1. INTRODUCTION:

1.1 Project Overview:

- For the success of each and every project, first the project objectives need to be framed so as to carry out the project with a smooth flow and bring out the desired output.
- The goal of the project is to create a kind of alarm system to detect the forest fire before or after the fire in order to enforce certain preventive measures.
- This can be achieved by using the Deep Learning and CNN model with the cumulative effect of the Artificial Intelligence technology.

1.2 Purpose:

The objectives of this project can be summarized as follows:

- We will be able to learn how to get and prepare the dataset
- We will be able to know how to do image processing
- We will understand how CNN layers are work.
- Classify images using a Convolutional Neural Network
- We will be able to know what are the activation functions can be used.
- We will be able to know how to read images using OpenCV
- We will know convolutional Neural Networks for Computer vision AI Problems.
- Upon completing all the above mentioned tasks or milestones we can obtain a model which can predict the forest fires at an early stage.

2. LITERATURE SURVEY:

LITERATURE SURVEY

S.NO	TITTLE	AUTHOR	ABSTRACT
1.	Emerging methods for early detection of forest firesusing unmanned aerial vehicles and LORAWAN sensor networks	GEORGI HRISTOV[x1] JORDAN RAYCHEV[x2] DIYANA KINANEVA[x3] PLAMEN ZAHARIEV[x4]	Forest fires are occurring throughout the year with an increasing intensity in the summer and autumn periods. These events are mainly caused by the actions of humans, but different nature and environmental phenomena, like lightning strikes or spontaneous combustion of dried leafs or sawdust, can also be credited for their occurrence. Regardless of the reasons for the ignition of the forest fires, they usually cause devastating damage to both nature and humans. Forest fires are also considered as a main contributor to the air pollution, due to the fact that during every fire huge amounts of gases and particle mater are released in the atmosphere. In this paper we will discuss and present 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.

2.	A Review on Early Forest Fire Detection Systems Using Optical Remote Sensing	PANAGIOTIS BARMPOUTIS[x1] PERIKLIS PAPAIOANNOU[x2] KOSMAS DIMITROPOUOS[x3] NIKOS GRAMMALIDIS [x4]	The environmental challenges the world faces nowadays have never been greater or more complex. Global areas covered by forests and urban woodlands are threatened by natural disasters that have increased dramatically during the last decades, in terms of both frequency and magnitude. Large-scale forest fifires are one of the most harmful natural hazards affffecting climate change and life around the world. Thus, to minimize their impacts on people and nature, the adoption of well-planned and closely coordinated effffective prevention, early warning, and response approaches are necessary. This paper presents an overview of the optical remote sensing technologies used in early fifire warning systems and provides an extensive survey on both flflame and smoke detection algorithms employed by each technology. Three types of systems are identifified, namely terrestrial, airborne, and spaceborne-based systems, while various models aiming to detect fifire occurrences with high accuracy in challenging environments are studied. Finally, the strengths and weaknesses of fire detection systems based on optical remote sensing are discussed aiming to contribute to

			future research projects for the development of early warning fifire systems.
3.	A framework for use of wireless sensor networks in forest fire detection and monitoring	YUNUS EMREASLAN[x1] IBRAHIMKORPEOGLU[x2] OZGURULUSOY[x3]	Forest fires are one of the main causes of environmental degradation nowadays. Current surveillance systems for forest fires lack in supporting real-time monitoring of every point of a region at all times and early detection of fire threats. Solutions using wireless sensor networks, on the other hand, can gather sensory data values, such as temperature and humidity, from all points of a field continuously, day and night, and, provide fresh and accurate data to the fire-fighting center quickly. However, sensor networks face serious obstacles like limited energy resources and high vulnerability to harsh environmental conditions, that have to be considered carefully. In this paper, we propose a comprehensive framework for the use of wireless sensor networks for forest fire detection and monitoring. Our framework includes proposals for the wireless sensor network architecture, sensor deployment scheme, and clustering and communication protocols. The aim of the framework is to detect a fire threat as early as possible and yet consider the energy consumption of the sensor nodes and the environmental conditions that may affect the required activity level of the network. We implemented a simulator to validate and evaluate

			Through extensive simulation experiments, we show that our framework can provide fast reaction to forest fires while also consuming energy efficiently.
4.	FOREST FIRE DETECTION USING MACHINE LEARNING	PRAGAT[X1] SEJAL SHAMBHUWANI[X2] PIYUSHA UMBRAJKAR[X3]	Detection of forest fire should be fast and accurate as they may cause damage and destruction at a large scale. Recently, Amazon forest confronted a devastating forest fire which remained obscured for over 15 days. Hence resulting in huge loss of ecosystem and adversely affecting the global conditions. As the technology is developing, Wireless Sensor Networks (WSN) is gaining importance in recent research areas as it has shown its usefulness in warning disasters and save lives[1]. As soon as an unusual event is noticed in the networks, an event is detected through the sensor devices placed at distributed locations. This event detection information is passed to the base station and decision is taken. Due to the static configuration of such sensor data in WSN generally lead to false alarm generation [2]. In such a scenario we can use machine learning algorithms to prevent false alarm since they get configured efficiently in dynamic nature, that too automatically .Therefore for eliminating the static essence of WSN, we present a machine learning algorithm imbibed with WSN. In this paper, we propose a decision tree machine learning approach for detecting events.

