EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRE

A PROJECT REPORT

Submitted by

612919104006 P.ABINAYA
612919104009 R.ABIRAMI
612919104012 S.DEEPIKA
612919104042 B.RAMAYDEVI

Team ID : PNT2022TMID23627

In partial fulfillment for the award of the
Certification of
IBM PROJECT
In
ARTIFICIAL INTELLIGENCE DOMAIN

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(AUTONOMOUS)

Approved by AICTE, New Delhi and Accredited by NBA Afllicated to Anna University,Chennai-25, An ISO 9001-2008 Certified Institution
Elayampalayam,Tiruchengode,Namakkal Dt. – 637205

DEPARTMENT OF INFORMATION TECHNOLOGY

TABLE OF CONTENTS

1. INTRODUCTION

1.1 PROJECT OVERVIEW

One of the most extremely occurring disasters in recent times is forest fires(wildfires).Due to the wildfires, a lot of acres of forest area are going destroyed The significant reasons that lead to the occurrence of forest fires are warming due to the increase in the average temperature of the earth and human negligence. Dynamic Integrated Model of Climate and the Economy (DICE) indicates that the economy will lose about $23 trillion in the next 80 years due to the change in climate . In Africa, South America, Southeast Asia, and New Zealand, forest fires occur due to human factors like husbandry of animals and agriculture . Nowadays, there are various technologies for fire modelling to predict the spread of fires, such as physical models and mathematical models . These models depend on data collection during forest fires, simulation, and lab experiments to specify and predict fire growth in many regions. Recently, simulation tools have been used to predict forest fires, but simulation tools faced some problems such as the accuracy of input data and simulation tool execution time .

1.2 PURPOSE

Machine learning is a sub-branch of Artificial Intelligence (AI) to learn computers aspect. Machine learning can be divided into two classes: supervised, unsupervised and reinforcement. In supervised learning, a supervisor is existed to give insights to the learning algorithm on how a decision or an action is bad or good. In supervised learning, the whole the data set is labelled completely. Supervised machine learning algorithms are as linear regression, Support Vector Machine (SVM), Artificial Neural Networks (ANN) and decision trees. In unsupervised learning, the data set is not labelled. This leads that the algorithm must define the labels. The structure of the data set and the relationship between the features will be learned by the algorithm. Unsupervised machine learning algorithms are as k-means clustering and Self-Organizing Map (SOM). In reinforcement learning, the learning algorithm gets punished in case of a wrong action and gets rewarded in case of correct action.

2.LITERATURE SURVEY

2.1 EXISTING SOLUTIONS

(a) Deep convolutional neutral networks for forest fire

Detection Authors: Qingjie zhang,
Jiaolong xu,
Liang xu,
Haiefeng guo.

This paper proposes that forest fires can bedetected by vision-based fire detection systems whichcan be mounted to an unmanned aerial vehicle(UAVs) for strategically scanning acreage of fireprone areas. This paper also strongly recommendsConvolutional neural networks for identifying smokeand fire through videoframes which is taken a images. They have collected the dataset from differentinternet sources. They have resized the images tocanonical size of 240x320. In this paper, the basicidea is to find the fire patches in an image. Theauthors propose two methods for the algorithm tobuild the model. First was to apply fire patch classifierfrom scratch. Second was to teach a full imageclassifier and apply fine-tuned patch classifier if theimage contains fire. Then they compare SVM-pool5(Support vector machines) with CNN-pool5, theaccuracies recorded are 95.6% and 97.3% respectivelywith a detection rate of 84.8%, making CNN-pool5network more accurate than SVM-pool5 classifier

(b) Fire dtection system using machine learning

Authors : AArul,R S Hari Prakaash,
RGokul raja,
V.Nandhalai.

Fire can be detected by using the amount ofsmoke. The smoke sensors are used to measure theamount of smoke from the fire, and it could becompared with a threshold value and if it is beyondthat value, it is considered as a fire scenario. Usingimage processing, fire can be detected as soon aspossible. Fixing the CCTV camera everywhere andthe images from these cameras can be processed tomonitor the fire.

If any changes occur, it is easy todetect and extinguish the fire quickly. This

system hasa water extinguisher for extinguish the fire when thealarm turns on. The CCTV camera is used forrecording the video of a particular spot and it isconnected to a mini- computer called Raspberry-pi.So that it could get the constant video recording of aparticular area. The captured video pictures areprocessed frame by frame and once the fire detected,the alarm would be turn on. Also, the alarm would beturned off when the fire extinguished completely. TheVirtual Network Computing is used for the executionof the program, where the details of video aretransferred from the raspberry-pi to the viewingcomputer. This system includes detection, alert, fireextinguish, software and network modules

(c) A Foreset fire detection system
based on ensemble learing

Authors : Renjie Xu,
Haifeng Lin,
Kangjie Lu,
Lin Cao,
Yunfei Liu

In this paper, a novel method for firedetection is proposed based on ensemble learning.The dataset is created using 10581 images fromvarious public sources like BowFire FD-Dataset, ForestryImages,VisFire.The dataset ispreprocessed and fed into not just one but twoindividual object detectors, YOLOv5 and EfficientDetintegrated in parallel mode to achieve better accuracythan a single object detector. Although it usesintegrated object detectors, this does not take thewhole image into consideration. Therefore, anotherclassifier is introduced to solve this problem.EfficientNet takes the image as wholeand evaluatesthe image to enable total advantage of theinformation. The results will be decided by a decisionstrategy algorithm which takes the opinion of the three individual object detectors into account which inturn improves the performance of the model and decrease the rate of False positives. This paper claims that they have achieved a superior trade-off average accuracy, average recall, false positive and latency.

