PROJECT REPORT

UNIVERSITY ADMIT ELIGIBILITY PREDICTOR

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# INTRODUCTION

**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, andsize.

# PURPOSE

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

# LITERATURE SURVEY

**PROBLEM STATEMENT DEFINITION**

Forest fires are a major environmental issue, creating economic and ecological damagewhile endangering human lives. It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it ismore 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.

# 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.

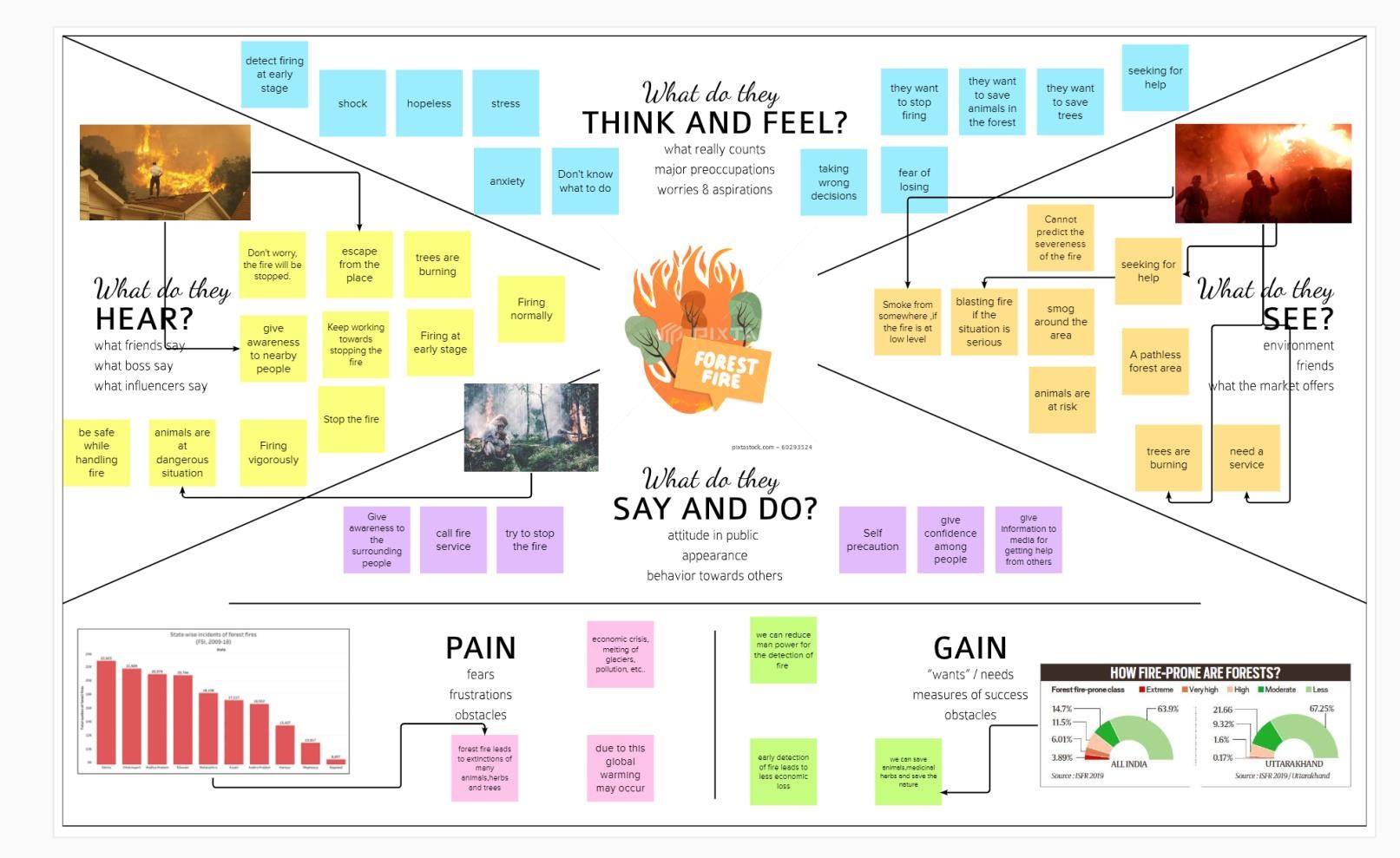
* X. Yang, L. Tang, H. Wang and X. He, "Early Detection of Forest Fire Based on Unmaned Aerial Vehicle Platform," 2019 IEEE International Conference on Signal, Information and Data Processing (ICSIDP), 2019, pp. 1-4, doi: 10.1109/ICSIDP47821.2019.9173181.
* H. Soliman, K. Sudan and A. Mishra, "A smart 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](http://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](http://www.mdpi.com/1306746) 10.23919/MIPRO.2019.8756696