5.	Forest Fire Modeling and Early Detection using Wireless Sensor Networks	MOHAMED HEFEEDA[X1] MAJID BAGHERI[X2]	Early detection of forest fires is the primary way of minimizing their damages. We present the design of a wireless sensor network for early detection of forest fires. We first present the key aspects in modeling

			forest fires according to the Fire Weather Index (FWI) System which is one of the most comprehensive forest fire danger rating systems in North America. Then, we model the forest fire detection problem as a node k-coverage problem ($k \geq 1$) in wireless sensor networks. We propose approximation algorithms for the node k-coverage problem which is shown to be NP-hard. We present a constant-factor centralized algorithm, and a fully distributed version which does not require sensors know their locations. Our simulation study demonstrates that our algorithms: activate near-optimal number of sensors, converge much faster than other algorithms, significantly prolong (almost double) the network lifetime, and can achieve unequal monitoring of different zones in the forest
6.	Forest Fire Detection System	SANGJOON CHA[X1] CHRIS CANTU[X2] PEDRO CANTU[X3] JOSE FLORES[X4] DR. NANTAKAN WONGKASEM[X5] DR. HEINRICH FOLTZ[X6]	The world is burning. As global warming continues to display a statistical rise in global average temperatures and various environmental factors continue to contribute to the rise in forest fires, the need for a wireless detection system to recognize these fire hazards and that can successfully alert the necessary first responders is becoming more and more apparent. Such a detection and alert system would be able to potentially save billions of dollars in property, infrastructure, and environmental costs and damages, preserve wildlife habitats and ecosystems that are directly affected by forest fires, and prevent the displacement of countless families from their homes

			that neighbor forested areas and regions. Therefore, we have come

			together as an engineering team to propose and develop a prototype solution to these issues using our acquired technical knowledge as senior electrical engineering students for our senior design project this semester. Our project idea entitled, “Forrest Fire Detection System,” will be comprised of multiple systems working in tandem: a LoRa antennae system that will wirelessly transmit sensor data to an accessible website, a solar PV power supply, and a data retrieval gateway and alert system. In summary, we aim to reduce the social, economical, and environmental impacts brought on by forest fires.

2.1 Existing Problem:

● Aerial monitoring of forest fire using drone Cameras operated in remote locations
● Use of various sensors such as smoke, flame, gas etc…to sense and detect fire
● Human surveillance for forest
● Thermal imaging of forest
● Use of satellite images to detect fire