(d)Forest fire image recogntion based on convolution neural network

Authors : Yuanbin Wang,
Langfei Dang,
J.Ren

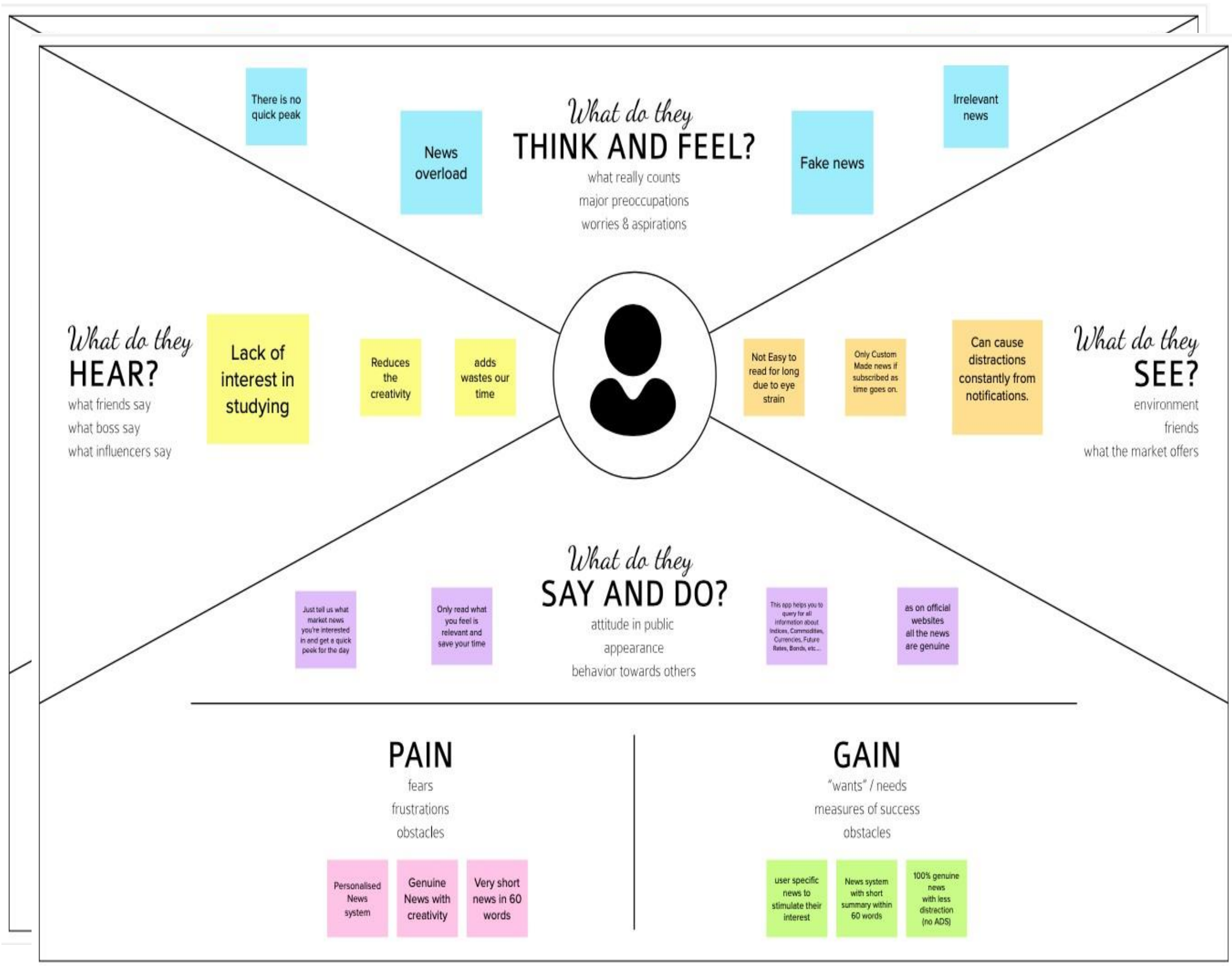
In fire detection, the color of the imagefrom a camera is highly important. Sometimes, it doesnot possible to watch the entire forest imagesaccording to the size as it may be some difficulties indetecting the fire. So that, using Convolutional NeuralNetwork (CNN) technology would be easier to avoidthe blindness and accurate level of fire identification.It uses the support vector mechanism for the imageclassification. In this technique, the image issegmented based on the color of the flame andtransferred to the CNN network. This would be foundout more attributes and decide there is a fire occurs or not. Fire can be detected by analyzing the color of the flame in a picture. Finding the fire by using thenumber of pixels plotted in a picture according to thefire color and can be measure the intensity of the fire.So that, it should be easier to detect fire and stamp outthe fire. The system should be trained and tested usinga large amount of data. Algorithms are used for thesegmentation of images and in finding the fire. Thismethod should be more effective and reliable inidentifying the fire. The accuracy should be much better than the other methods.

2.2 PROPOSED SOLUTION

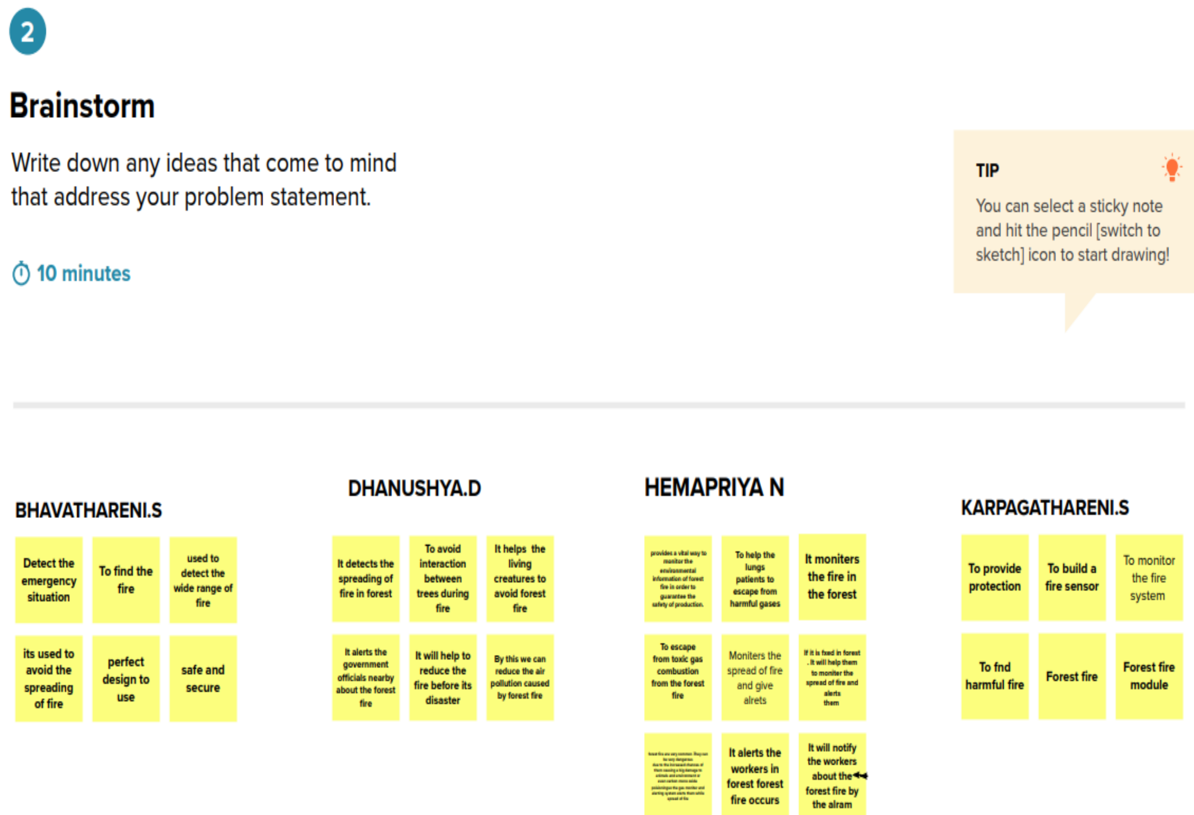
The forest is a large surface of area filled with trees, lots of dried leaves, woods and so on.These elements encourage the fire when it starts.Thefire can be ignited through many reasons such as high temperature in summer seasons, smoking, or someparties which having fireworks. Once fire starts, itwill remain until it distinguished completely. The damage and the cost for distinguish fire because offorest fire can be reduced when the fire detected early as possible. So, the fire detection is important in thisscenario. Finding of the exact location of the fire andsending notification to the fire authorities soon after the occurrence of fire can make a positive impact.There are different types of fire detection methods used by the Government authorities such as satellitemonitoring, tower monitoring, using sensors, optical cameras and so on. There are some other techniques used for fire suppression.they are using flying water tanks for fire suppression. In middle east countries, theseelements sweep away and burnt it in a certain unfuelled place.But, they provide fire inthese areas and wait until it dies itself without make any danger to the wildlife or humans.