# IDEATION & PROPOSED SOLUTION

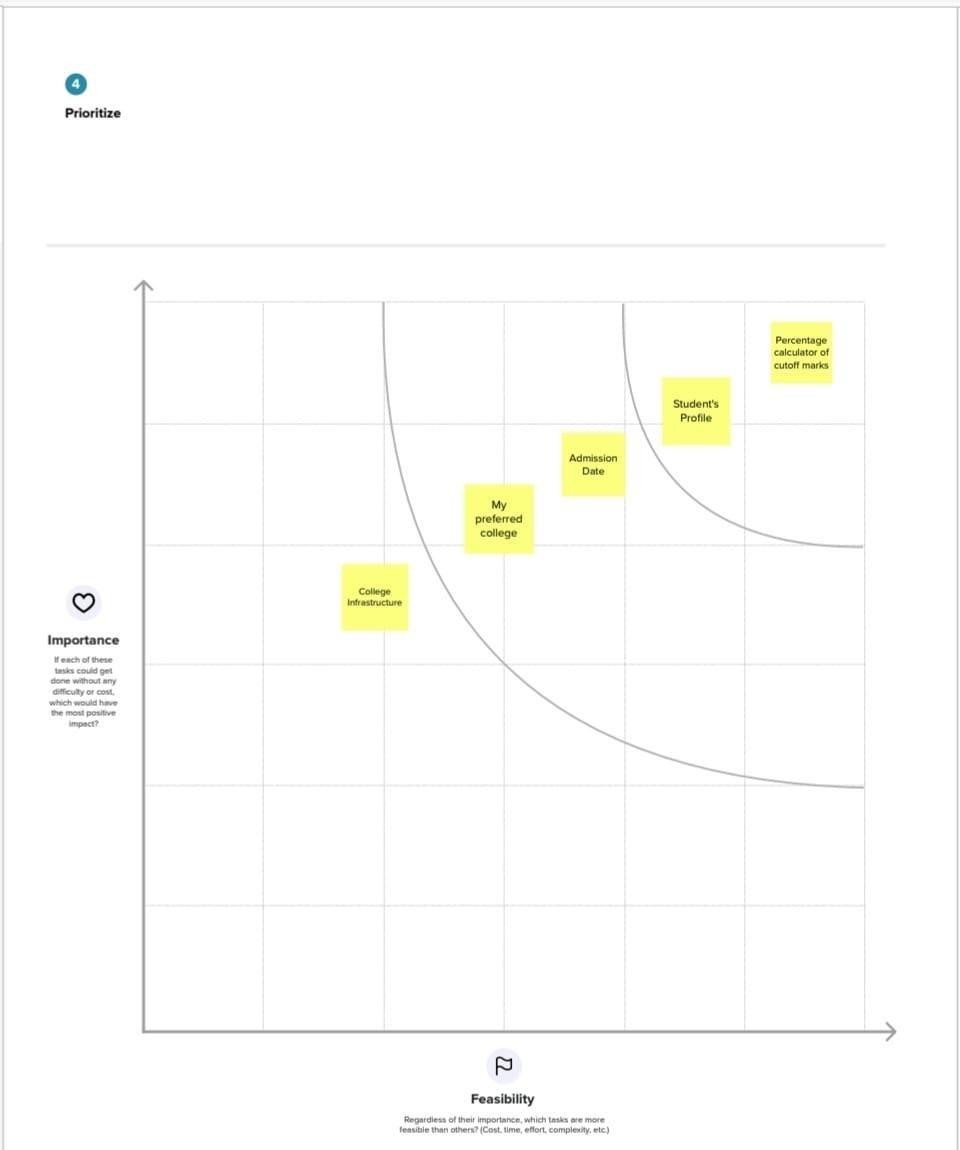
**EMPATHY MAP CANVAS**

This map is created with view of the project in user's perspective, to find pain & gain points and to summarize it with a list of problem statements.



