Natural Disasters Intensity Analysis and Classification Using Artificial Intelligence

TEAM ID **:** PNT2022TMID25918

TEAM LEADER **:** SUJITHA R

TEAM MEMBERS : DHARSHINI PRIYA S

SRI NANDHINI D

VETRISELVI A

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1. INTRODUCTION

1.1 Project Overview

Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. Artificial intelligence (AI), in particular machine learning (ML), is playing an increasingly important role in disaster risk reduction (DRR) – from the forecasting of extreme events and the development of hazard maps to the detection of events in real time, the provision of situational awareness and decision support.

1.2 Purpose

- Supply of essential commodities. Rehabilitation of disaster victims.
- Protective measures to reduce the intensity of future disasters.
- Rescue of victims by the event and disposal of losses suffered.

2. LITERATURE SURVEY

2.1 Existing problem

Natural disasters not only disturb the human ecological system but also destroy the properties and critical infrastructures of human societies and even lead to permanent change in the ecosystem. Disaster can be caused by naturally occurring events such as earthquakes, cyclones, floods, and wildfires. Many deep learning techniques have been applied by various researchers to detect and classify natural disasters to overcome losses in ecosystems, but detection of natural disasters still faces issues due to the complex and imbalanced structures of images.

2.2 References

SURVEY 1

“Neural Network Applications In Earthquake Prediction” Meta-Analytic And Statistical Insights On Their Limitations.Arnaud Mignan And Marco Broccardo neural Network Applications In Earthquake Prediction ; Meta-Analytic And Statistical Insights On Their Limitations Seismological Research Letters (May 2020).

Methods:

Deep learning has solved seemingly intractable problems, boosting the hope to find approximate solutions to problems that now are considered unsolvable. Earthquake prediction, the Grail of Seismology, is, in this context of continuous exciting discoveries, an obvious choice for deep learning exploration. We review the entire literature on artificial neural network (ANN) applications for earthquake prediction (77 articles, 1994-2019 period) and find two emerging trends: an increasing interest in this domain, and a complexification of ANN models over time, towards deep learning. Despite apparent positive results observed in this corpus, we demonstrate that simpler models seem to offer similar predictive powers, if not better ones. Due to the structured, tabulated nature of earthquake catalogs, and the limited number of features so far considered, simpler and more transparent machine learning models seem preferable at the present stage of research. Those baseline models follow first physical principles and are consistent with the known empirical laws of Statistical Seismology, which have minimal abilities to predict large earthquakes.

SURVEY 2

Title:

"Simultaneous Earthquake Detection On Multiple Stations Via A Convolutional Neural Network" Shaobo Yang; Hu; Haijiang Zhang; Guiquan Liu, Seismological Research Letter(2021)

Methods:

As the amount of seismic data has grown rapidly, it is very important to develop a fast and reliable event detection and association algorithm. Generally, event detection is first performed on individual stations followed by event association through linking phase arrivals to a common event generating them. This study considers earthquake detection as the problem of image classification and convolutional neural networks (CNNs), as some of the widely used deep-learning tools in image processing, can be well used to solve this problem. In contrast to existing studies training the network using seismic data from individual stations, in this study, we train a CNN model jointly using records of multiple stations. Because the CNN automatically synthesizes information among multiple stations, the detector can more reliably detect seismic events and is less affected by spurious signals. The CNN is trained using aftershock data of the 2013 Mw 6.6 Lushan earthquake. We have applied it to two very different datasets of Gofar transform fault, East Pacific Rise and Changning shale gas field in southern Sichuan basin, China. The tests show that the trained CNN has strong generalization ability and is flexible with the number of available stations, different instrument types, and different data sampling rates. It can detect many more events than the conventional short-term average/long-term average detector and is more efficient than template-matching methods.

SURVEY 3

Title:

“A Deep Learning Approach of Recognizing Natural Disasters on Images using Convolutional Neural Network and Transfer Learning” International Conference on Artificial Intelligence and its ApplicationsDaryl B. ValdezRey Anthony G. Godmalin December 2021.

Methods:

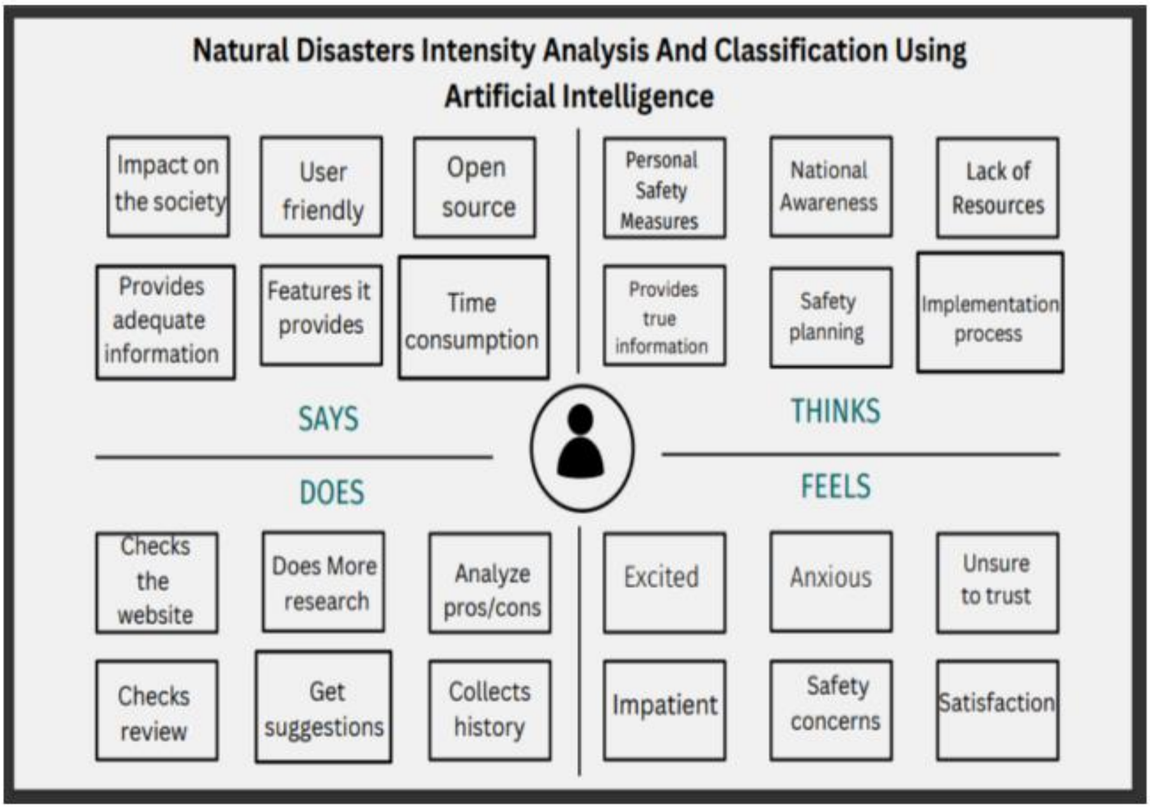
Natural disasters are uncontrollable phenomena occurring yearly which cause extensive damage to lives, and property and cause permanent damage to the environment. However, by using Deep Learning, real-time recognition of these disasters can help the victims and emergency response agencies during the onset of these destructive events. Methods used include: Deep learning(DL),Convolutional Neural Network(CNN)

2.3 Problem Statement Definition

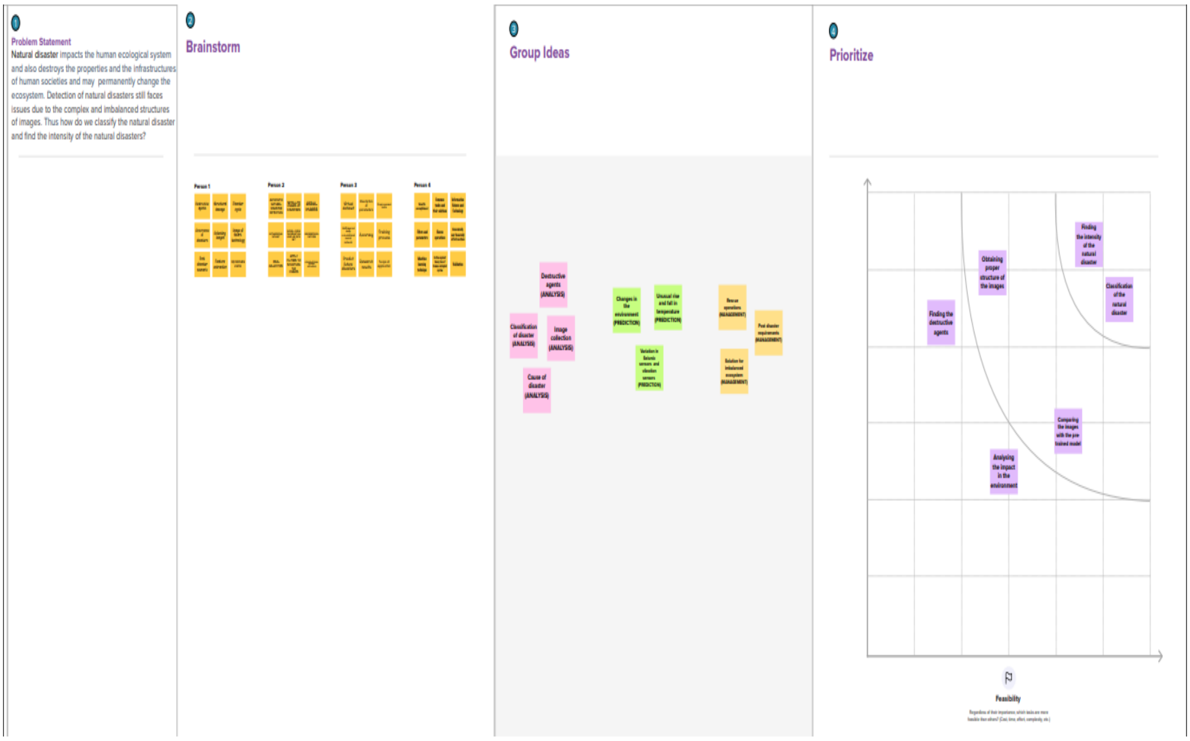
Natural disaster impacts the human ecological system and also destroys the properties and the infrastructures of human societies and may permanently change the ecosystem. Detection of natural disasters still faces issues due to the complex and imbalanced structures of images. Thus how do we classify the natural disaster and find the intensity of the natural disasters?