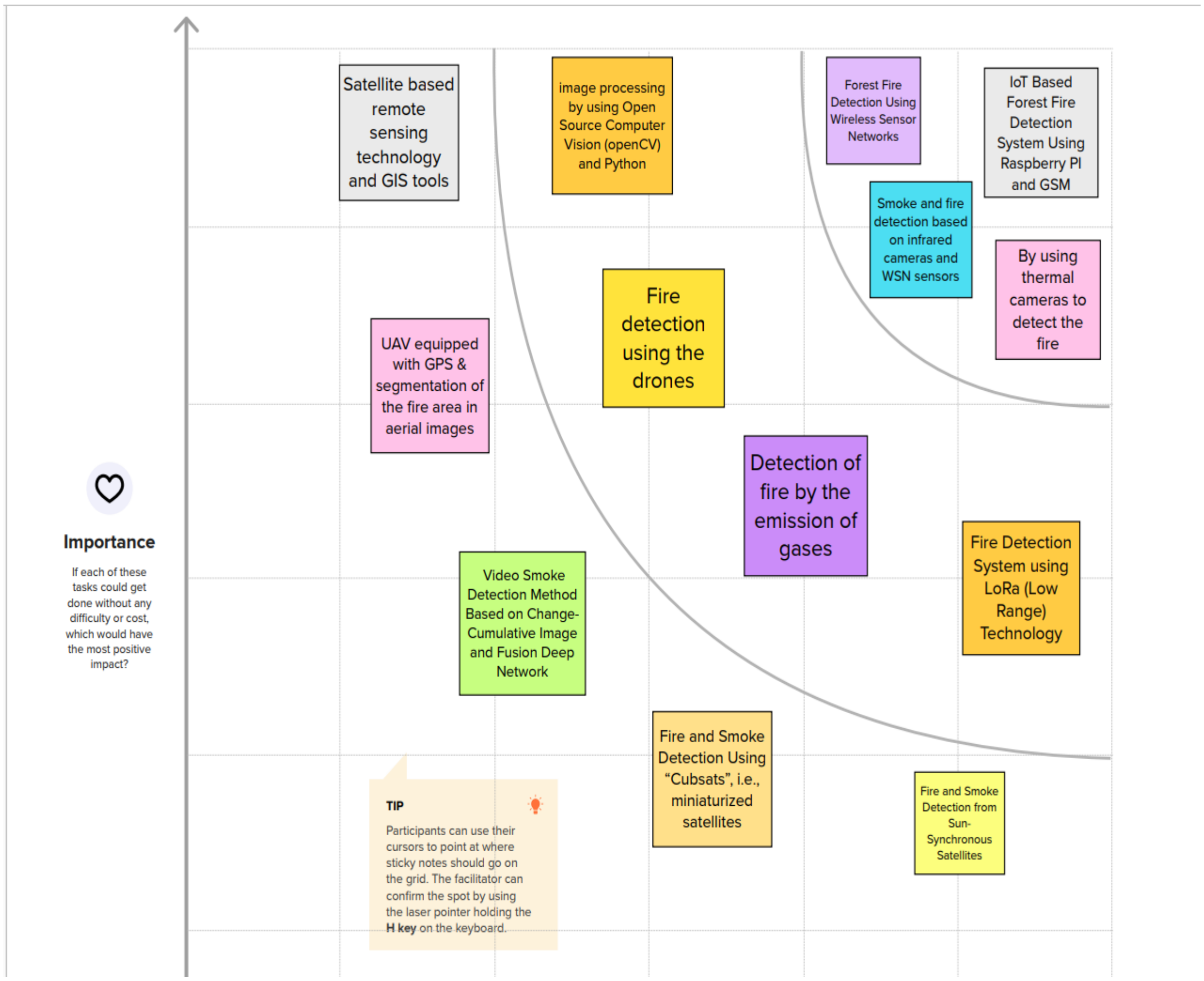
3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

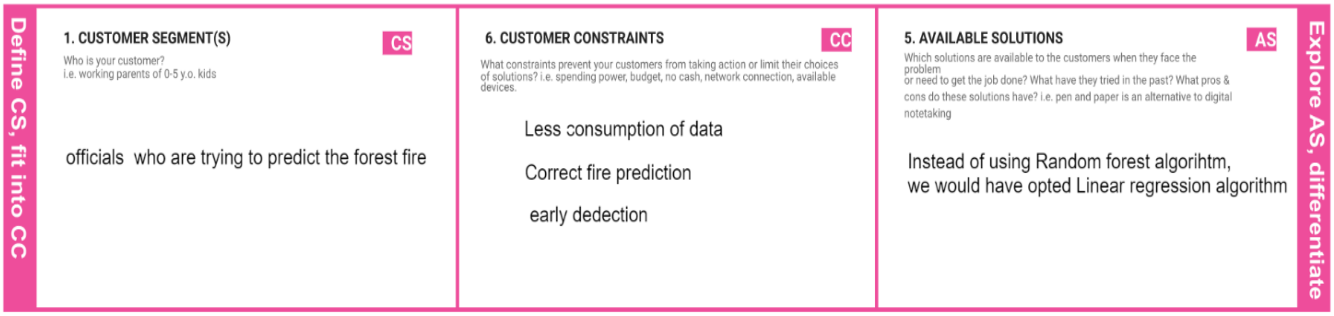


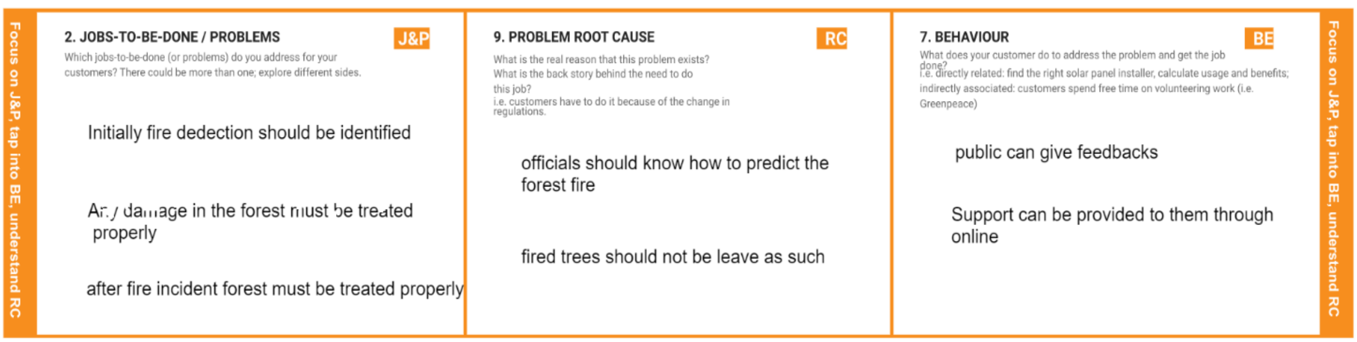

Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Satellite based remote sensing technology and GIS tools
image processing by using Open Source Computer Vision (openCV) and Python
Forest Fire Detection Using Wireless Sensor Networks
IoT Based Forest Fire Detection System Using Raspberry PI and GSM
Smoke and fire detection based on infrared cameras and WSN sensors
By using thermal cameras to detect the fire
Fire detection using the drones
UAV equipped with GPS & segmentation of the fire area in aerial images
Detection of fire by the emission of gases
Fire Detection System using LoRa (Low Range) Technology
Video Smoke Detection Method Based on Change-Cumulative Image and Fusion Deep Network
Fire and Smoke Detection Using "Cubsats", i.e., miniaturized satellites
Fire and Smoke Detection from Sun-Synchronous Satellites
TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard.