# IDEATION & BRAINSTORMING

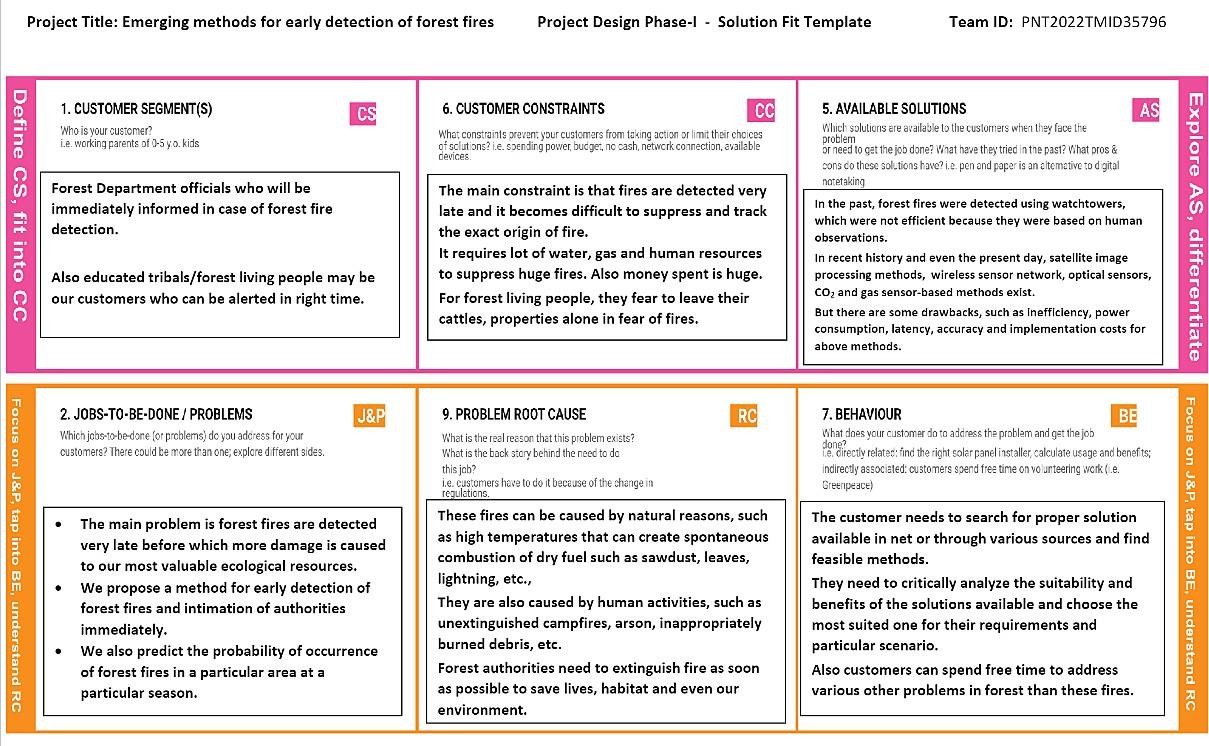
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. 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.



# PROPOSED SOLUTION

|  |  |  |
| --- | --- | --- |
| **S.NO** | **PARAMETER** | **DESCRIPTION** |
| 1. | PROBLEM STATEMENT(PROBLE M 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 gal of informing the local fire authorities. |
| 2. | IDEA / SOLUTION DESCRIPTION | The user interact with a web camera to read the video.  Once the input image from the video frame is send to the model if the fire is detected it is showcase of the console and alerting sound will be generated and alert message will be send to be authorities..  To achieve classifies images using a Convolutional Neural Network and use other open CV tools. |
| 3. | NOVELTY / UNIQUENESS | Decreasing the response time of total system that is increase the processing speed of the model. |
| 4. | SOCIAL IMPACT / CUSTOMER SATISFACTION | Tribal people who live in forest & Forest department authorities or benefited.  Saving the most essential forest cover and the wild life. |
| 5. | BUSINESS MODEL (REVENUE MODEL) | We can generate the revenue by supply chain,power and supply,fire stations and government by providing services. |
| 6. | SCALABILITY  OF THE SOLUTION | We can further install smoke detecting sensors in highly Prone areas to increase accuracy of fire detection.  Attaching GPS tracking to each cameras to find the exact location of fires. |

**PROBLEM SOLUTION FIT**



# REQUIREMENT ANALYSIS FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution.

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User Registration | Registration through Form Registration through LinkedIn Registration through Gmail |
| FR-2 | User Confirmation | Confirmation via Email Confirmation via OTP |
| FR-3 | Reporting | Gives alarm whenever fire is detected and send message to register 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. |

