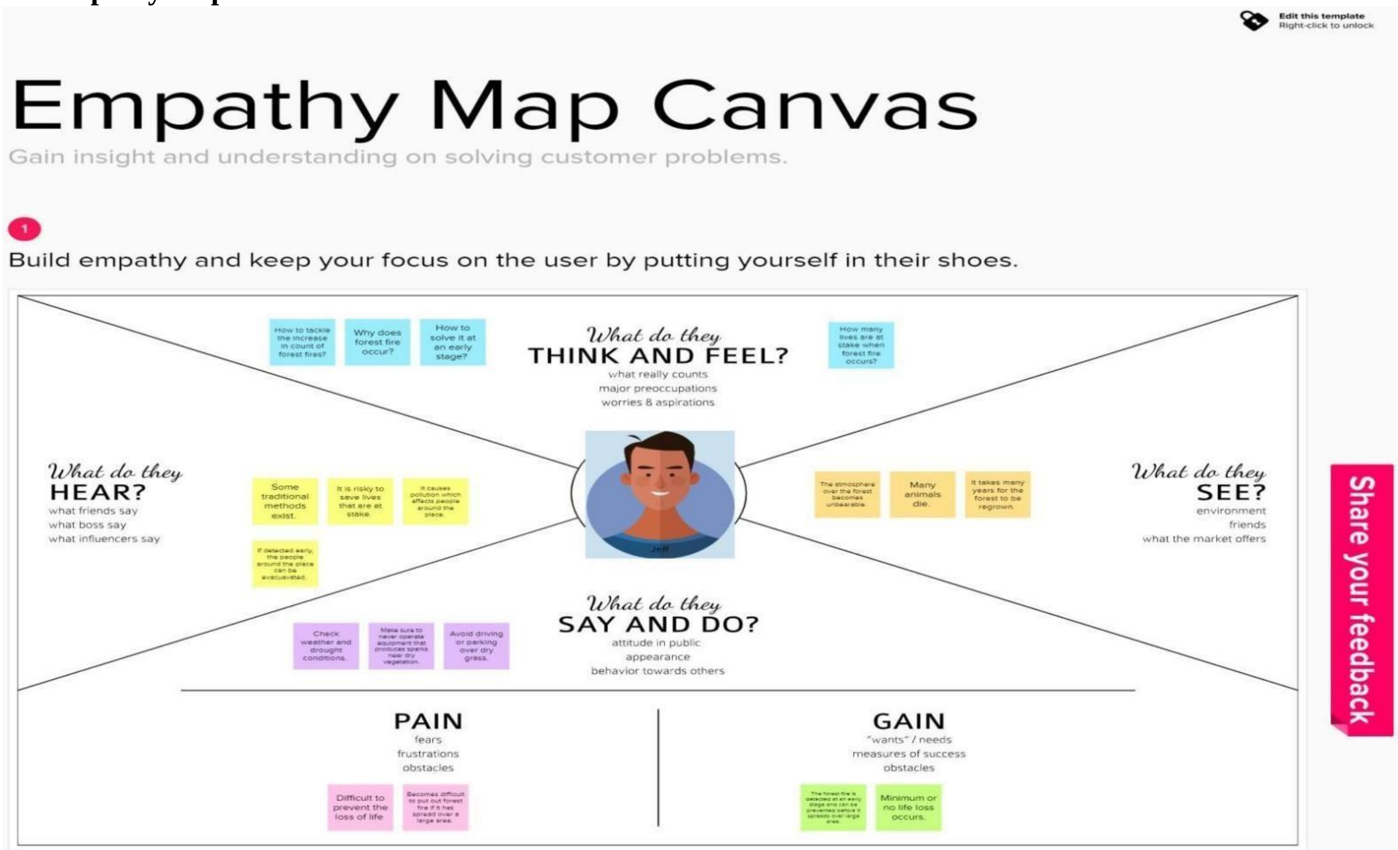
2.3Problem Statement Definition

Forest fire has a severe effect on wildlife animals, humans and ecological system. According to the survey conducted by forest authorities, every year huge loss is caused due to forest fire accidents. The idea of this project is to build an early detection and prevention system for forest fire to preserve the nature using Convolution Neural Network (CNN).