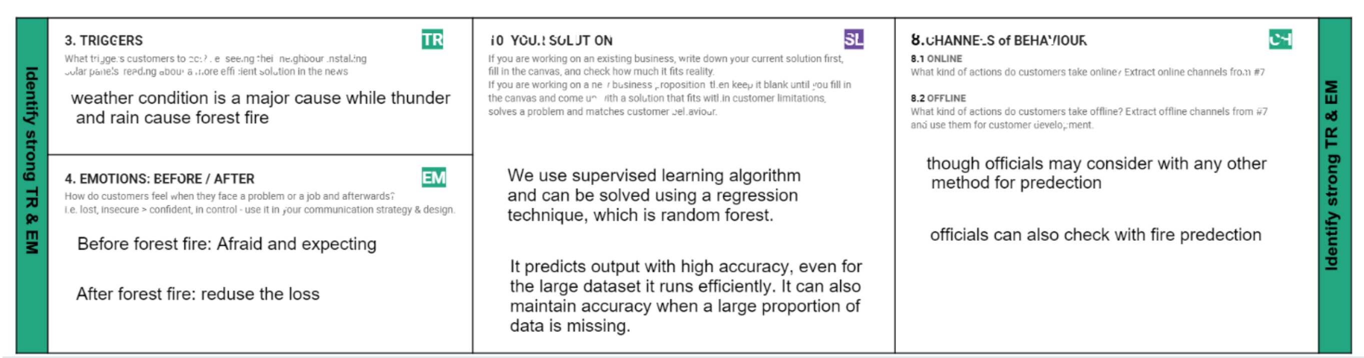
3.3 PROPOSED SOLUTION

The ability to predict fire progression and area burned is crucial to mitigating the immediate and far-reaching consequences of wildfires. Existing studies have attempted to fill this gap, mainly through mathematical models but predictive techniques would enable decision makers to deal with large amount of data in a more timely manner. The Wildland Fire Management Research, Development & Application Organization proposed a wildland fire decision support tool called FSPro (Fire Spread Probability). FSPro is a geospatial probabilistic model that predicts fire growth, and is designed to support long-term decision making. FSPro addresses fire growth beyond the timeframes of reliable weather forecasts by using historic climatological data. FSPro calculates and maps the probability that fire will spread to areas on the landscape based on the current fire perimeter or ignition point.we propose an intelligent system based on genetic programming for the prediction of burned areas of forest fires. In order to build predictive models, we only considered data relating to forest characteristics and meteorological data. Drawing on the idea of using computational intelligence techniques

3.4 PROBLEM SOLUTION FIT







4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

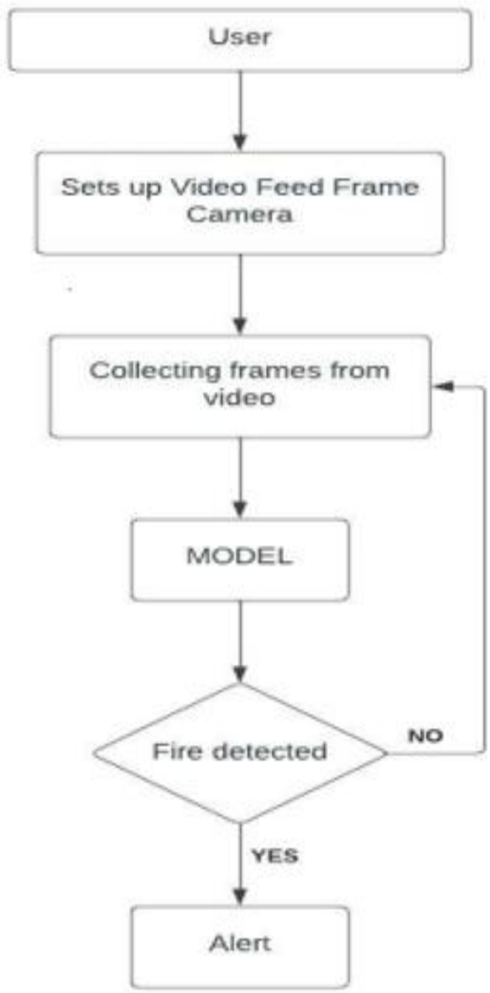
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	Image capture	Capture image of forest Check the forest if fired
FR-3	Image Processing	Upload the forest image Start detection
FR-4	Forest fire prediction	Identify the parameters to be considered for the identification of forest fire
FR-5	Fire descrption	Show the recommended rescue measures for the forest fire
FR-6	Providing dataset	Training dataset Testing dataset
FR-7	Adding dataset	Forest fire dataset
FR-8	Updated Native Language options	Language can be changed according to the user wish

4.2 NON-FUNCTIONAL REQUIREMENTS

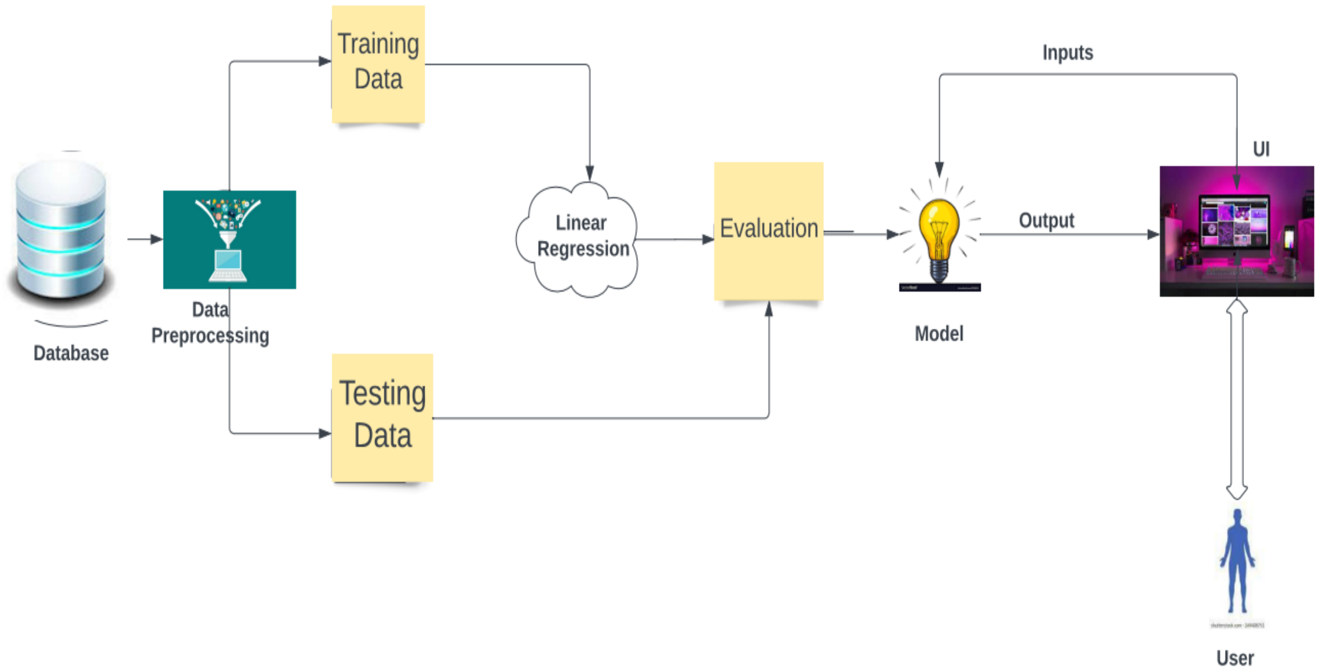
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Forest fire dataset can be used for detection of all kind of forest's dataset can be reusable datasets can be prepared according to the leaf
NFR-2	**Security**	User information and forest data are secured The algorithm used are more secure
NFR-3	**Reliability**	The fore fire is more The dataset and image captureing performs consistenly well
NFR-4	**Performance**	Forest fire defines once the fire is detected Performs well accordingly to the quality of forest fire
NFR-5	**Availability**	Forest fire will used again for detection
NFR-6	**Scalability**	Increase in growth of predicting the results and defining the forest