# NON-FUNCTIONAL REQUIREMENTS:

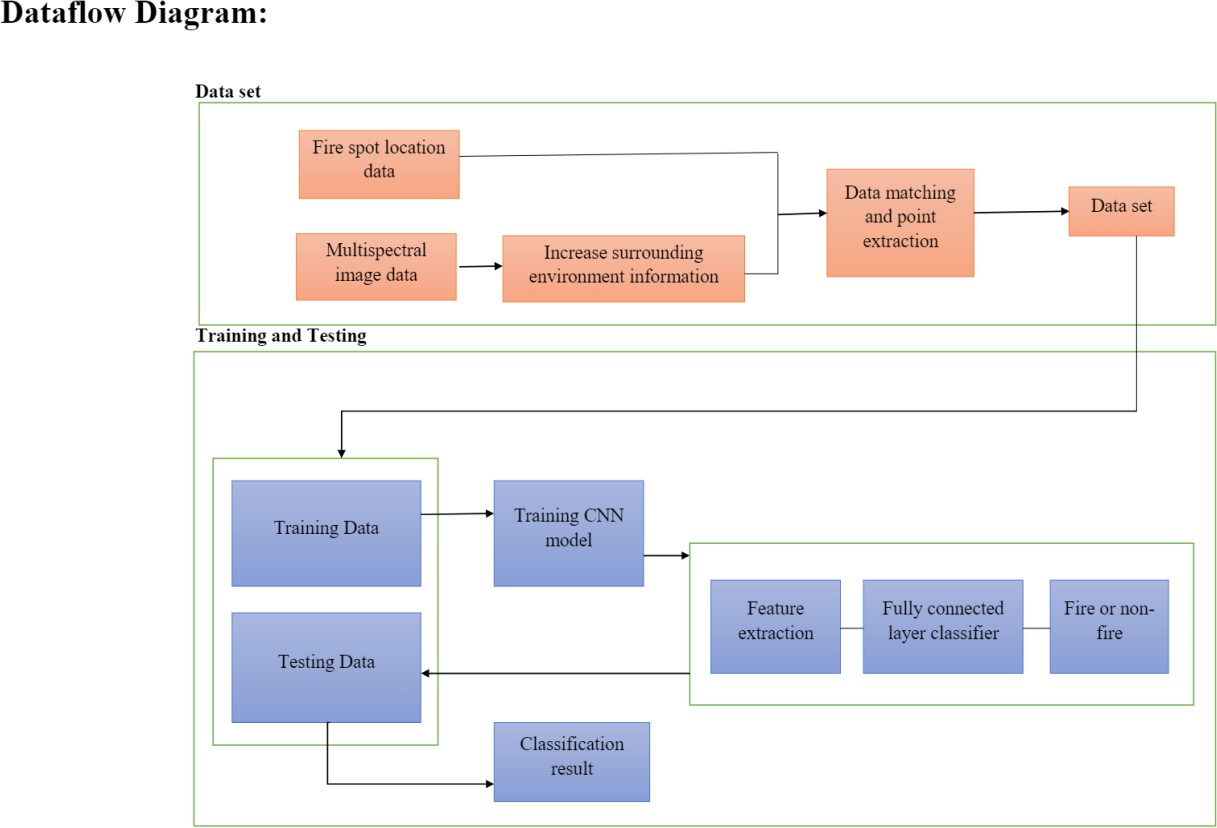
Following are the non-functional requirements of the proposed solution.

|  |  |  |
| --- | --- | --- |
| **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 understanted system. |
| NFR-2 | **Security** | Data stored in system can be accessed only by administrator. |
| NFR-3 | **Reliability** | System automatically returns to normal state once alerm gets turn of which reduces hardware usages and failures. |
| NFR-4 | **Performance** | With high accuracy and no 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 to different cameras wont be overlapped to detect their  location. |