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



3.3 Proposed Solution

1. Problem Statement (Problem to be solved)

Natural disasters are inevitable, and disasters drastically affect the economy, ecosystem, and human life. Buildings collapse, ailments spread, and sometimes natural disasters such as tsunamis, earthquakes, and forest fires can devastate nations. Many deep learning techniques are used to classify natural disasters and to find their intensity, but still, this becomes a difficult task because of the complex and unstructured images. Thus this involves finding and classifying the natural disaster and analyzing its intensity.

2. Idea / Solution description

Firstly the data is collected for creating a high-quality dataset for image classification. Usually, a dataset is composed of images and a set of labels, here we have a collection of natural disaster images and each image can have one or more labels. Then we create models to predict the outcome of the events by comparing them with the captured one and with the dataset. An integrated webcam is used to capture the video frame and is given as input to the model. Then it is followed by image pre-processing obtained from the video frame. The obtained text is compared with the pre-trained model by using deep learning algorithm and finally, it is been evaluated and classified accordingly.

3. Novelty / Uniqueness

The detection of natural disasters by using deep learning techniques still faces various issues due to noise and serious class imbalance problems. Thus the proposed model provides an effective solution by working in two blocks—one for the detection of natural disaster occurrences and the second block to remove imbalanced class issues. The proposed model could be achieved with the highest accuracy as compared to other state-of-the-art methods due to its multi-layered structure and performs significantly better for natural disaster detection and classification.

4.Social Impact / Customer Satisfaction

Disaster alerts could be done prior so as to avoid drastic loss of lives and things and can avoid unpredictable changes in the environment. The disaster in a particular area could be predicted and classified accordingly as zones and significant worsening could be avoided. People could identify the disaster occurring in different parts of the world and can easily follow up on the intensity.

5.Scalability of the Solution

The analysis of the natural disaster and classification helps in making strong and effective decisions on preventing the loss of lives and helps in preparation for the upcoming inevitable disaster. It takes full advantage of the information obtained from the analysis and produces an appropriate solution that could be handled in the future.

3.3 Problem Solution fit

Project Title: Natural Disasters Intensity Analysis and Classification using Artificial Intelligence

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMIDxxxxxx
PNT2022TMID25918

Define CS, fit into CC			Explore AS, differentiate
	1. CUSTOMER SEGMENT(S) CS Who is your customer? i.e. working parents of 0-5 y.o. kids General citizens who need awareness about the natural disaster occurring anywhere in the world and in their hometown. Researchers who are interested in predicting the future occurrences and Government organizations to analyze the impact of the disaster and help the people around the zone.	**6. CUSTOMER CONSTRAINTS** CC What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. People are not aware of disasters since it is unpredictable. It is difficult for citizens to prepare for the worst condition at the time of disasters.	**5. AVAILABLE SOLUTIONS** AS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking People watch news channels to get to know about the disaster. But sometimes due to power interruptions, they won't be knowing about the impact and wouldn't be able to prepare for the upcoming disasters.

Focus on J&P, tap into BE, understand RC			Focus on J&P, tap into BE, understand RC
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. --> Be prepared prior. --> Analyze each season and check what natural calamities will happen in that particular month. -->Use a generator in case there is a power outage. -->Store food in advance.	**9. PROBLEM ROOT CAUSE** RC What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. People are not aware and ready to face the natural calamities since they don't know when it will occur.	**7. BEHAVIOUR** BE What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) Directly related: Watch news channels and other websites to know in advance about the natural calamities. Indirectly related: Should help the people in need and do volunteering work and create and spread awareness either directly or through posting in social media pages.

Identify strong TR & EM			Identify strong TR & EM
	3. TRIGGERS TR What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. People should watch news channel and other social media pages to make efficient solution such as preparation and efficiently facing the problem. **4. EMOTIONS: BEFORE / AFTER** EM How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. People will feel insecure and lose confidence when they are not prepared. But if they prepare to handle the worse, they can efficiently find solutions for future calamities.	**10. YOUR SOLUTION** SL If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. To tackle this problem, a website is created in which all the upcoming natural disasters are analyzed and classified accordingly to provide clear information about the event. And every minute the news is updated by analyzing the zones so that people can prepare for the worse condition to handle in prior.	**8. CHANNELS of BEHAVIOUR** CH **8.1 ONLINE** What kind of actions do customers take online? Extract online channels from #7 **8.2 OFFLINE** What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. ONLINE: They could find out the zones and constantly check for the upcoming disaster. OFFLINE: They can analyze and create awareness and be prepared to handle the situation.

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registering via Google Accounts Registering via Product’s own user management system
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Accessibility 1	Confirmation of accessibility for image data to certain organisation via email provided
FR-4	User Accessibility 2	Accessible to instant weather data.
FR-5	Location Accessibility	Gain access to user location via mobile GPS to show the instant cyclone intensity
FR-6	Internet Availability	Internet is required to access the web page.