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION & TECHNICAL ARCHITECTURE



5.3 USER STORIES

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 will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	high	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Low	Sprint-1
	Login	USN-1	As a user, I can log into the application by entering email & password	They can access the details and dashboard	High	Sprint-1
Customer (Web user)	Registration	USN-3	Login into executive portal to help the user	Help in accessing the moment and the acess	High	Sprint-1
Customer Care Executive	Help dashboard	USN-2	Can provide the necessary details of help through desired way like emails,mobiles and SMS		Medium	Sprint-1
Administrator	User account control	USN-4	The person who is responsible for the website control and other management activities	Provides support to forest fire predection	High	Sprint-1

6.PROJECT PLANNING AND SCHEDULING

6.1 PRODUCT BACKLOG, SPRINT SCHEDULE, AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data collection and prepocessing	USN-1	Collecting the dorest fire dataset	2	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-2	Labelling the dataset according to class	1	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-3	Someof the forest fire is labeled accordingly	2	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-4	Dataset will contain forest fire prediction	Qsz1z	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1	Preprocessing	USN-5	To prepare raw data in a format that the network can accept	1	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-6	Scaling is used for making data points generalized	2	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-7	Shear range image will be disorted along an axis,mostly to create or rectify the perception angle	2	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-8	Zoom augmentation will randomly zoom the image and adds new pixels for the image	2	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-1		USN-9	Flipping the entire pixells of an image	2	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Training ,Testing and Creating a model	USN-10	Start initial the model	2	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-11	Adding difference layers of cnn	1	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-12	Creating compiling with adam optimizer	1	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-13	Creating metrics	1	Low	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-14	Train the data with 20 epoch	1	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-15	Testing the model	1	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2		USN-16	Save the model	1	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-2	Flask and frame workdesign	USN-17	Creating backend framework with flask	2	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-3		USN-18	Importing the model file	2	High	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-3		USN-19	Server startup,request and service in aloop	2	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-3	Frontend web application developemen	USN-20	Creating a html template with css file	1	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-3		USN-21	User can import forest fire in webpage	1	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-4		USN-22	Predicting where is fireoccurred for the given input	1	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-4		USN-23	User can classify as forest fired or not	1	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni
Sprint-4		USN-24	Alert the admin about the predection with the gmail	1	Medium	Dhanushya,bhavadharani,hemapriya karpagathareni

6.2 PROJECT TRACKER, VELOCITY & BURNDOWN CHART

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	3 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

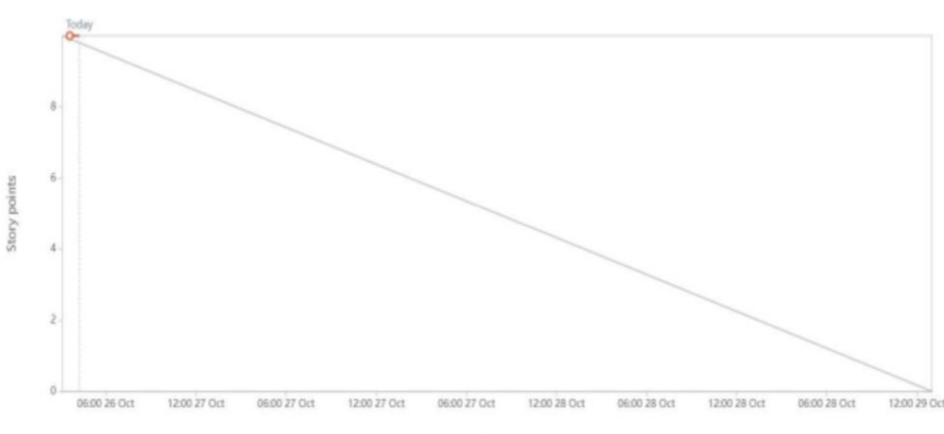
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

For Sprint-1 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 6 / 6 = 1
For Sprint-2 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 18 / 6 = 3.0
For Sprint-3 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 16 / 6 = 2.6
For Sprint-4 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 12/ 6 = 2.0

Average Velocity = 14/6 AV = 2.333

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



7.CODING & SOLUTIONING

7.1 CODING

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from scipy.stats import norm
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression, Lasso, Ridge, ElasticNet
from sklearn.preprocessing import PolynomialFeatures, MinMaxScaler, LabelEncoder
from sklearn.svm import SVR
from sklearn.metrics import r2_score
from sklearn.metrics import mean_squared_error
import warnings; warnings.simplefilter('ignore')


# Importing the dataset
df_forest = pd.read_csv("/content/forestfires (1).csv")
df_forest.head()
print ("The shape of the dataset : ", df_forest.shape)
plt.rcParams['figure.figsize'] = [8, 8]
sns.distplot(df_forest['area']);
df_forest['u_area'] = np.log(df_forest['area'] + 1)
plt.rcParams['figure.figsize'] = [20, 10]
sns.set(style = "darkgrid", font_scale = 1.3)
month_temp = sns.barplot(x = 'month', y = 'temp', data = df_forest,
                         order = ['jan', 'feb', 'mar', 'apr', 'may', 'jun', 'jul',
'aug', 'sep', 'oct', 'nov', 'dec'], palette = 'winter');
month_temp.set(title = "Month Vs Temp Barplot", xlabel = "Months", ylabel =
"Temperature");


df_forest.day.unique()
plt.rcParams['figure.figsize'] = [10, 10]
sns.set(style = 'whitegrid', font_scale = 1.3)
day = sns.countplot(df_forest['day'], order = ['sun' ,'mon', 'tue', 'wed', 'thu',
'fri', 'sat'], palette = 'spring')
day.set(title = 'Countplot for the days in the week', xlabel = 'Days', ylabel =
'Count');


plt.rcParams['figure.figsize'] = [8, 8]
sns.set(style = "white", font_scale = 1.3)
scat = sns.scatterplot(df_forest['temp'], df_forest['area'])
scat.set(title = "Scatter Plot of Area and Temperature", xlabel = "Temperature", ylabel
= "Area");