# PROJECT DESIGN

**DATA FLOW DIAGRAMS**

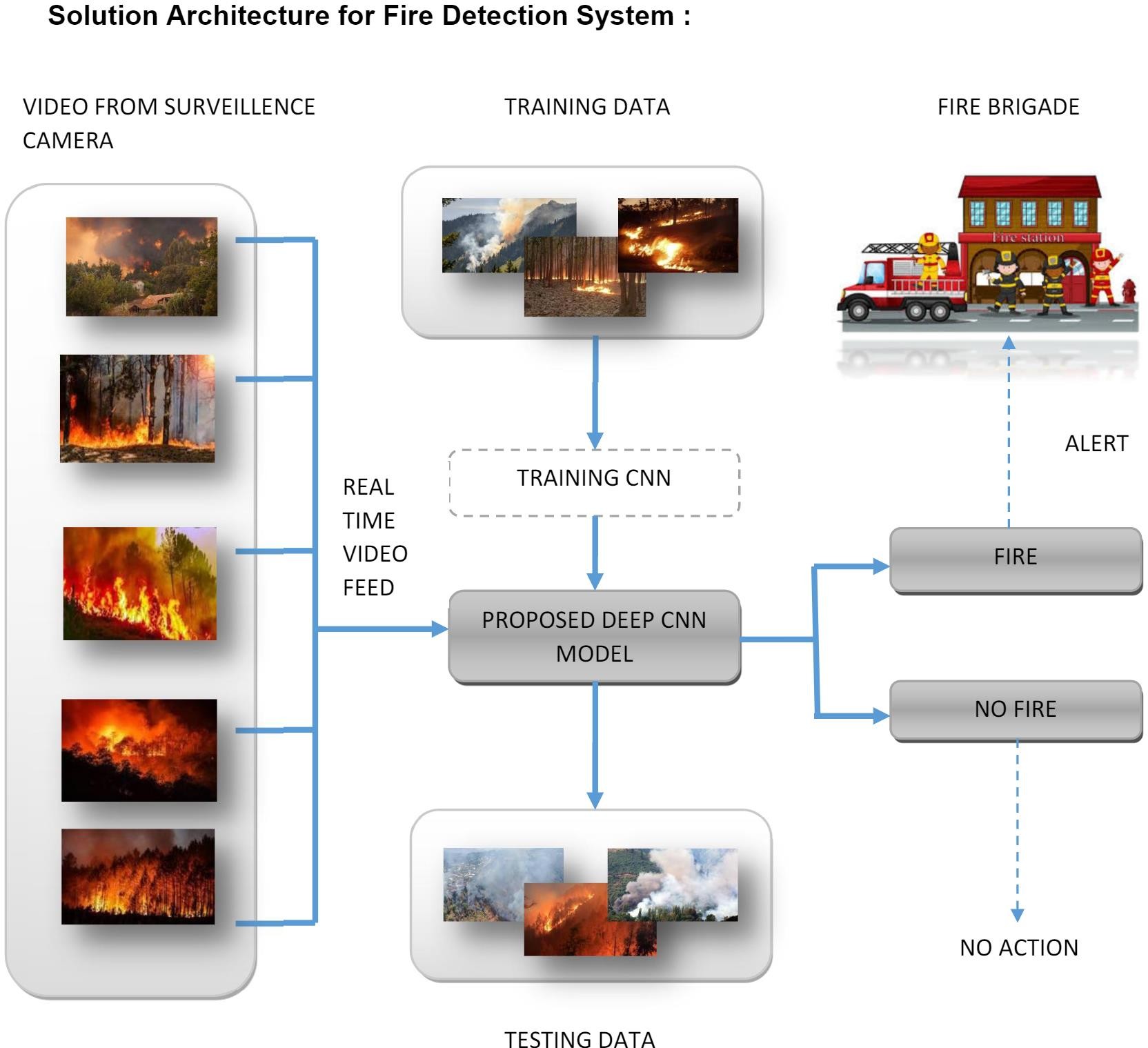
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where datais stored.



# SOLUTION & TECHNICAL ARCHITECTURE

Solution Architecture is a complex process-with many sub-process-that bridges the gap between business problem and technologies solutions; It goals are to :

* Find the best tech solutions to solve existing business problems .
* Describe the structure, characteristics, behavior and the aspects of the software to project stakeholders.
* Define the features, development phases and solution requirements.
* Provide specifications according to which the solution is defined, managed and delivered.

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**USER STORIES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **USER STORY NO** | **USER STORY/TASKS** | **ACCEPTANCE CRITERIA** | **PRIORITY** | **RELEASE** |
| USN-1 | The user, I can register for the application and give my phone number/mail to receive  alert message. | I can receive confirmation mail 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  install at remote places. | I can monitor to the live happenings in the forest through a web applications. | Low | Sprint-4 |
| USN-4 | As a user I can log in to the application by  endering email and 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 fires and failures  of service provided. | I can have safe users experience and all the issues raised in sorted. | Medium | Sprint-3 |
| USN-6 | As a user I must be ale 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 a detailed report of intensity of forest fire and also  where exactly fire is detected. | I can receive the accurate location of forest fires 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 applications should make predictions also  in future. | I can be confidence when and where occurs and confidently and make necessary arrangements for it at correct time. | Medium | Sprint-4 |