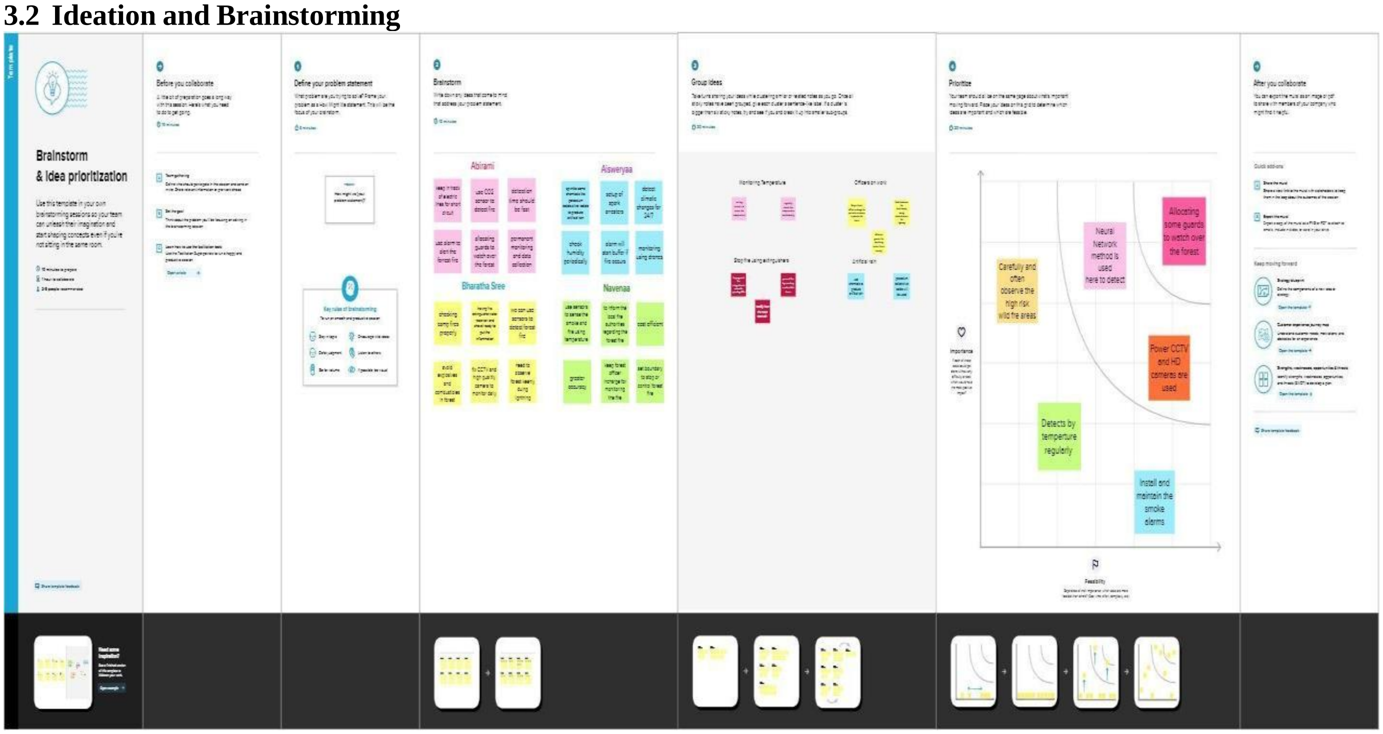
Problem Statement (PS)	**I am (Customer)**	**I’m trying to**	**But**	**Because**	**Which makes me feel**
PS-1	Native people	To survive	Challenging for us it causes many diseases also because ofthe smoke produced fromforest.	The sudden climate change causesdisasters like glacier melting, extinction of Species etc. ‘	Anxious
PS-2	Forest officer	Detect forest fire	The surveillance of forest is difficult	Volume of trees is high inthick forest. Itis difficult to supervise	Frustrated

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation and Brainstorming



3.3. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The idea of this project is to build an early detection and prevention system for forest fire to preserve the nature.
2.	Idea / Solution description	Drones are used to monitor the environment in forest. If any suspicious activities like forest fire happens in forest it will be detected.
3.	Novelty / Uniqueness	Feature detection in frames of the videos will be analysed. Accuracy will be high while detecting the forest fire.
4.	Social Impact / Customer Satisfaction	Prevention of forest fire can reduces the CO2 in atmosphere. We can also save countless lives of wildlife species, tribal people etc.
5.	Business Model (Revenue Model)	It is considered as more profitable project for government spends millions of dollars for detection of forest fires and can be used by corporation to monitor huge reserve forests.
6.	Scalability of the Solution	We can increase the installation of cameras to monitor the respectable amount of area and can also use drones for thick forest areas. The images and videos will be collected in the local server.