4.2 Non-functional Requirements

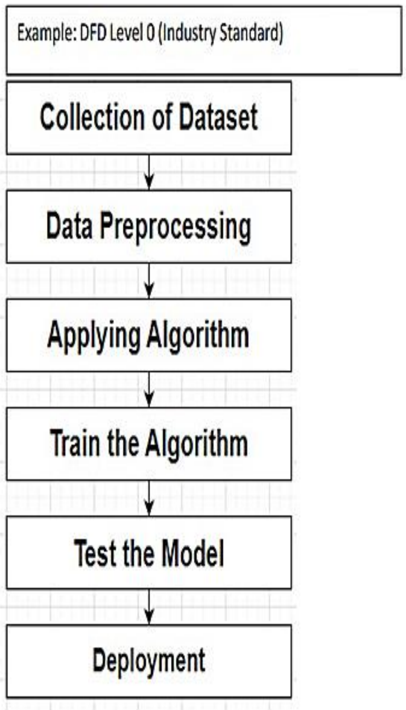
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Interactive UI is developed which facilitate easy navigation on the web page.
NFR-2	Security	It provides a distinct and secure encryption layer to the system interface for additional security standards.
NFR-3	Reliability	Accurate prediction of the natural disaster and the website can also be fault tolerant.
NFR-4	Performance	Since the model is trained with range of data it shows increased performance on every new instance
NFR-5	Availability	It can be made available 24/7.
NFR-6	Scalability	It is highly scalable since fast API is used to make the API which can handle more request per second.

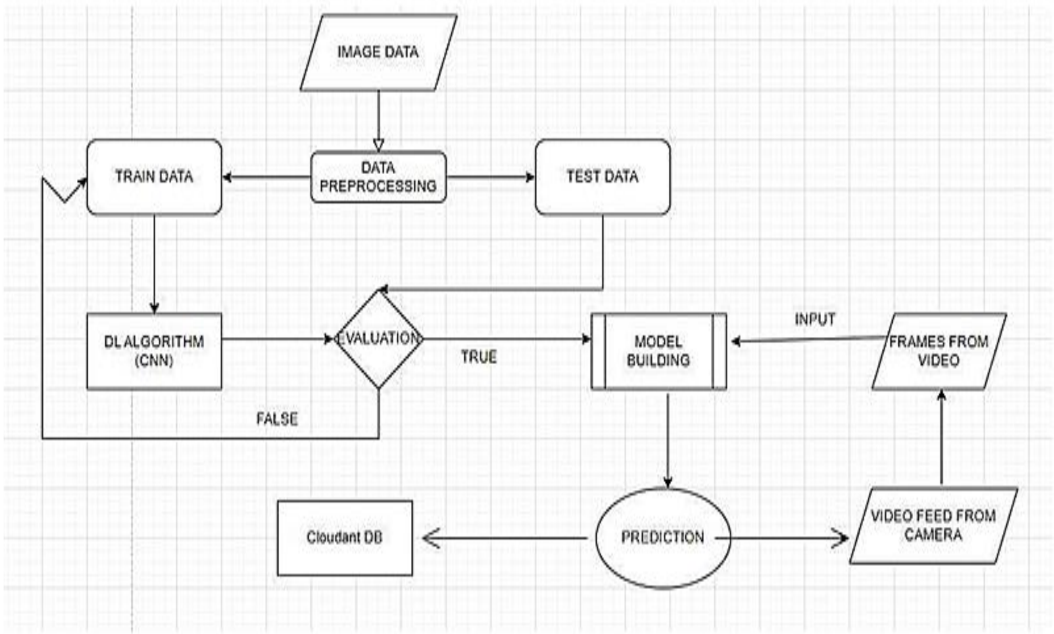
5. PROJECT DESIGN

5.1 Data Flow Diagrams

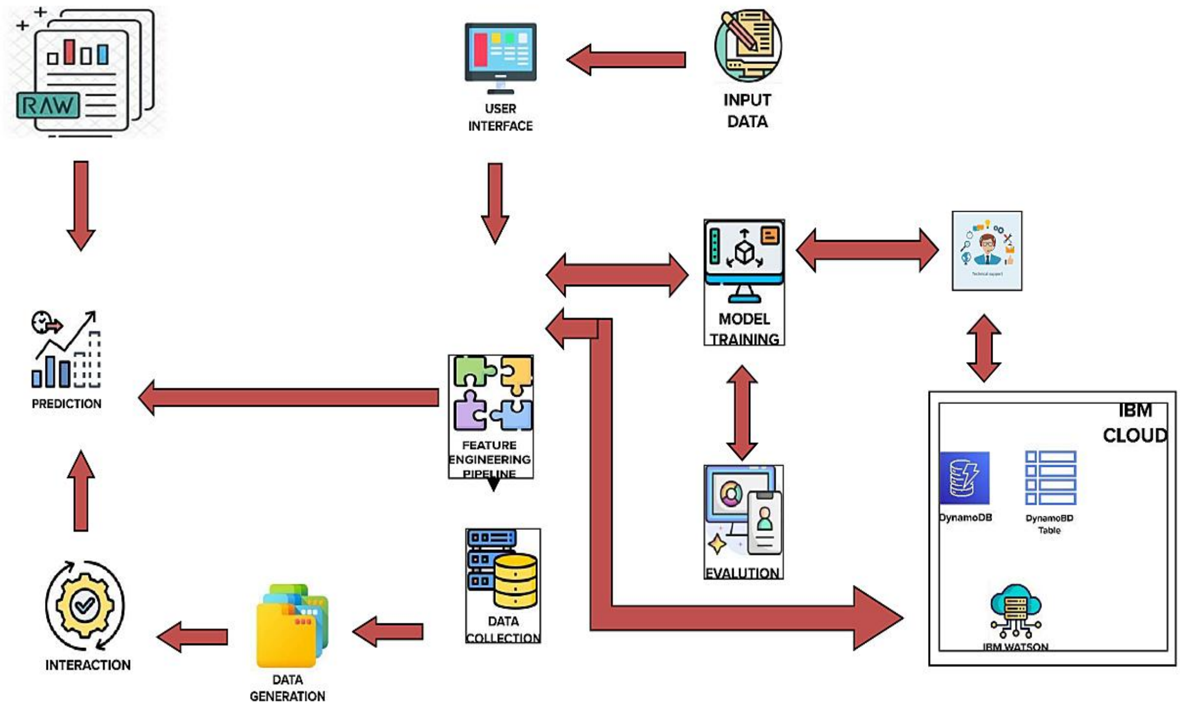
Data Flow Diagrams:

A data flow diagram (DFD) is a visual representation of the information flow through a process or system. DFDs help you better understand process or system operation to discover potential problems, improve efficiency, and develop better processes





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	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail Login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login & access my account with my registered credentials	High	Sprint-1
	Dashboard	USN-6	As a user, I can access the services and information provided in the dashboard	I can upload the images, I can viewthe result, I can edit my profile and I can view my history	High	Sprint-1
Customer (Web user)	Login	USN-7	As a user, I can log into the web application and access the dashboard	I can login with the same registered credentials and access my account through web application	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer Care Executive	Help Desk	USN-8	As a user, I can get the guidance from the customer care	I can get help from the customer care for carrying out my tasks	High	Sprint-2
Administrator	Management	USN-9	As an administrator, I can collect new datasets and keep the model trained	I can collect and train the model with new dataset frequently	High	Sprint-2
		USN-10	As an administrator, I can update other features of the application	I can update and tune the features of application if needed	Medium	Sprint-1
		USN-11	As an administrator, I can maintain the information about the user	I can maintain information like user type and other such information	Medium	Sprint-1
		USN-12	As an administrator, I can maintain third-party services	I can support and maintain any third-party services	Low	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	Registration	USN-1	As a user, I can register for the application by entering my email and confirming my password.	9	High	Dharshini Priya
		USN-2	As a user, I will receive confirmation email once I have registered for the application	4	High	Dharshini Priya
	Login	USN-3	As a user, I can log into the application by entering my email and password	7	Low	Dharshini Priya
Sprint-2	Data preparation	USN-4	The user data is converted into modules	9	Medium	Sri Nandhini
	Creating the Interactive dashboard	USN-5	Creating the dashboard to display the natural calamities which are about to happen near the location.	9	High	Sujitha Vetriselvi
Sprint-3	Creating the report and story	USN-6	The report is made for the user to check the intensity and the calamities	8	High	Sujitha Vetriselvi

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Creating the web application	USN-7	Website is created to display the contents.	7		Dharshini Priya Sri Nandhini Sujitha Vetriselvi

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	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	4 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. CODING & SOLUTIONING

```
from flask import
Flask,render_template,request import cv2
from tensorflow.keras.models import
load_model import tensorflow
import numpy as np

app =
Flask(__name__,template_folder="templa
tes")
model=load_model("Flask/analysis.h5")
#print(model)

@app.route('/',methods=['GET'])
def index():
  return render_template('home.html')

@app.route('/home.html',methods
=['GET']) def home():
  return render_template('home.html')

@app.route('/intro.html',methods
=['GET']) def about():
  return render_template('intro.html')
```

```
@app.route('/upload.html',methods=['GE
T'])
def upload():
  return render_template('upload.html')

@app.route('/uploader.html',methods=['G
ET','POST']) def predict():
  if request.method == "POST":
    f = request.files['filename']
    f.save("Flask/videos/save.mp4")
  cap=cv2.VideoCapture("Flask/videos/sa
ve.mp4")
  while(True):
    _,frame = cap.read()
    frame=cv2.flip(frame,1)
    while(True):
      (grabbed,frame) = cap.read()
      if not grabbed:
        break
      output = frame.copy()
      frame =
cv2.cvtColor(frame,cv2.COLOR_BGR2R
GB)
      frame =
cv2.resize(frame,(64,64))       x=np.expan
d_dims(frame,axis=0)
      result =
np.argmax(model.predict(x),axis=1)
      index=['Cyclone','Earthquake','Flood','
Wildfire']
      result = str(index[result[0]])
      #print(result)
      cv2.putText(output,"activity:
{}".format(result),(10,120),cv2.FONT_HERSHEY_PLAIN,1,(0,25,255),1)
      cv2.imshow("Output",output)
    if cv2.waitKey(0) & 0xFF==ord('q'):
      break
```

```
  print("[INFO]cleaning up...")
  cap.release()
  cv2.destroyAllWindows()
  return render_template("upload.html")

if __name__ == '__main__':
  app.run(host='0.0.0.0',port=8000,debug=
True)
```