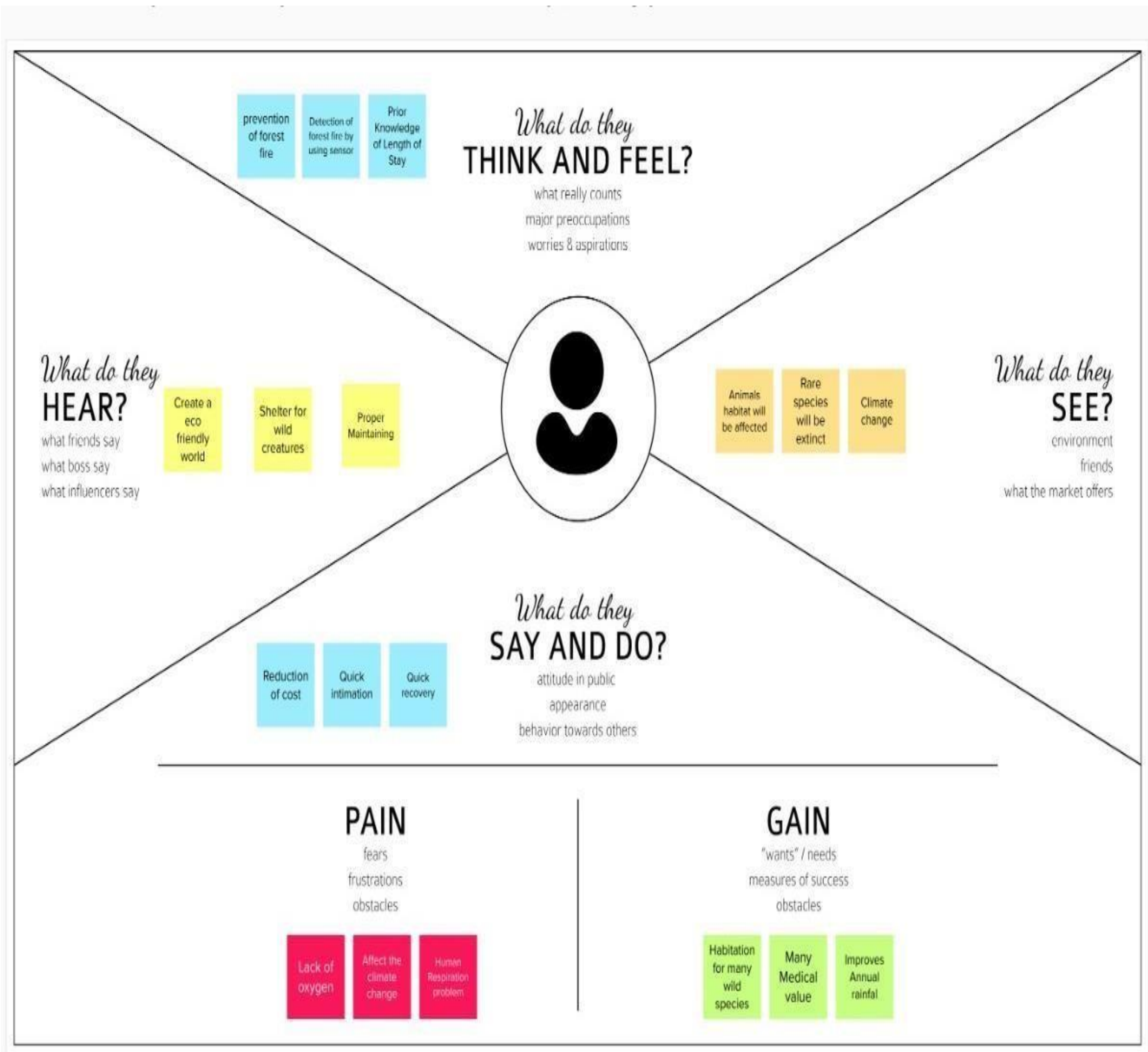
2.2 References:

[1] Zhentian Jiao1, Youmin Zhang, Jing Xin, Lingxia Mu, Yingmin Yi, Han Liu and Ding Liu, ”A Deep Learning based forest fire detection approach using UAV and YOLOv3,” 1st International Conference on Industrial Artificial Intelligence (IAI), 2019 [2] Qingjie Zhang, Jiaolong Xu, Liang Xu and Haifeng Guo, ”Deep Convolutional Neural Networks for forest fire detection,” in Proceedings of the 2016 International Forum on Management, Education and Information

Technology Application, Atlantis Press, 2016. [3] Qi-xing ZHANG, Gao-hua LIN, Yong-ming ZHANG, Gao XU, Jin-jun WANG, ”Wildland forest fire smoke detection on Faster R-CNN using synthetic smoke images,” 8th International Conference on Fire Science and Fire Protection Engineering(on the Development of Performancebased Fire Code), 2017. [4] Genovese, Angelo and Labati, Ruggero and Piuri, Vincenzo and Scotti, Fabio, ”Wildfire smoke detection using computational intelligence techniques,” IEEE International Conference on Computational Intelligence for Measurement Systems and Applications Proceedings, 2011. [5] C. Yuan, Z. X. Liu, and Y. M. Zhang, “UAV-based forest fire detection and tracking using image processing techniques,” in 2015 International Conference on Unmanned Aircraft Systems. IEEE, 2015, pp. 639–643. [6] C. Yuan, Z. X. Liu, and Y. M. Zhang, “Aerial images based forest fire detection for firefighting using optical remote sensing techniques and unmanned aerial vehicles,” Journal of Intelligent & Robotic Systems, vol. 88,no. 2-4, pp. 635–654, 2017. [7] X. Z. Chunyu Yu, Zhibin Mei, “A real-time video fire flame and smoke 5 detection algorithm,” in Asia-Oceania Symposium on Fire Science and Technology, 2013. [8] YongMin Liu, YiMing Liu, HongLei Xu, Kok Lay Teo, ”Forest fire monitoring, detection and decision making systems by wireless sensor network,” IEEE Chinese Control And Decision Conference (CCDC), 2018. [9] Pulkit Chugh, Eric Tom Mathews, G. Barath Kumar, ”Forest fire detection through UAV imagery using CNNs,” unpublished. [10] A. Koubaa and B. Qureshi, “Dronetrack: Cloud-based real-time object

3.IDEATION AND PROPOSED SOLUTION:

3.1 Empathy Map Canvas:



3.2 IDEATION AND BRAINSTORM

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare

1 hour to collaborate

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

c **Learn how to use the facilitation tools**

Use the Facilitation Superpowers to run a happy and productive session.