3.4 Problem Solution Fit

Project Title:Emerging methods for early detection of forest fire **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID17719

Define CS, fit into CC

1.CUSTOMER SEGMENT: CS

Forest administration
Forest officers
Common people

6. CUSTOMER CONSTRAINTS CC

Need to monitor the forest 24*7
Huge datastore is needed to manage data

5. AVAILABLE SOLUTIONS AS

- Prescribed fires in fire-prone temperate forests to reduce emissions of biomass from the historic rate of wildfire losses.
- Fire control practices in Amazonian forests to avoid unintended fires that degrade the forest (such as fire breaks at forest edges).

Explore AS, differentiate

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

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Permanent monitoring and detect forest fire accurately

9. PROBLEM ROOT CAUSE RC

- Lightning
- Spontaneous combustion of dry vegetation
- Volcanic activities
- Carelessness while Smoking or using mosquito coil or candles or camp-fires
- Arson or intentional
- Tribal ritual/tradition

7. BEHAVIOUR BE

When burning fuel is exposed to oxygen from the air, a chemical reaction occurs that releases heat and generates combustion.The manner in which fuel ignites, flame develops and fire spreads. In wildland this behavior is influenced by weather and topography interact.

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

Identify strong TR & EM

3. TRIGGERS TR

Initial smoke will trigger the forest officer to take the step at earlier stage

4. EMOTIONS: BEFORE / AFTER EM

Frustated due to poor netwrok connection
And misprediction of forest fire

10. YOUR SOLUTION SL

Image processing,video processing,neural network are used for the early detection of forest fire

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE
Monitoring the forest through survelliance camera

8.2 OFFLINE
Take survey from existing video clips

Identify strong TR & EM

4. Requirement Analysis

4.1 Functional Requirements

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Video surveillance start	Start surveillance through remote control
FR-2	Forest monitoring	Continuous monitoring through camera
FR-3	Detect fire	Fire is detected through CNN model
FR-4	Alert	Alert the forest officials through message

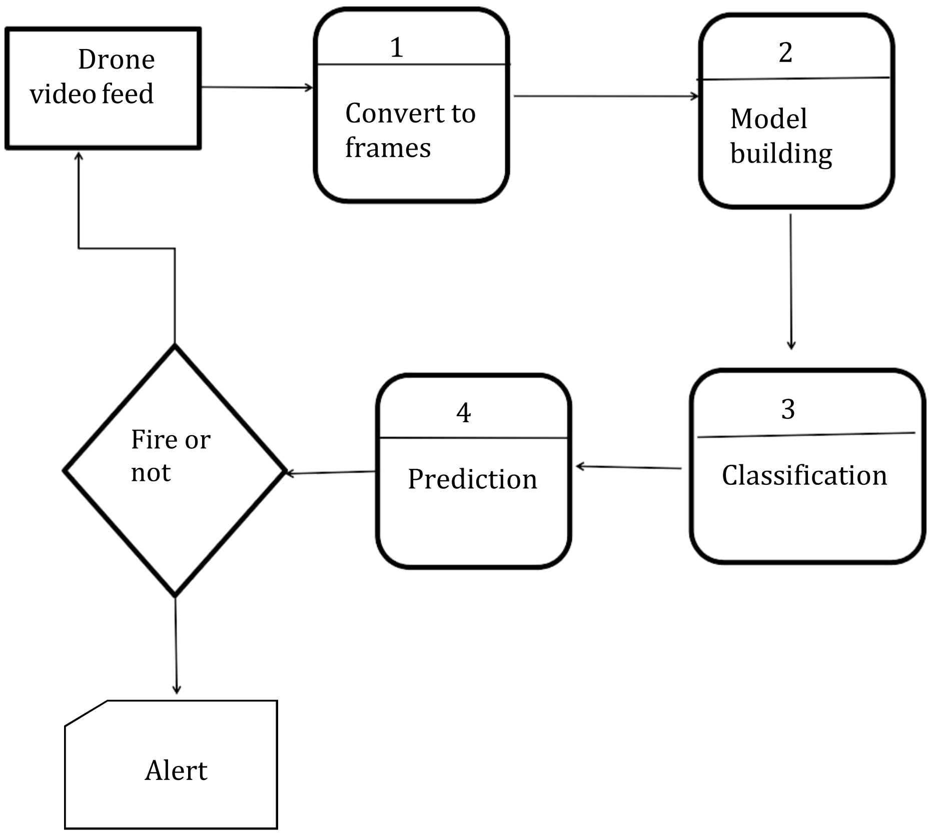
4.2 Non-functional Requirements

Following are the non-functional requirements of the proposed solution.