TRAIN AND TEST THE MODEL

```
from google.colab import drive
drive.mount('/content/drive')
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
In [84]: from tensorflow.keras.preprocessing.image import
ImageDataGenerator train_datagen =
ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,sh
ear
_range=0.2)
test_datagen = ImageDataGenerator(rescale=1./255)
In
[85]:
x_train=train_datagen.flow_from_directory("/content/drive/MyDrive/dataset/t
rain_set",target_size=(64,64),class_mode='categorical',batch_size=5,color_
mode='rgb')
x_test=test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset/te
st_set",target_size=(64,64),class_mode='categorical',batch_size=5,color_mo
de='rgb')
Found 742 images belonging to 4 classes.
Found 198 images belonging to 4 classes.
I
n [86]: import numpy as np import tensorflow
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Conv2D,MaxPooling2D,Flatten
I
n [87]: model=Sequential()
model.add(Conv2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Conv2D(32,(3,3),activation='relu'))
```

model.add(MaxPooling2D(pool_size=(2,2))) model.add(Flatten())
model.add(Dense(units=128,activation='relu'))
model.add(Dense(units=4,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['a
ccuracy'])

In [88]: model.summary()

Model: "sequential_1"

_

Layer (type) Output Shape Param #
==
================= conv2d_2 (Conv2D) (None, 62, 62,
32) 896 max_poo
ling2d_2 (MaxPooling (None, 31, 31,
32) 0 2D)
conv2d_3 (Conv2D) (None,
29, 29,
32) 9248 max_po
oling2d_3 (MaxPooling (None, 14, 14,
32) 0 2D)

flatten_1 (Flatten) (None, 6272) 0
dense_2
(Dense) (None,
128) 802944 de
nse_3 (Dense) (None,
4) 516
===
=========

Total params: 813,604
Trainable params: 813,604

Non-trainable params: 0

_

In
[89]:
model.fit_generator(generator=x_train,steps_per_epoch=len(x_train),validati
on_data=x_test,validation_steps=len(x_test),epochs=20)
Epoch 1/20

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.
  """Entry point for launching an IPython kernel.
149/149 [==============================] - 44s 293ms/step - loss: 1.1635 - accuracy: 0.4798 - val_loss: 0.9364 - val_accuracy: 0.6566
Epoch 2/20
149/149 [==============================] - 41s 273ms/step - loss: 0.8416 - accuracy: 0.6429 - val_loss: 0.8283 - val_accuracy: 0.6717
Epoch 3/20
149/149 [==============================] - 42s 284ms/step - loss: 0.6678 - accuracy: 0.7655 - val_loss: 0.7795 - val_accuracy: 0.7323
Epoch 4/20
149/149 [==============================] - 41s 273ms/step - loss: 0.6775 - accuracy: 0.7493 - val_loss: 0.6493 - val_accuracy: 0.7626
Epoch 5/20
149/149 [==============================] - 41s 273ms/step - loss: 0.5995 - accuracy: 0.7749 - val_loss: 0.6781 - val_accuracy: 0.7879
Epoch 6/20
149/149 [==============================] - 41s 273ms/step - loss: 0.5397 - accuracy: 0.7817 - val_loss: 0.8131 - val_accuracy: 0.7172
Epoch 7/20
149/149 [==============================] - 42s 285ms/step - loss: 0.4696 - accuracy: 0.8275 - val_loss: 0.6780 - val_accuracy: 0.7879
Epoch 8/20
149/149 [==============================] - 41s 272ms/step - loss: 0.4959 - accuracy: 0.8194 - val_loss: 0.8018 - val_accuracy: 0.7576
Epoch 9/20
149/149 [==============================] - 41s 273ms/step - loss: 0.3969 - accuracy: 0.8544 - val_loss: 0.6865 - val_accuracy: 0.7828
Epoch 10/20
149/149 [==============================] - 41s 273ms/step - loss: 0.3885 - accuracy: 0.8652 - val_loss: 0.8218 - val_accuracy: 0.7677
Epoch 11/20
149/149 [==============================] - 42s 280ms/step - loss: 0.3552 - accuracy: 0.8652 - val_loss: 1.0350 - val_accuracy: 0.7374
Epoch 12/20
149/149 [==============================] - 41s 273ms/step - loss: 0.3266 - accuracy: 0.8801 - val_loss: 0.7144 - val_accuracy: 0.7778
Epoch 13/20
```

149/149 [==============================] - 40s 268ms/step - loss: 0.2738 - accuracy: 0.8949 - val_loss: 0.6965 - val_accuracy: 0.7879
Epoch 14/20
149/149 [==============================] - 40s 271ms/step - loss: 0.2957 - accuracy: 0.8827 - val_loss: 0.7882 - val_accuracy: 0.7677
Epoch 15/20
149/149 [==============================] - 42s 283ms/step - loss: 0.2576 - accuracy: 0.9084 - val_loss: 1.0848 - val_accuracy: 0.7525
Epoch 16/20
149/149 [==============================] - 41s 271ms/step - loss: 0.2901 - accuracy: 0.8976 - val_loss: 0.8777 - val_accuracy: 0.7828
Epoch 17/20
149/149 [==============================] - 41s 271ms/step - loss: 0.2853 - accuracy: 0.9097 - val_loss: 1.1820 - val_accuracy: 0.7273
Epoch 18/20
149/149 [==============================] - 42s 276ms/step - loss: 0.2219 - accuracy: 0.9272 - val_loss: 0.8731 - val_accuracy: 0.7929
Epoch 19/20
149/149 [==============================] - 41s 275ms/step - loss: 0.1894 - accuracy: 0.9353 - val_loss: 1.0621 - val_accuracy: 0.7374
Epoch 20/20
149/149 [==============================] - 40s 269ms/step - loss: 0.2297 - accuracy: 0.9151 - val_loss: 1.1963 - val_accuracy: 0.7374

O

ut[89]: In [90]: model**.**save('analysis.h5') model_json=model**.**to_json() **with** open("model-bw.json","w") **as** json_file:
  json_file**.**write(model_json)

I

n [91]: **from** tensorflow.keras.models **import** load_model **from** tensorflow.keras.preprocessing **import** image model=load_model('analysis.h5')

In [92]:

x_train**.**class_indices

Out[92]:

{'Cyclone': 0, 'Earthquake': 1, 'Flood': 2, 'Wildfire': 3}

I

n [93]: img = image**.**load_img(r"/content/drive/MyDrive/dataset/test_set/Earthquake/1347.jpg",target_size=(64,64)) x=image**.**img_to_array(img) x=np**.**expand_dims(x,axis=0)