Open article

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, 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

Prioritize

Your team should all be on thesame 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

FEASABILITY

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, com plexi ty, etc.)

3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Forest fires are considered as one of the most widespread hazards in a forested landscape. They have a serious threat to forest and its flora and fauna. Unplanned and abrupt forest fires are a major cause of forest degradation, while a controlled fire to manage and check the spread of unwanted forest fires serves as the action to improve the forest. So therefore, we've to detect prevention measure which should be taken to identify the fire prone areas and the tools which needed to be developed to minimize the loss and as well as implement forest fire committee to work for the reduction of damage caused.
2.	Idea / Solution description	Our solution aims at collecting the vast range of dataset to test and train the model regularly by using **CNN** where the system can detect immediately if any ignition of fire is found, where the video can be surveyed by satellite. Then **Cloudant DB** is brought to use where the large amount of data is stored and fetched which acts as a server. **Open CV** acts as a tool for processing videos which are captured. To send alerts to forest committee **Twilio API** is used where alerts are passed on detection. **Watson Assistant** also a chatbot tool which can help you monitor if any guide is needed.
3.	Novelty / Uniqueness	Existing system uses electronic sensors to detect forest fire and smoke. The change in temperature indicates the presence of forest fire and smoke in a region which can be detected by the sensors using radiation heat. As forests are in remote area it's difficult for installation and maintenance of sensors. Our proposed system depends on using AI to make it cheaper and easier for the forest management. Accuracy and timely prediction using AI, CNN and API made it possible.
4.	Social Impact / Customer Satisfaction	Forest fires are dangerous for the existence of life as they carry wildlife and natural resources which gives life to various living bodies. Thus, fires are occurred expectedly or unexpectedly which has to be prevented as earlier as we can. Therefore, forest management should be active enough to be aware and keeping an eye to check the forest fields regularly. As, what we save, saves us should be the

		social awareness to be brought to the people. The proposed solution meets the customer satisfaction needs as it provides immediate alerts as soon as any fire is spotted which helps the forest committee to take actions sooner.
5.	Business Model (Revenue Model)	A working model which gets the live captures from satellite needed to be implemented, where the camera can monitor continuously the forest area and a working trained model which can automatically show up if any spark, fire or smoke is detected. The model has to be trained widely using large datasets which can be fed into databases and feedbacks can be retrieved. Thus, video processing is the main motive for detection of forest fires, then forest management team should be present to monitor the live video and to get ready to prevent fire from further extension if any alert is produced from the trained model. Thus, this proposed model can be implanted at fire-prone area to provide quick responses and practice prevention methods.
6.	Scalability of the Solution	The device should be compatible with a minimum of 4GB RAM to support usage of various software like **Anaconda Navigator** for python and data science. Testing and training undergo using latest technology like **Tensor Flow** and **Keras.** Importantly satellite needed to be accessed repeatedly via camera and the data generated have to processed by Open CV and further it should be connected with a alerting system and a messaging interface to send notifications.

3.4 Problem Solution Fit:

1.Customer segments

The forest resources which pays a vital role in is aining lives on earth, therefore to preserve them from unexpected outbreak of fire and smoke.The forest management team do need this device in fire prone areas.

2.Jobs-to-be-done/Problems

The main problem that exists is weather and climate by releasing large number of carbon dioxide,carbon monoxide and fine particulate matter into the atmosphere.Resulting, air pollution can cause varying range of health issues, including respiratory andcardiovascular problems.

3.Triggers

The unconsious behaviour towards burned cigarette left,chances of leaving the campfire remained burnt and it can cause spread due to presence of vast dry grass spread across and electric supply being disrupted.

4.Emotions:Before/After

Wildfires can cause lot of stress since the factor thatnfluence their direction and intensity are unpredictable and can change at anytime. People who have lived through wildfires can face dramatic mood swings, anxiety and mood-swings.

5.Available solutions

Existing systems uses optical sensors for detecting forest fires. As fire is detected the sensors sends signal to the office of forest management. Among with that satellites are used to detect xR rays spotted in forest lands.

6.Customer Constraints

Climatic changes and the greenhouses gases are the reasons behind the destruction. Along with this the human factor to greedily use resources also play a vital reason for the forest fires.

7.Behaviour

When fire is detected the sytem which is implemented to monitor the forests sets the alarm to ring, that is it gives the signal through which fire management team and the forest committee tries to call off the fire. Thus, the aim is to recognise the fire as early as possible to prevent spread of fire which will cause further damage and it'll become difficult to control.