plt.rcParams['figure.figsize'] = [8, 8]
```

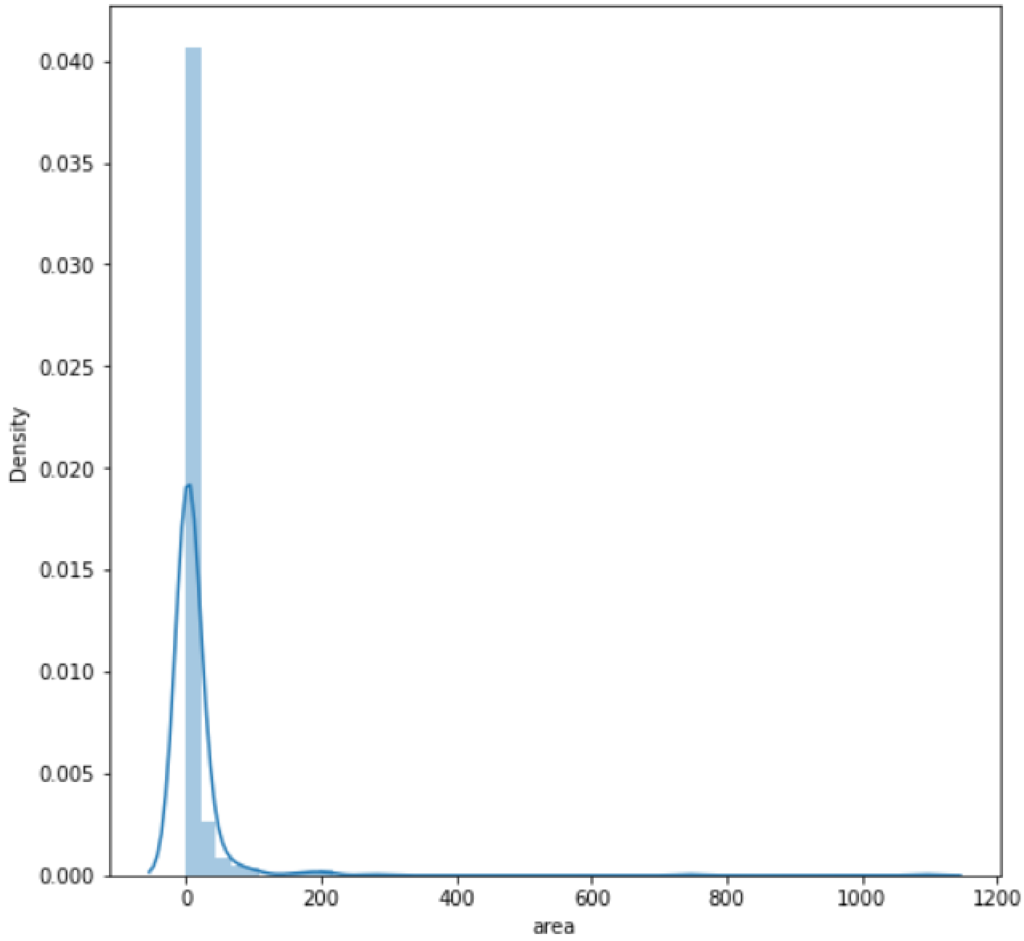
```
sns.set(style = "white", font_scale = 1.3)
scat = sns.scatterplot(df_forest['temp'], df_forest['u_area'])
scat.set(title = "Scatter Plot of Area and Temperature", xlabel = "Temperature", ylabel
= "Area");


plt.rcParams['figure.figsize'] = [20, 10]
sns.set(style = 'white', font_scale = 1.3)
fig, ax = plt.subplots(1,2)

# Distribution Plots
area_dist = sns.distplot(df_forest['area'], ax = ax[0]);
area_dist_2 = sns.distplot(df_forest['u_area'], ax = ax[1]);
area_dist.set(title = "Skewed Area Distribution", xlabel = "Area", ylabel = "Density")
area_dist_2.set(title = "Reduced Skewness of Area Distribution", xlabel = "U_Area",
ylabel = "Density");



plt.rcParams['figure.figsize'] = [12, 10]
sns.set(font_scale = 1)
sns.heatmap(df_forest.corr(), annot = True);



data = norm.rvs(df_forest['area'])

# Fit a normal distribution to the data
mu, std = norm.fit(data)

plt.hist(data, bins=25, density=True, alpha=0.6, color='g')

# Plot the PDF
xmin, xmax = plt.xlim()
x = np.linspace(xmin, xmax, 100)
p = norm.pdf(x, mu, std)
plt.plot(x, p, 'k', linewidth=2)
title = "Fit results: mu = %.2f,  std = %.2f" % (mu, std)
plt.title(title)

plt.show()



df_forest['area'] = np.log(df_forest['area'] + 1)
df_forest.drop(columns = 'u_area', inplace = True)

display(df_forest)



minmax = MinMaxScaler()
```

```
# FFMC, DMC, DC, ISI, RH
df_forest['FFMC'] = minmax.fit_transform(np.array(df_forest['FFMC']).reshape(-1, 1))
df_forest['DMC'] = minmax.fit_transform(np.array(df_forest['DMC']).reshape(-1, 1))
df_forest['DC'] = minmax.fit_transform(np.array(df_forest['DC']).reshape(-1, 1))
df_forest['ISI'] = minmax.fit_transform(np.array(df_forest['ISI']).reshape(-1, 1))
df_forest['RH'] = minmax.fit_transform(np.array(df_forest['RH']).reshape(-1, 1)


df_forest['day'].value_counts()


df_forest.describe()


df_forest['month'].replace({'jan' : 1, 'feb' : 2, 'mar' : 3, 'apr' : 4, 'may' : 5,
'jun' : 6,
                           'jul' : 7, 'aug' : 8, 'sep' : 9, 'oct' : 10, 'nov' : 11,
'dec' : 12},
                           inplace = True)

# Days
df_forest['day'].replace({'sun' : 1, 'mon' : 2, 'tue' : 3, 'wed' : 4, 'thu' : 5, 'fri'
: 6, 'sat' : 7}, inplace = True)

# # Using Label Encoder for cat to num conversion
# categorical = list(df_forest.select_dtypes(include = ["object"]).columns)
# for i, column in enumerate(categorical) :
#     label = LabelEncoder()
#     df_forest[column] = label.fit_transform(df_forest[column])

df_forest.head(10)


target = df_forest['area']
features = df_forest.drop(columns = 'area')

X_train, X_test, y_train, y_test = train_test_split(features, target, test_size = 0.15,
random_state = 196)

print ("Train data set size : ", X_train.shape)
print ("Test data set size : ", X_test.shape)


X_train.head()


# Linear Regression Model
model = LinearRegression()
model.fit(X_train, y_train)

# Predictions
predictions = model.predict(X_test)
```

```
# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, predictions))
print ("r2 Score : ", r2_score(y_test, predictions))
poly = PolynomialFeatures(4)
poly_X_train = poly.fit_transform(X_train)
poly_X_test = poly.fit_transform(X_test)

model_2 = LinearRegression()
model_2.fit(poly_X_train, y_train)

# Predictions
predictions_poly = model_2.predict(poly_X_test)

# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, predictions_poly))
print ("r2 Score : ", r2_score(y_test, predictions_poly))



model_3 = Lasso(alpha = 100, max_iter = 10000)
model_3.fit(X_train, y_train)

# Predictions
prediction = model_3.predict(X_test)

# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, prediction))
print ("r2 Score : ", r2_score(y_test, prediction))


model_4 = Ridge(alpha = 500)
model_4.fit(X_train, y_train)

# Predictions
pred = model_4.predict(X_test)

# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, pred))
print ("r2 Score : ", r2_score(y_test, pred))


model_5 = ElasticNet(alpha = 100, max_iter = 10000)
model_5.fit(X_train, y_train)