# PROJECT PLANNING & SCHEDULING

**SPRINT PLANNING & ESTIMATION PRODUCT BACKLOG, SPRINT SCHEDULE, AND ESTIMATION**

Use the below template to create product backlog and sprint schedule

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SPRINT** | **FUNCTION AL REQUIREM ENT (EPIC)** | **USER STOR Y NUMB ER** | **USER STORY / TASK** | **STO RY POI NTS** | **PRIORI TY** | **TEAM MEMB ERS** |
| Sprint-1 | Registration | USN-1 | As a user, I can register for the application by entering my email, password, and confirmingmy password. | 20 | High | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |
|  |  | USN-2 | As a user, I will receive confirmation emailonce I have registered for the  application | 18 | Medium | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |
| Sprint-2 | Input | USN-3 | When ever the fire is detected, the information is given to the database. | 20 | High | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |
| Sprint-2 |  | USN-4 | When it is the wildfire then the alarmingsystem is activated. | 18 | Medium | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |
| 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 | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |
| Sprint-4 | Action | USN-6 | Required actions will be taken in order to control erupted wildfire by reaching as early as possible to the destination with  the help of detecting systems. | 20 | High | NIVETHA R SIVASHALINI GPRIYANGA K ABIRAMI S |

# PROJECT TRACKER, VELOCITY & BURNDOWN CHART:

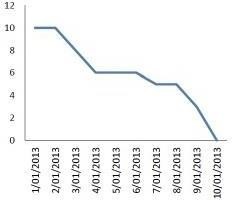
**PROJECT TRACKER:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SPRINT** | **TOTAL STORY POINTS** | **DURAT ION** | **SPRINT START DATE** | **SPRINT END DATE (PLANNED)** | **STORY POINTS COMPLE TED (AS ON PLANNED END DATE)** | **SPRINT RELEAS EDATE (ACTUA L)** |
| 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 |

# REPORTS

**BURNDOWN CHART:**

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile [software development](https://www.visual-paradigm.com/scrum/what-is-agile-software-development/) methodologies suchas [Scrum.](https://www.visual-paradigm.com/scrum/scrum-in-3-minutes/) However, burn down charts can be applied to any project containing measurable progress from time.



# CODING & SOLUTIONING (EXPLAIN THE FEATURES ADDED IN THE PROJECTALONG WITH CODE)

from google.colab import drive drive.mount('/content/drive')

!unzip drive/MyDrive/archive\ \(1\).zip

import keras

from matplotlib import pyplot as plt

from keras.preprocessing.image import ImageDataGenerator

train\_datagen=ImageDataGenerator(rescale=1./255,shear\_range=0.2,rotation\_range=180,zoom\_range=0.2,ho rizontal\_flip=True)

test\_datagen=ImageDataGenerator(rescale=1./255)

from google.colab import drive drive.mount('/content/drive')

x\_train=train\_datagen.flow\_from\_directory('/content/drive/MyDrive/Dataset/Dataset/Dataset/train\_set', target\_size=(128,128),batch\_size=32,class\_mode='binary')

x\_test=test\_datagen.flow\_from\_directory('/content/drive/MyDrive/Dataset/Dataset/Dataset/test\_set', target\_size=(128,128),batch\_size=32,class\_mode='binary')

# MODEL BUILDING

#to define the linear Initialisation import sequential from keras.models import Sequential

#to add layers import Dense from keras.layers import Dense

#to create Convolutional kernel import convolution2D from keras.layers import Convolution2D

#import Maxpooling layer

from keras.layers import MaxPooling2D

#import flatten layer

from keras.layers import Flatten import warnings warnings.filterwarnings('ignore')

model=Sequential()

model.add(Convolution2D(32,(3,3),input\_shape=(128,128,3),activation='relu')) #add maxpooling layers

model.add(MaxPooling2D(pool\_size=(2,2))) #add faltten layer

model.add(Flatten()) #add hidden layers

model.add(Dense(150,activation='relu')) #add output layer model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary\_crossentropy',optimizer="adam",metrics=["accuracy"])

model.fit\_generator(x\_train,steps\_per\_epoch=14,epochs=10,validation\_data=x\_test,validation\_steps=4)

model.save("forest.h5")