8.Channel of Behaviour

Online Detection: Thus the chatbot or the API can connect through internet to feed you with the current status of the forest. Offline Detection: Thus, the forest management can send notice to the nearby residential areas or the media can bring the awareness through news, radio.

9.Problem root cause

The reasons possible are:

1. Due to natural causes- Lightning 2.Man-made causes- Naked flame, cigarette, electric Spark Thus, continous care and monitoring is needed to preserve natural resources to save lives.

10.Your solution

To minimize these loses, we have proposed a solutionto detect early detection of forest fires by using CCTV camera surveillance, which can detect fire in indoor and outdoor activities. Thus instant alerts has to be sent to the forest management office so that they can take further actions to disrupt the daamge caused by the fire.

4. REQUIREMENTS :

4.1 Functional Requirements:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Reporting	User receives a SMS if forest fires occurs
FR-4	Detection of forest fire	Detects forest fire at the earliest
FR-5	Video Recording	Records the forest footage 24/7

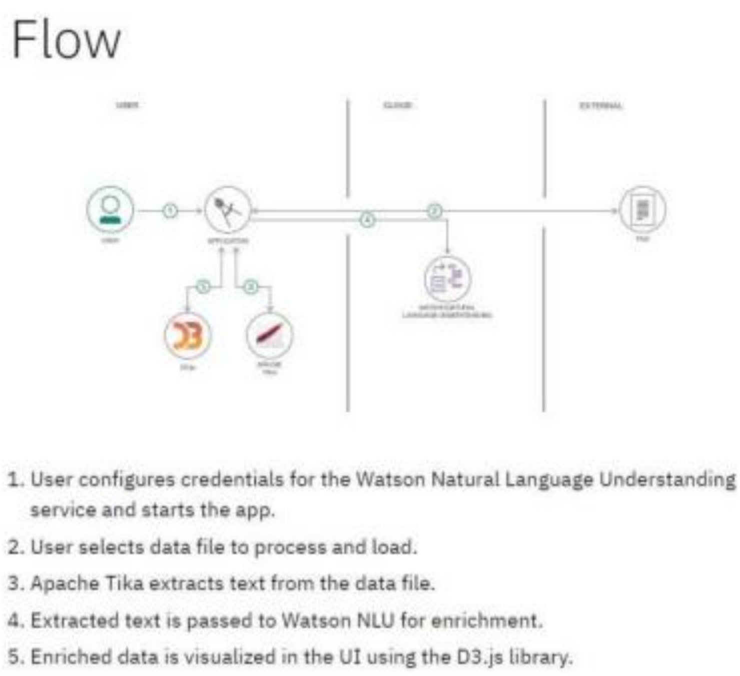
4.2 Non Functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	A non technical person can easily use the app
NFR-2	**Security**	Login to the app provides Security
NFR-3	**Reliability**	Software updates will be done periodically
NFR-4	**Performance**	The response from the app will be spontaneous
NFR-5	**Availability**	The App will be available at all times except during the server maintenance
NFR-6	**Scalability**	The Website traffic limit will be 100 users at a time

5. PROJECT DESIGN :

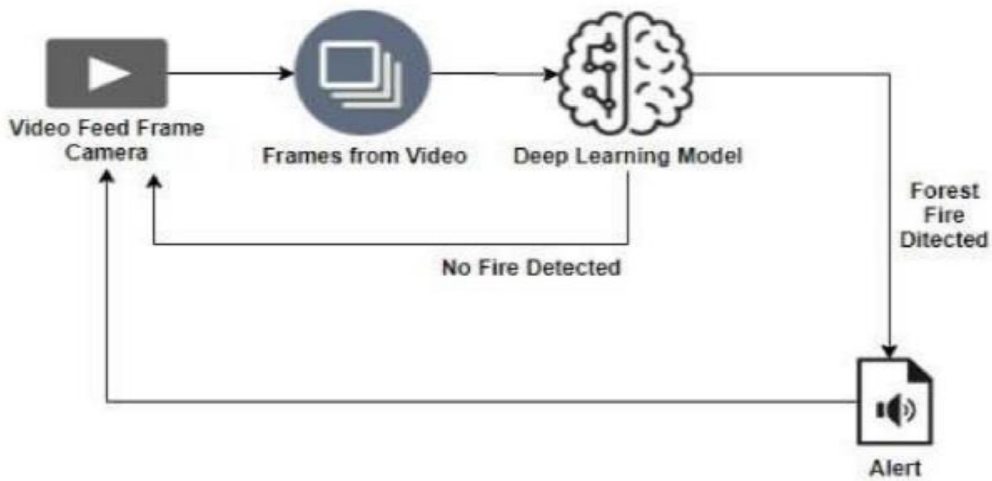
5.1 Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution & Technical Architecture:

Solution Architecture:



5.3 User Stories:

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-3	As a user, I can log into the application by entering email & password	User will get confirmation mail in their registered gmail	High	Sprint-1
Customer (Web user)	Web Registeration	USN-1	User have to register by giving their personal information,gmail,password	User will get confirmation mail in their registered gmail	High	Sprint-1

6.PROJECT PLANNING & SCHEDULING:

6.1 sprint planning & Estimation;

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers,research publications etc.	11 OCTOBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	13 OCTOBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	13 OCTOBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	13 OCTOBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	13 OCTOBER 2022
Solution Architecture	Prepare solution architecture document.	13 OCTOBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	19 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	19 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	19 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	19 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	27 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	IN PROGRESS..

6.2 Sprint Devivery schedule

Use the below template to create product backlog and sprint 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.	20	High	BOOBALAN SAKTHIGANESH VIMALRAJ LIJINS
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application usage.	20	High	BOOBALAN LIJINS SAKTHIGANESH VIMALRAJ
Sprint-2	Input	USN-3	Whenever the fire is detected, the information is given to the database.	20	High	BOOBALAN SAKTHIGANESH LIJINS VIMALRAJ
Sprint-2		USN-4	When it is the wildfire then the alarming system is activated.	20	High	BOOBALAN VIMALRAJ LIJINS SAKTHIGANESH
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-3	Output	USN-5	And the alarm also sent to the corresponding departments and made them know that the wildfire is erupted.	20	High	BOOBALAN LIJINS VIMALRAJ SAKTHIGANESH
Sprint-4	Action	USN-6	Required actions will be taken in order to controlled erupted wildfire by reaching as early as possible to the destination with the help of detecting systems.	20	High	BOOBALAN SAKTHIGANESH LIJINS VIMALRAJ

6.3 Reports from JIRA:

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	3 Days	04 Nov 2022	07 Nov 2022	20	07 Nov 2022
Sprint-2	20	3 Days	08 Nov 2022	11 Nov 2022	20	11 Nov 2022
Sprint-3	20	3 Days	12 Nov 2022	15 Nov 2022	20	15 Nov 2022
Sprint-4	20	3 Days	16 Nov 2022	19 Nov 2022	20	19 Nov 2022

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)

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

7.CODING & SOLUTIONING:

7.1 Feature 1:

train_dataset=test.flow_from_directory("/content/drive/MyDrive/Data set/Train set",

target_size=(128,128),

batch_size=32,

class_mode='binary')

Found 95 images belonging to 2 classes.

[ ] test_dataset=test.
flow_from_directory("/content/drive/MyDrive/Dataset/Test set",

target_size=(128, 128),

patch_size=32,

class_mode='binary')

Found 100 images belonging to 2 classes.

7.2 Feature 2:

After the image preprocessing we have done the model building.The model building output is shown here.

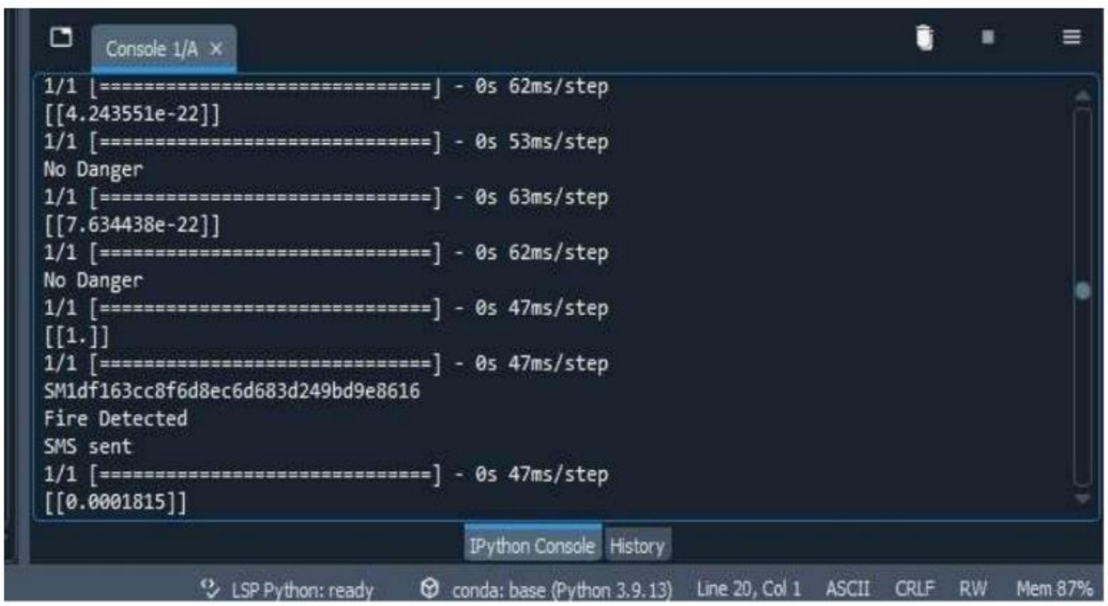
```
[ ] model = load_model("/content/drive/MyDrive/forest.h5")

def predictImage(filename) :

img1 = image. load_ing(filename, target_size=(128, 128) )

Y = image. ing_to_array (img1)

X = np. expand_dims(Y, axis=0)

val = model. predict(X)


print(val)

if val == 1:

print(" fire")

elif val == 0:

print("no fire")


predictImage("/content/drive/MyDrive/Dataset/Test set/with fire/with fire (1).jpg")

1/1 [ ===

(=====] - 41s 41s/step

[[1. ]]
```