# Predictions
pred1 = model_5.predict(X_test)

# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, pred1))
print ("r2 Score : ", r2_score(y_test, pred1))
```

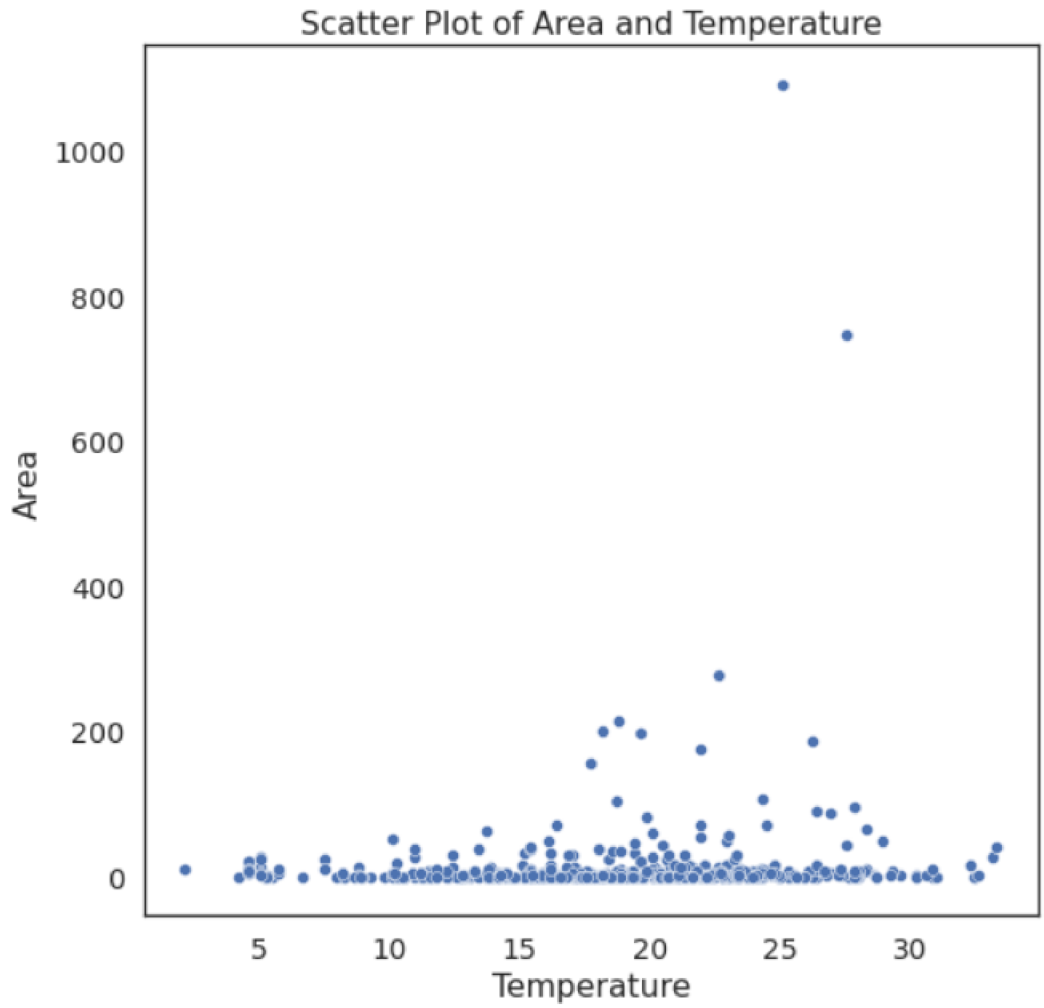
```
model_6 = SVR(C = 100, kernel = 'linear')
model_6.fit(X_train, y_train)

# Predictions
prediction = model_6.predict(X_test)

# Scores
print ("Mean Squared Error : ", mean_squared_error(y_test, prediction))
print ("r2 Score : ", r2_score(y_test, prediction))


prediction = np.exp(prediction - 1)