from keras.models import load\_model #import image from keras

from tensorflow.keras.preprocessing import image import numpy as np

#import cv2 import cv2

#load the saved model model=load\_model('forest.h5')

img=image.load\_img('/content/drive/MyDrive/Dataset/Dataset/Dataset/test\_set/forest/0.48007200\_15308819 24\_final\_forest.jpg')

x=image.img\_to\_array(img) res=cv2.resize(x,dsize=(128,128),interpolation=cv2.INTER\_CUBIC) #expand the image shape

x=np.expand\_dims(res,axis=0)

pred=model.predict(x)

pred

pip install twilio

pip install playsound

pip install pygobject

from twilio.rest import Client from playsound import playsound if pred==0:

print('Forest fire') account\_sid='AC80f3d03cdbb0f27e31568ed8e2ff4db4' auth\_token='4f6aa521bfa0bf0d3d8508a139c946f3' client=Client(account\_sid,auth\_token) message=client.messages \

.create(

body='forest fire is detected,stay alert', #use twilio free number from\_='+18304453233',

#to number to='+919159572761')

print(message.sid) print("Fire detected") print("SMS Sent!") elif pred==1: print('No Danger')

from logging import WARNING #import opencv library

import cv2 #import numpy

import numpy as np

#import image function from keras from keras.preprocessing import image #import load\_model from keras

from keras.models import load\_model #import client from twilio API

from twilio.rest import Client

#import playsound package

from playsound import playsound

import cv2

import numpy as np

from google.colab.patches import cv2\_imshow from matplotlib import pyplot as plt

import librosa

from tensorflow.keras.preprocessing import image from keras.models import load\_model

# Create a VideoCapture object and read from input file

# If the input is the camera, pass 0 instead of the video file name

cap = cv2.VideoCapture('/content/drive/MyDrive/IBM/Dataset/Dataset/test\_set/with fire/19464620\_401.jpg')

# Check if camera opened successfully if (cap.isOpened()== False):

print("Error opening video stream or file")

# Read until video is completed while(cap.isOpened()):

# Capture frame-by-frame ret, frame = cap.read()

if ret == True:

x=image.img\_to\_array(frame) res=cv2.resize(x,dsize=(128,128),interpolation=cv2.INTER\_CUBIC) #expand the image shape

x=np.expand\_dims(res,axis=0) model=load\_model("/content/drive/MyDrive/Dataset/Dataset/Dataset/test\_set/with fire/599857.jpg") cv2\_imshow(frame)

pred=model.predict(x) pred = int(pred[0][0]) pred

int(pred)

if pred==0:

print('No danger') break

else:

print("Forest fire") break

# When everything done, release the video capture object

cap.release()

# Closes all the frames cv2.destroyAllWindows

# SENDING ALERT MESSAGE

from twilio.rest import Client from playsound import playsound if pred==0:

print('Forest fire') account\_sid='AC80f3d03cdbb0f27e31568ed8e2ff4db4' auth\_token='4f6aa521bfa0bf0d3d8508a139c946f3' client=Client(account\_sid,auth\_token) message=client.messages \

.create(

body='forest fire is detected,stay alert', #use twilio free number from\_='+18304453233',