fire

8.TESTING:

8.1Test Cases:

By the showing image of forest fire the desired output of "Forest fire is detected, stay alert" is sent via SMS form twilio service. By showing the image of forest the desired output is no danger.



import cv2

from playsound import playsound

from twilio.rest import Client

```
fire_cascade = cv2.CascadeClassifier('fire_detection.xml')

cap = cv2.VideoCapture(0)

while(True):
ret, frame = cap.read()
gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
fire = fire_cascade.detectMultiScale(frame, 1.2, 5)

for (x,y,w,h) in fire:
cv2.rectangle(frame,(x-20,y-20),(x+w+20,y+h+20),(255,0,0),2)
roi_gray = gray[y:y+h, x:x+w]
roi_color = frame[y:y+h, x:x+w]
print("Fire is detected 🔥 🔥 ")
playsound('audio.mp3')

account_sid = 'ACf232c8d290c2e56b760b27dcfe4a481e'
auth_token = '329e940af6e7ee375f8fd4a2a94968bc'
twilio_number = '+19803757860'
target_keys = '+919962828967'
client = Client(account_sid, auth_token)
```

```
message = client.messages.create(
body="fire fire 🔥 ",
from_=twilio_number,
to=target_keys
)
print(message.body)
exit()
```

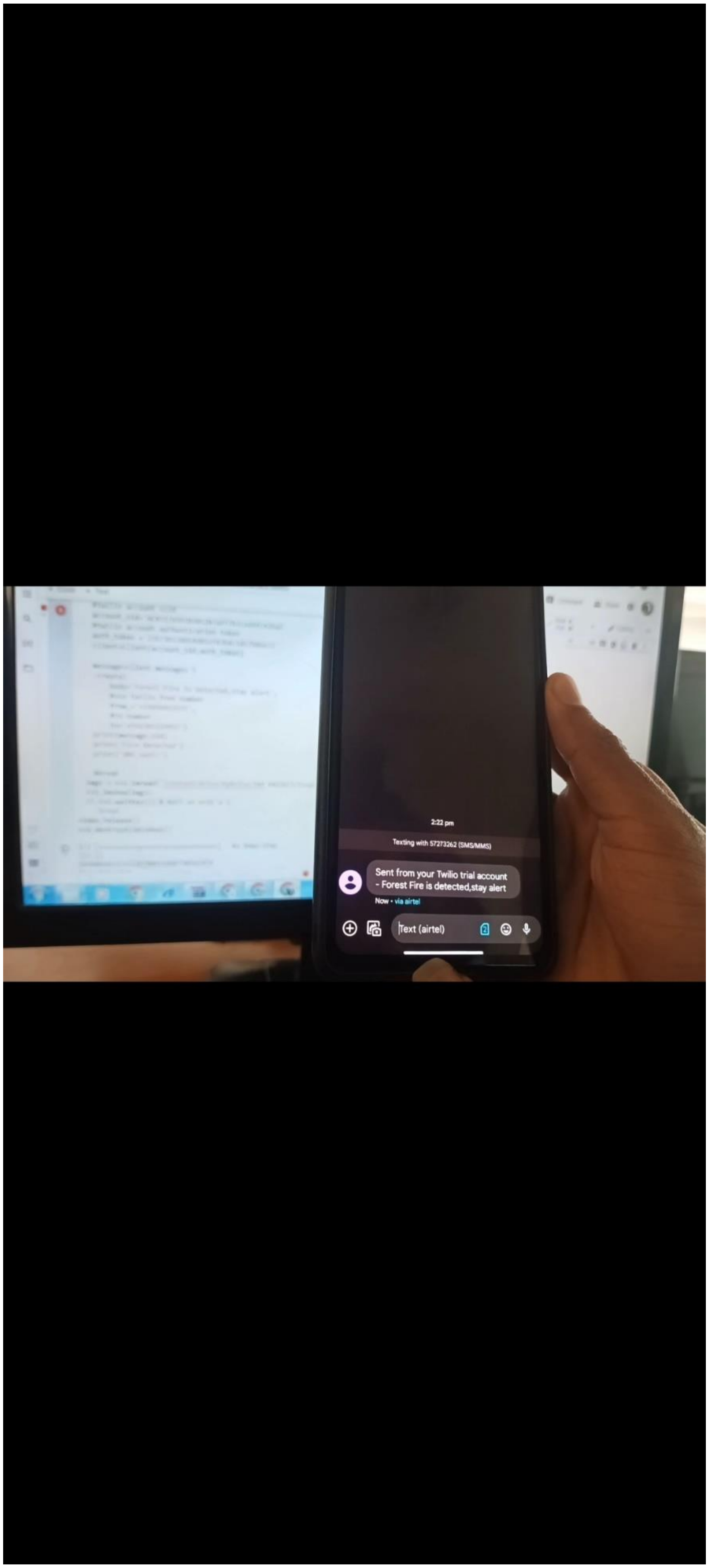
25

```
cv2.imshow('frame', frame)
if cv2.waitKey(1) & 0xFF == ord('q'):
break
```