prediction.
```

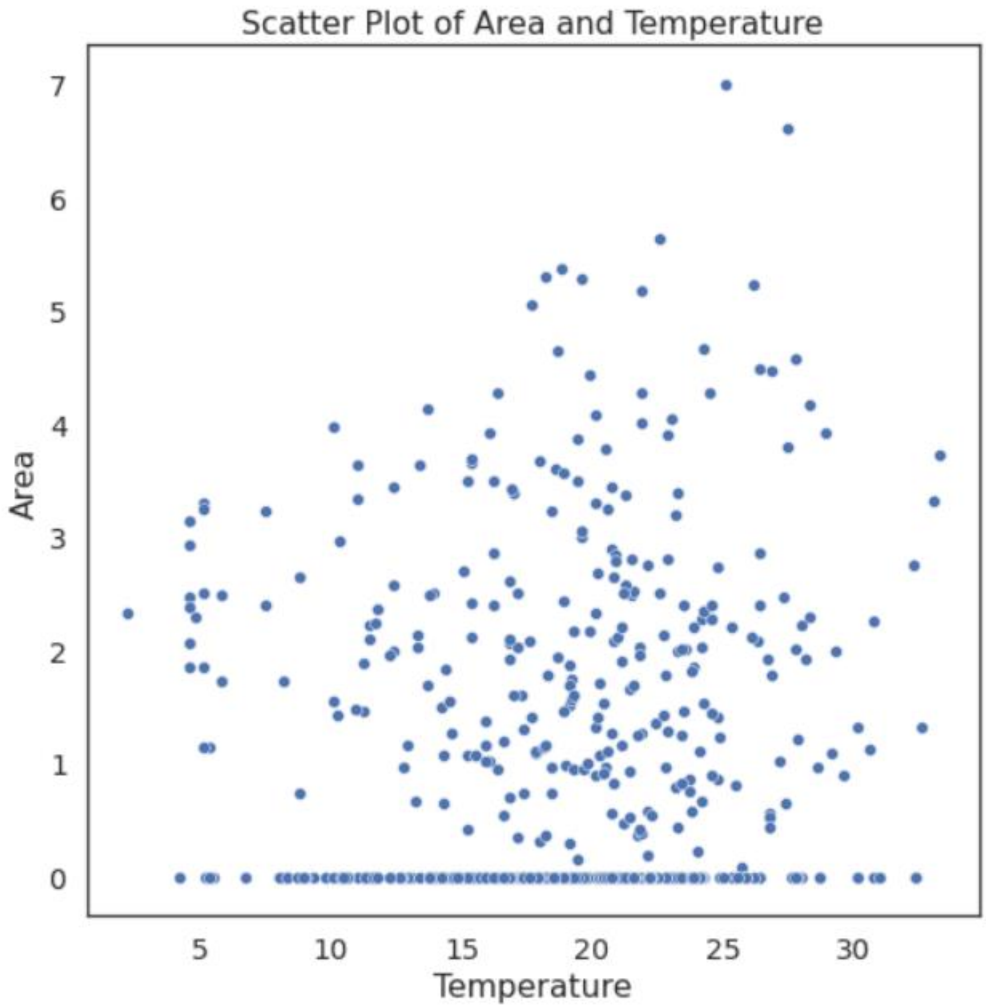
7.2 SCHEMA

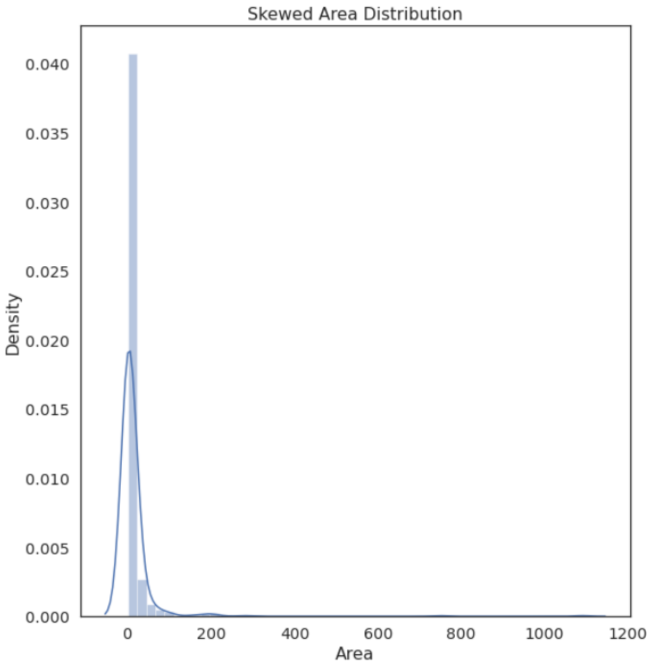


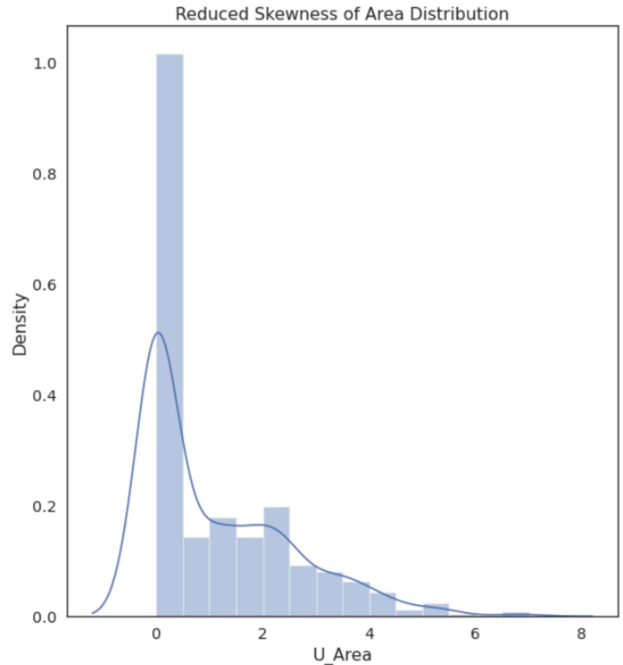
8.RESULTS

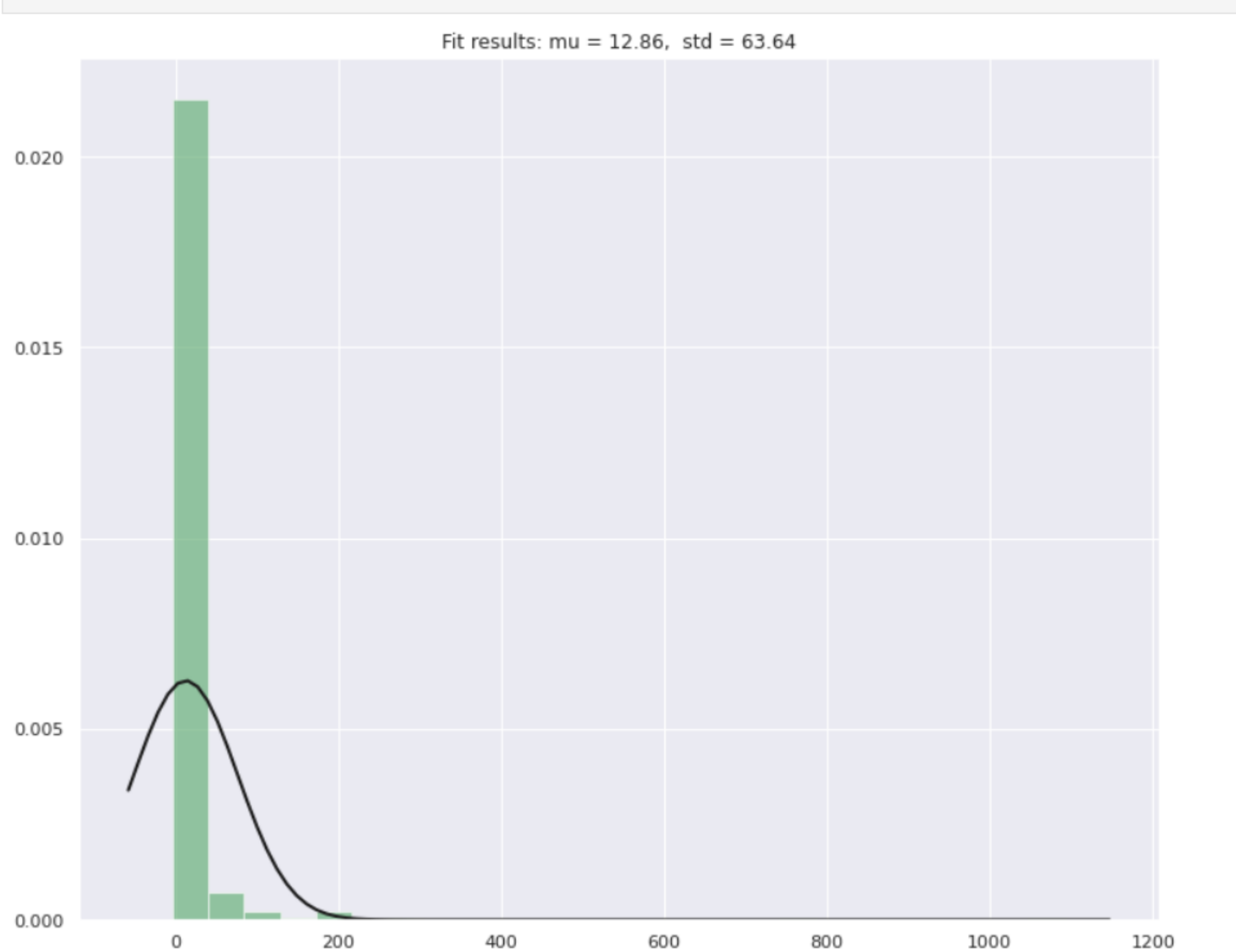
8.1 SAMPLE SCREENS




Scatter Plot of Area and Temperature
Area
Temperature
0
1
2
3
4
5
6
7
5
10
15
20
25
30


Skewed Area Distribution
Density
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0
200
400
600
800
1000
1200
Area


Reduced Skewness of Area Distribution
Density
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
U_Area


Fit results: mu = 12.86, std = 63.64
0.020
0.015
0.010
0.005
0.000
0
200
400
600
800
1000
1200

9.ADVANTAGES AND DISADVANTAGES

9.1 ADVANTAGES

1. Forest fires promote healthier trees
2. Forest fires help to increase water availability
3. Forest fires help to kill disease that can impact the biome

9.2 DISADVANTAGES

4. Forest fires can create health problems for people
5. Forest fires can trigger mudslides, landslides, and other forms of erosion.
6. Forest fires can devastate the ecosystem

10. CONCLUSION

A forest fire risk prediction mecha-nism, based only on meteorological data and independent ofany weather prediction mechanism.The results demonstratesthe ability to predict forest fire risk prediction with a low error on the number of fires as well ason the predicted scale This seem like tough task but to the realization of the fact that fire fighters are not well equipped with the things they should be having as an AI researcher I am suggesting the way AI can help in this process. Though equipping the forest fire department with right gadget shall be much cheaper option.

11.FUTURE WORKS

The development and direction of fire fighting works are moving toward 3S technology, which relies on digitizing forestry data, integrating forest fire warning, and monitoring system applications, and building automated, intelligent, and networked digital forest fire management systems.

12.REFERENCES

1. [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. [2] Qingjie Zhang, Jiaolong Xu, Liang Xu and Haifeng Guo, ”Deep Convolutional Neural Networks for forest fire detection,” in Proceed ings of the 2016 International Forum on Management, Education and Information Technology Application, Atlantis Press, 2016.

3. [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 Performance based Fire Code), 2017.

4. [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. [5] C. Yuan, Z. X. Liu, and Y. M. Zhang, “UAV-based forest fire detection 5 and tracking using image processing techniques,” in 2015 International Conference on Unmanned Aircraft Systems. IEEE, 2015, pp. 639–643.

6. [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. [7] X. Z. Chunyu Yu, Zhibin Mei, “A real-time video fire flame and smoke detection algorithm,” in Asia-Oceania Symposium on Fire Science and Technology, 2013.

8. [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. [9] Pulkit Chugh, Eric Tom Mathews, G. Barath Kumar, ”Forest fire detection through UAV imagery using CNNs,” unpublished.

10. [10] A. Koubaa and B. Qureshi, “Dronetrack: Cloud-based real-time object then testing our model by providing the data that is allocated for testing. We can use our saved model file for video analysis of forest fire and use it in real time surveillance camera for real timeprediction