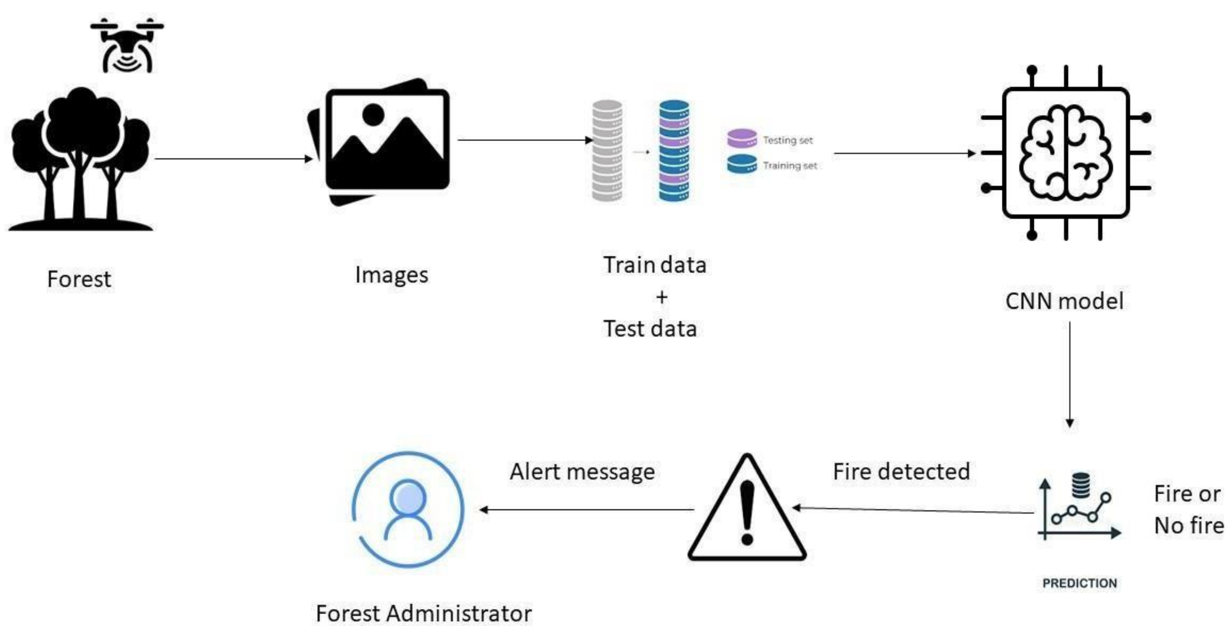
FR No.	Non-Functional Requirement	Description
NFR-1	**Reliability**	Model is safe to install
NFR-2	**Security**	More secure environment
NFR-3	**Availability**	Build model is available all the time
NFR-4	**Performance**	Model will achieve high accuracy