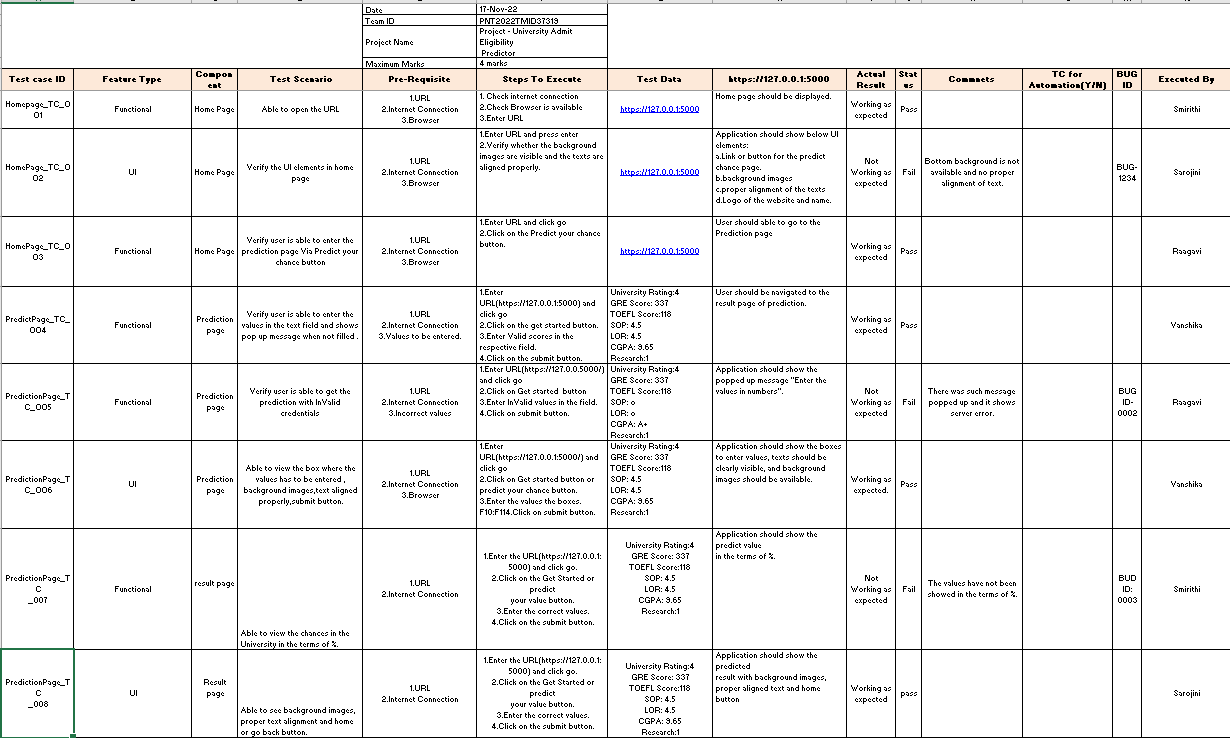
#to number to='+919159572761')

print(message.sid) print("No Danger") print("SMS Sent!") elif pred==1:

print('Fire Detected')

# TESTING

**TEST CASES**



**USER ACCEPTANCE TESTING**

## PURPOSE OF DOCUMENT

The purpose of this document is to briefly explain the test coverage and open issues of the Emerging Methods for Early Detection of Forest Fires project at the time of the release to User Acceptance Testing (UAT).

## DEFECT ANALYSIS

This report shows the number of resolved or closed bugs at each severity level, and howthey were resolved

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Resolution** | **Severity 1** | **Severity 2** | **Severity 3** | **Severity 4** | **Subtotal** |
| By Design | 11 | 4 | 2 | 3 | 20 |
| Duplicate | 1 | 0 | 3 | 1 | 5 |
| External | 2 | 3 | 1 | 1 | 7 |
| Fixed | 10 | 2 | 4 | 20 | 36 |
| Not Reproduced | 0 | 0 | 1 | 0 | 1 |
| Skipped | 0 | 0 | 1 | 1 | 2 |
| Won't Fix | 0 | 5 | 2 | 3 | 10 |
| Totals | 24 | 14 | 14 | 29 | 81 |

## Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section** | **Total Cases** | **Not Tested** | **Fail** | **Pass** |
| Print Engine | 7 | 0 | 0 | 7 |
| Client Application | 51 | 0 | 1 | 50 |
| Security | 2 | 0 | 0 | 2 |
| Outsource Shipping | 3 | 0 | 0 | 3 |
| Exception Reporting | 9 | 0 | 1 | 8 |
| Final Report Output | 4 | 0 | 0 | 4 |
| Version Control | 2 | 0 | 0 | 2 |

**PERFORMANCE TESTING**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Parameter** | **Values** | **Screenshot** |
| 1. | Metrics | **Regression Model:** Linear Regression  R2 Score-0.85 RMSE –0.057 MSE-0.037  **Classification Model: None** | Graphical user interface, text, application  Description automatically generated |
| 2. | Tune The Model | Hyper parameter Tuning:(Grid Search CV) clf. Best \_score\_ - 0.921875  Validation Method – Grid Search CV(eestimator=SVC() |  |

* 1. **RESULTS**



# ADVANTAGES & DISADVANTAGES

**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 conditions.
* 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.

# 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.

# FUTURE SCOPE

* The scope of using video frames in the detection of fire using CNN is challengingas well as innovative. If this system with less error rate can be implemented at alarge scale like in big factories, 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 greatpromise 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 experimentswith Large datasets and training models.

# APPENTEX GITHUB & PROJECT DEMO LINKGITHUB:

**https://github.com/IBM-EPBL/IBM-Project-50857-1660927195**

# PROJECT DEMO:

## https://youtu.be/OH3vCsyAzS8