9. RESULT:

```
while(1):
  success,frame=video.read()
  cv2.imwrite("img.jpg",frame)
  img=image.load_img("img.jpg",target_size=(64,64))
  x=image.img_to_array(img)
  res = cv2.resize(x, dsize=(128, 128), interpolation=cv2.INTER_CUBIC)
  x=np.expand_dims(res,axis=0)
  pred=model.predict(x)
  p=pred[0]
  print(pred)
  #cv2.putText(frame,"predicted class = 
"+str(name[p]),(100,100),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,0))
  if pred[0]==0:
        print('No Danger')
  else:
    #twilio account ssid
    account_sid='AC0317e5b10205207aff7b3ced4fc426a2'
    #twilio account authentication token
    auth_token ='25b72b128814d01ef03b4c1d5798de33'
    client=Client(account_sid,auth_token)

    message=client.messages \
    .create(
        body='Forest Fire is detected,stay alert',
        #use twilio free number
        from_='+19896012535',
        #to number
        to='+916385229957')
    print(message.sid)
    print('Fire Detected')
    print('SMS sent!')

    #break
  imgs = cv2.imread("/content/drive/MyDrive/IBM PROJECT/final.jpg")
  cv2_imshow(imgs)
  if cv2.waitKey(1) & 0xFF == ord('a'):
     break
video.release()
cv2.destroyAllWindows()
```

```
1/1 [==============================] - 0s 222ms/step
[[1.]]
SMc850f5b687d56276c3ef94721d1e4206
Fire Detected
SMS sent!
```


2:22 pm
Texting with 57273262 (SMS/MMS)
Sent from your Twilio trial account - Forest Fire is detected,stay alert
Now • via airtel
Text (airtel)

10. ADVANTAGES:

Fire detection systems increase response times, as they are able to alert the correct people in order to extinguish the fire. This thus reduces the amount of damage to the property. Fire detection systems can be connected to sprinklers that will automatically respond when a fire is detected.

DISADVANTAGES:

ItCannot be Used Without Internet Connection.

11.CONCLUSION:

A comprehensive survey covering the articles of last decade has been presented inthis article. The potential benefits, feature of interest for forest fire detectionmonitoring and providing assistance to firefighting have been highlighted in thereview of the literature. As forest fire is one of the most active disaster events in allmost all the countries around the world, availability of information from multiplesources is always critical. The aim of this article was to provide a comprehensiveview existing technologies with respect to different fields, viz., use of wirelesssensor networks, use of image processing, use of cameras, use of animals as bio-logical sensors, and use of UAVs to detect and monitor fire incidents. We as authorsof this article hope to see a further improvement in the area of the literature reviewin the above-mentioned fields in the future

12.future scope:

The future will be with multicriteria detection in which the detector will be more of a

sensor, with the detection more for the products of combustion, such as carbon monoxide,

carbon dioxide, sulfur dioxide, nitrogen oxides in addition to heat and particulate matter.

13.APPENDIX:

13.1 SOURCE CODE:

Github-https://github.com/IBM-EPBL/IBM-Project-38323-1660378395

Demo link-https://drive.google.com/file/d/1YQdK5CU3vin9aUQ8ElhNJh1l9WkAZ_Hu/view?usp=drivesdk