5. Project Design

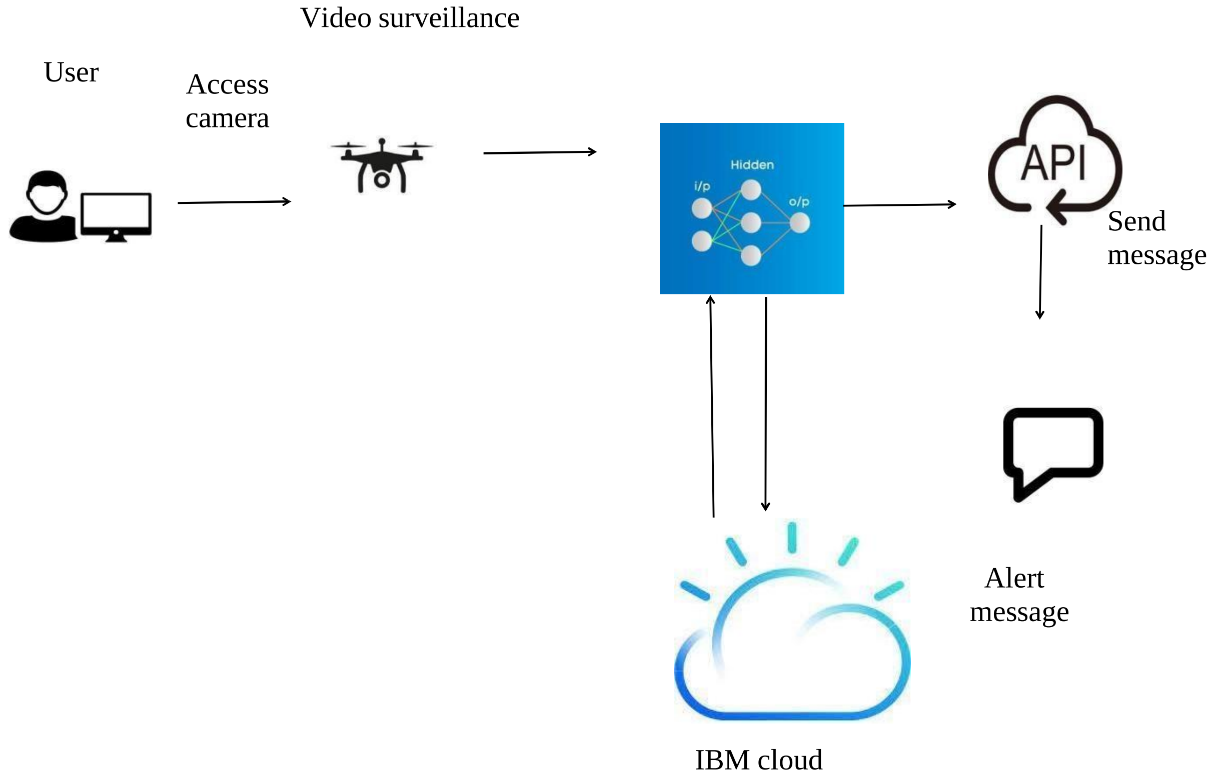
5.1 Data Flow Diagram



5.2 Solution Architecture



Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Administrator	Video surveillance	USN-1	As an administrator, I have to monitor the video recorded from the drone	I can access my account / dashboard	High	Sprint-3
	Forest monitoring	USN-2	As an administrator, I have to monitor the forest from the input video captured by the drone	I have the accessto monitor all time	Medium	Sprint-2
	Detect fire	USN-3	The system has to detect whether there is fire or not.	I have to continuously monitor the status	High	Sprint-1
	Alert	USN-4	As an administrator, I have to conform whether there is fire or not	I must have the right to inform the rescue team	High	Sprint-2

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 detected or not.	10	Medium	Abirami Bharatha Sree Navenaa Aisweryaa
Sprint-1		USN-2	The output would have to give high accuracy.	20	High	Abirami Bharatha Sree Navenaa Aisweryaa
Sprint-2	Video Processing	USN-3	The drone videos will be split into frames to detect the fire.	30	High	Abirami Bharatha Sree Navenaa Aisweryaa
Sprint-3	Alerting	USN-4	After the fire is detected the alert message have to be sent .	20	High	Abirami Bharatha Sree Navenaa Aisweryaa

6.2 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	30	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

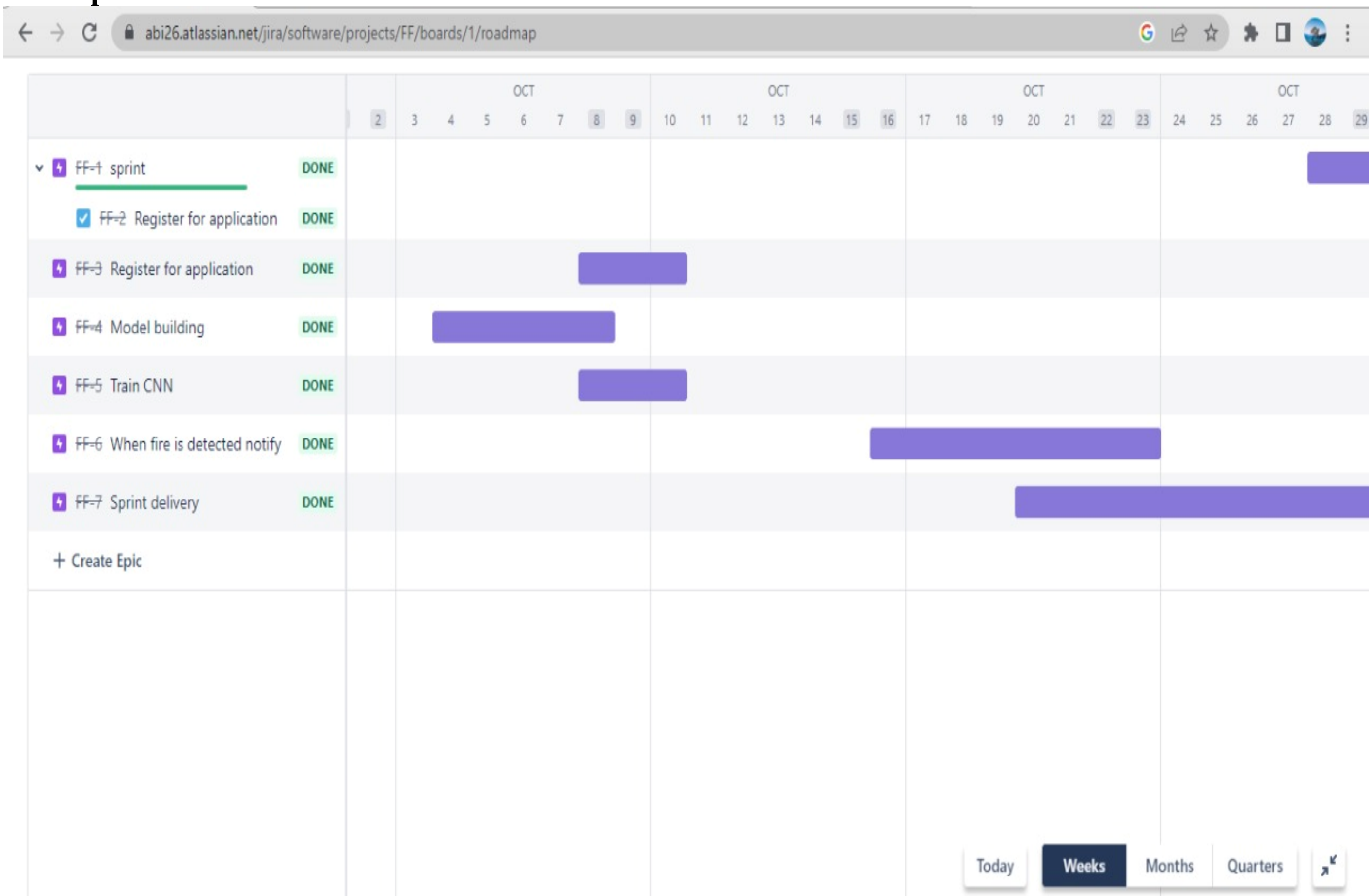
Velocity:

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=Sprint duration/Velocity

=20/6=3

6.3 Reports from JIRA



7.CODING & SOLUTIONING

7.1 Feature 1

Sequential model is created and pooling layers are added to the model. And model is flatten.

Coding:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,rotation_range=180,z
oom_range=0.2,horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
x_train=train_datagen.flow_from_directory(r'C:\Users\USER\Documents\Sem7\Naalaiyathir
an\Dataset\Dataset\train_set', target_size=(128,128),
batch_size=32,
class_mode='binary')
x_test=train_datagen.flow_from_directory(r'C:\Users\USER\Documents\Sem7\Naalaiyathira
n\Dataset\Dataset\test_set', target_size=(128,128),
```

```
batch_size=32,
class_mode='binary')
x_train.class_indices
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.layers import Convolution2D,MaxPooling2D, Flatten
import warnings
warnings.filterwarnings('ignore')
model=Sequential()
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.summary()
```

7.2 Feature 2

Model is build by adding dense layers with activation function relu and sigmoid. Then the model is compiled with binary cross entropy with adam optimizer and accuracy as performance metric.And then model is trained using training data and predicted using test data.

Model Building:

```
model.add(Dense(150,activation='relu'))
model.add(Dense(1,activation='sigmoid'))
model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)
len(x_test)
model.fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,
validation_data=x_test,validation_steps=len(x_test))
import tensorflow as tf
from keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
import cv2 model.save('forestfire.h5')
model=load_model('forestfire.h5')
testImg =
image.load_img(r'C:\Users\win\Desktop\Project_NT\test_set\forest\_101542074_g ettyimages_956391468.jpg')
testImgarrayImg = image.img_to_array(testImg)
arrayImg
x = np.expand_dims(arrayImg , axis = 0)X
images = np.vstack([x])
```

```
pred=model.predict(images)
Pred
x_train.class_indicesif
(pred[0] > 0.5):
print("forest with fire")
else:
print("forest without fire")
```

7.3 Feature 3

Video analysis is done on the trained model and alert notification is delivered to the user. To get the alert notifications we use twilio platform and create account in that platform.

Video Analysis:

```
import cv2
import numpy as np
from keras.preprocessing import image
from keras.models import load_model
from twilio.rest import Client
!pip install twilio
model=load_model('forestfire.h5')
video=cv2.VideoCapture(r'C:\Users\win\Desktop\Project_NT\video.mp4')
name=['forest','with fire']
#predict=model.predict(x)import
keras
from tensorflow.keras.utils import load_img, img_to_array
while(1):
success,frame=video.read()
cv2.imwrite("image.jpg",frame)
img=keras.utils.load_img("image.jpg")img=
cv2.resize(frame, (128,128))
x=keras.utils.img_to_array(img)
x=np.expand_dims(x,axis=0)
dim=(128,128)
# x=x.reshape(128, 128, 3)
# x= cv2.resize(x, (128,128)) pred
= model.predict(x)
#pred=model.predict_classes(x)
p=pred[0]
print(pred)
```

```
# cv2.putText(frame,"predicted class="+str(name[p]),(100,100),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,0),1)
if pred[0]==1:
account_sid='AC63518ea0e5f8e919ee2a4dc4dc17cdb6'
auth_token='e5413a0fd6c65647ca88e8cb0cd33fac'
client=Client(account_sid,auth_token)
message=client.messages.create(body='Forest Fire is detected,stay alert',from_='+1 989 762
1639',
to='+91 93394743')
print(message.sid)
print('Fire Detected')
print('SMS sent!')

else:

print("No Danger")
cv2.imshow("image",frame)
#if cv2.waitkey(1) & 0xFF== ord('a'):
#break
video.release()
cv2.destroyAllWindows()
```

8. TESTING

8.1 Test Cases

TestcaseID	Test Scenario	Test Data	Expected Result	Actual Result	Status	BugID	ExecutedBy
T01	Detection of Forest Fire	_101542074_gettyimages_956391468.jpg	No danger	No danger	Pass	-	Abirami& Aisweryaa
T02	Detection of Forest Fire	01_NeilBurnell_Mystical_photoverticall.jpg	No danger	No danger	Pass	-	BharathaSree &Navenaa
T03	Detection of Forest Fire	Bandipur_fires_2019.jpg	Fire Detected! SMS sent!	Fire Detected! SMS sent!	Pass	-	Aisweryaa &Navenaa
T04	Detection of Forest Fire	horseshoe_bay_fire.jpg	Fire Detected! SMS sent!	Fire Detected! SMS sent!	Pass	-	Abirami& BharathaSree
T05	Detection of ForestFire	ForestFire.mp4	Fire Detected! SMS sent!	Fire Detected! SMS sent!	Pass	-	Abirami, Navenaa,
T06	Detection of ForestFire	Forestwithnofire.mp4	No danger	No danger	Pass	-	Aisweryaa, BharathaSree

8.2 User Acceptance Testing

8.2.1 Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	badness 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**

8.2.2 TEST CASE ANALYSIS

Selection	Total cases	Not tested	Fail	Pass
Client	**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 Metrics

S No	Number of Epochs	Number of hidden layers	Activation function	Accuracy
1.	14	1	Softmax	64%
2.	10	1	Relu	29%
3	8	2	1. Relu 2. Sigmoid	64%

4	9	1	Elu	53%
5	10	2	1. Relu 2. Sigmoid	94%

10. ADVANTAGES & DISADVANTAGES
10.1 Advantages:

- The idea of this project is to build an early detection and prevention system for forest fireto preserve the nature.
- Fire detection systems speed up response times since they can notify the right persons to put out the fire. Thus, less harm is done to the forest and wildlife.
- Drones are used to monitor the environment in forest. If any suspicious activities like forest fire happens in forest it will be detected.
- Accuracy will be high while detecting the forest fire.
- Prevention of forest fire can reduces the CO_2 in atmosphere. We can also save countless lives of wildlife species, tribal people etc.
- It is considered as more profitable project for government spends millions of dollars for detection of forest fires and can be used by corporation to monitor huge reserve forests.
- We can increase the installation of cameras to monitor the respectable amount of area and can also use drones for thick forest areas. The images and videos will be collected in the localserver inorder to save many lives instantly.

10.2 Disadvantages:

- Since the initial investment for the drones are expensive. It regrets for those who want to install this detection system.
- Wildfires are unplanned fires that start in forests or wildland area. Need to assist the working mechanism to those who work in the system.
- A man can never watch the system 24 hours maybe they slept in the rest hours which leads to heavy damage.
- This technology is a real-time monitoring, the fire force have to be alert for any time.
- If there is a traffic in the communication, the message won’t be received by the other end.
- We can improve the alarm sound hence it sounds effective more.

11. CONCLUSION

The proposed system for forest fire detection was found to be an effective method for fire detection in forests that provides more accurate results. The fire detection is very accurate and false alarms are rare. We can improve the system by using sensors in the drones to identify heat, smoke and temperature. It is more useful than this system. This detection system is suitable to use in real time forest fire monitoring system. The proposed system achieves 93% fire detection rate . The proposed method was compared with other methods and demonstrates superior performance in terms of higher fire detection rate and less false alarm rate.

12. FUTURE SCOPE

As new technologies emerge, dealers should be sure to leverage both timeless and emerging technologies to target more customers/private organisations. This application is used to connect to the internet and cooperate with other devices. This alarm system is a notifier system. In the event that there is an immediate threat to life, property,or mission, the fire alarm system will sound the alarm, notifying occupants to escape, and letting the authorities know they need to respond.

13.APPENDIX

Source Code

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,rotation_range=180,zoom_range=0.2,horiz
ontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
x_train=train_datagen.flow_from_directory(r'E:\journal\Nalaya thiran\Dataset\Dataset\train_set',
target_size=(128,128),batch_size=32,
class_mode='binary')

x_test=train_datagen.flow_from_directory(r'E:\journal\Nalaya thiran\Dataset\Dataset\test_set',
target_size=(128,128),
batch_size=32,
class_mode='binary')
x_train.class_indices

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


model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))

model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
```

```
model.summary()
model.add(Dense(150,activation='relu'))
model.add(Dense(1,activation='sigmoid'))
model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuacy'])
len(x_train)
len(x_test)
model.fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,
validation_data=x_test,validation_steps=len(x_test))

import tensorflow as tf
from keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
import cv2
model.save('forestfire.h5')
model=load_model('forestfire.h5')
testImg = image.load_img(r'E:\journal\Nalaya thiran\Dataset\Dataset\test_set\with fire\louisiana_forest_fire.jpg',
target_size = (128,128))
testImg
arrayImg = image.img_to_array(testImg)
arrayImg
x = np.expand_dims(arrayImg , axis = 0)
x




images = np.vstack([x])
pred=model.predict(images)
pred
x_train.class_indices
if (pred[0] > 0.5):
account_sid='AC2e95b7df475c1def9cd2dd30d2887abc'
auth_token='5f20df1bea0e666d6dfad7ce8e0bf631'
client=Client(account_sid,auth_token)
message=client.messages.create(body='Forest Fire is detected,stay alert',
from_='+13465155048',
to='+91 9360069501')
print("fire detected")
print("SMS sent!")
else:
print("No danger")

from twilio.rest import Client
import cv2
video=cv2.VideoCapture(r'E:\journal\Nalaya thiran\video.mp4')
name=['forest','with fire']
account_sid='AC2e95b7df475c1def9cd2dd30d2887abc'
auth_token='5f20df1bea0e666d6dfad7ce8e0bf631'
client=Client(account_sid,auth_token)
message=client.messages.create(body='Forest Fire is detected,stay alert',
```

```
from_='+13465155048',
to='+91 9360069501')
print(message.sid)
get_ipython().system('pip install opencv-python')
get_ipython().system('pip install opencv-contrib-python --user')


import keras
from tensorflow.keras.utils import load_img, img_to_array
while(1):
success,frame=video.read()
img=keras.utils.load_img("image.jpg")
img=cv2.resize(frame,(128,128))
x=keras.utils.img_to_array(img)
x=np.expand_dims(x,axis=0)
dim=(128,128)
pred = model.predict(x)
p=pred[0]
print(pred)
if pred[0]==0:
account_sid='AC2e95b7df475c1def9cd2dd30d2887abc'
auth_token='5f20df1bea0e666d6dfad7ce8e0bf631'
client=Client(account_sid,auth_token)
message=client.messages.create(body='Forest Fire is detected,stay alert',
from_='+13465155048',
to='+91 9360069501')
print("fire detected")
print("SMS sent!")
else:
print("No Danger")
video.release()
cv2.destroyAllWindows()
```

GIT HUB LINK

https://github.com/IBM-EPBL/IBM-Project-2314-1658469722

PROJECT DEMO LINK

https://drive.google.com/file/d/145eaXzf6GWoDexztpg4fChV6d7qslpzA/view?usp=share_link