```
index=['Cyclone','Earthquake','Flood','Wildfire']
y=np.argmax(model.predict(x),axis=1)
print(index[int(y)])
1/1 [==============================] - 0s 82ms/step
Earthquake

In [94]: img = image.load_img(r"/content/drive/MyDrive/dataset/test_set/Cyclone/918.jpg",
target_size=(64,64)) x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
index=['Cyclone','Earthquake','Flood','Wildfire']
y=np.argmax(model.predict(x),axis=1)
print(index[int(y)])
1/1 [==============================] - 0s 23ms/step Cyclone
```

8. TESTING

8.1 Test Cases

TEST CASE ANALYSIS

Section	Total Cases	Not Tested	Fail	Pass
Client Application	10	0	3	7
Security	2	0	1	1
Performance	3	0	1	2
Exception Reporting	2	0	0	2

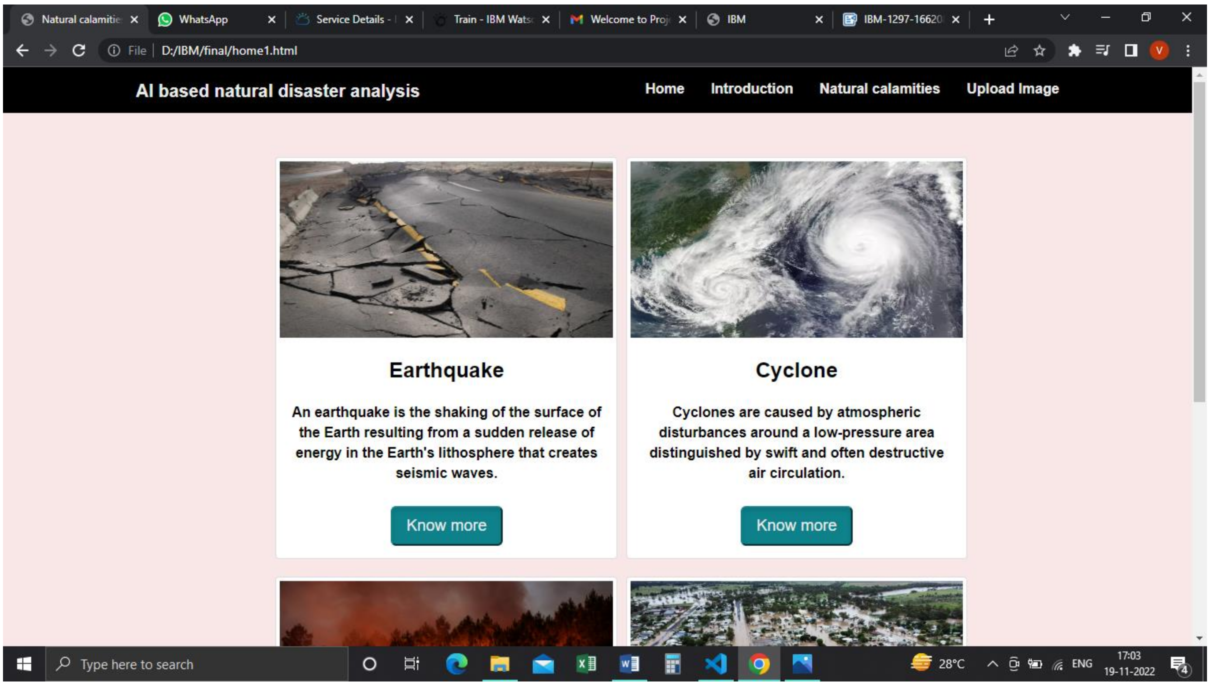
8.2 User Acceptance Testing

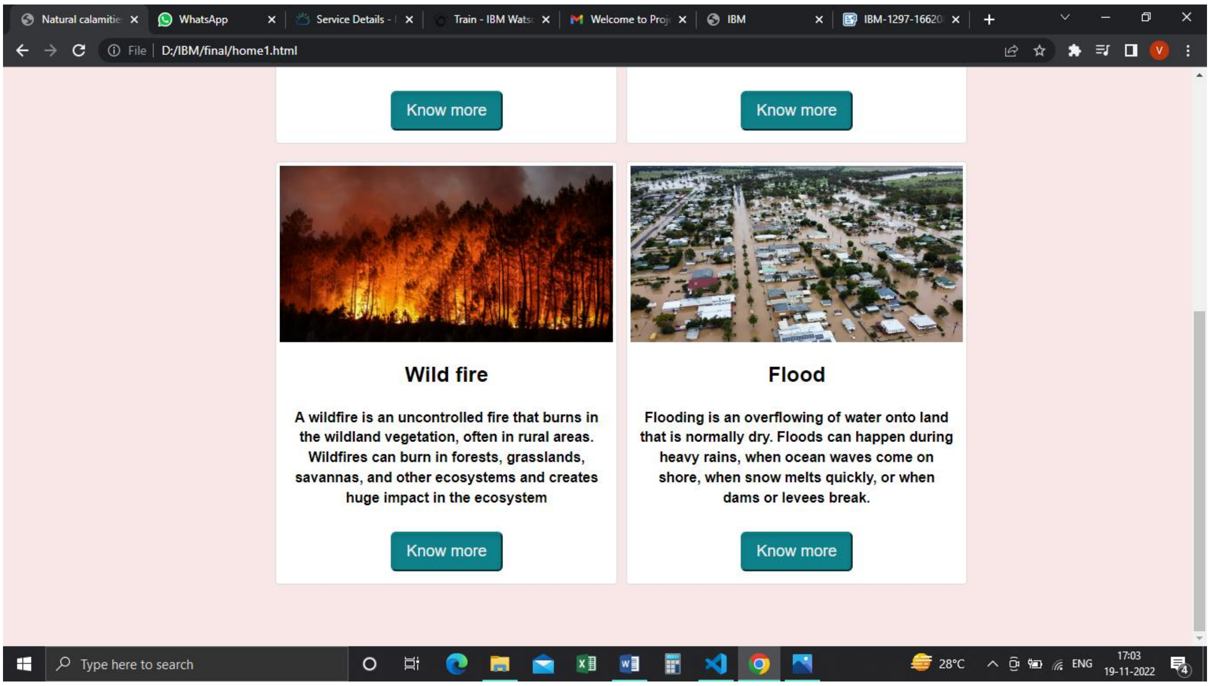
DEFECT ANALYSIS

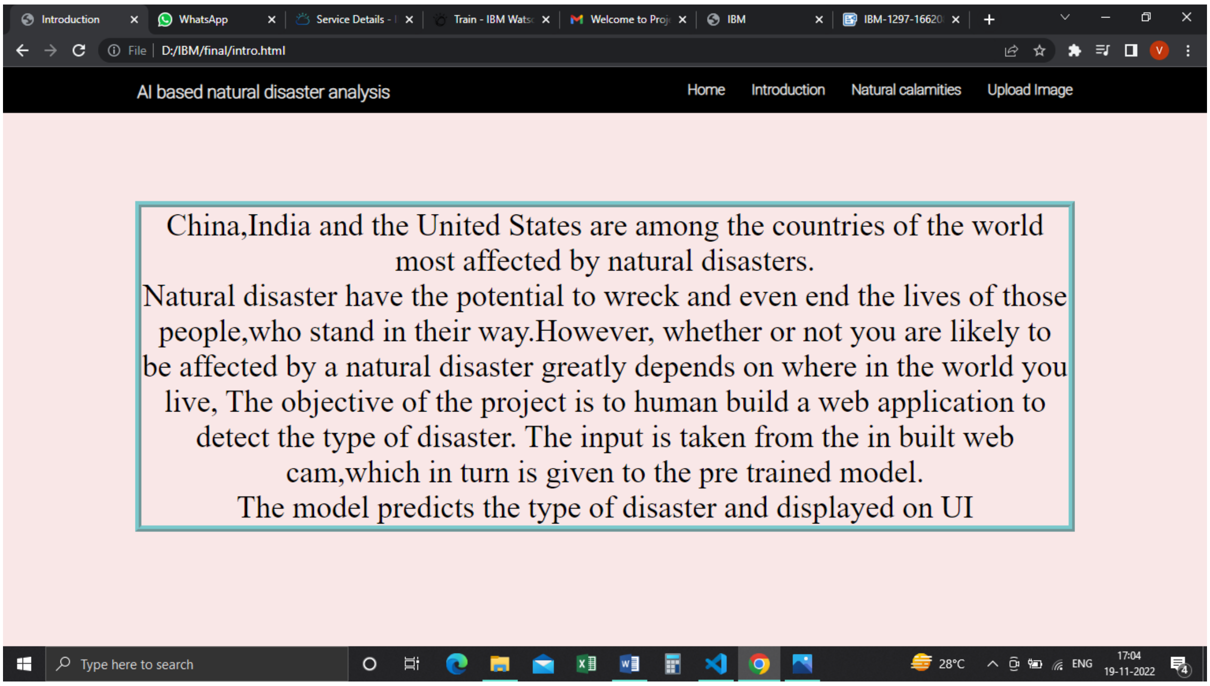
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Total
By Design	1	0	1	0	2
Duplicate	0	0	0	0	0
External	0	0	2	0	2
Fixed	4	1	0	1	6
Not Reproduced	0	0	0	1	1
Skipped	0	0	0	1	1
Won't Fix	1	0	1	0	2
Total	6	1	4	3	14

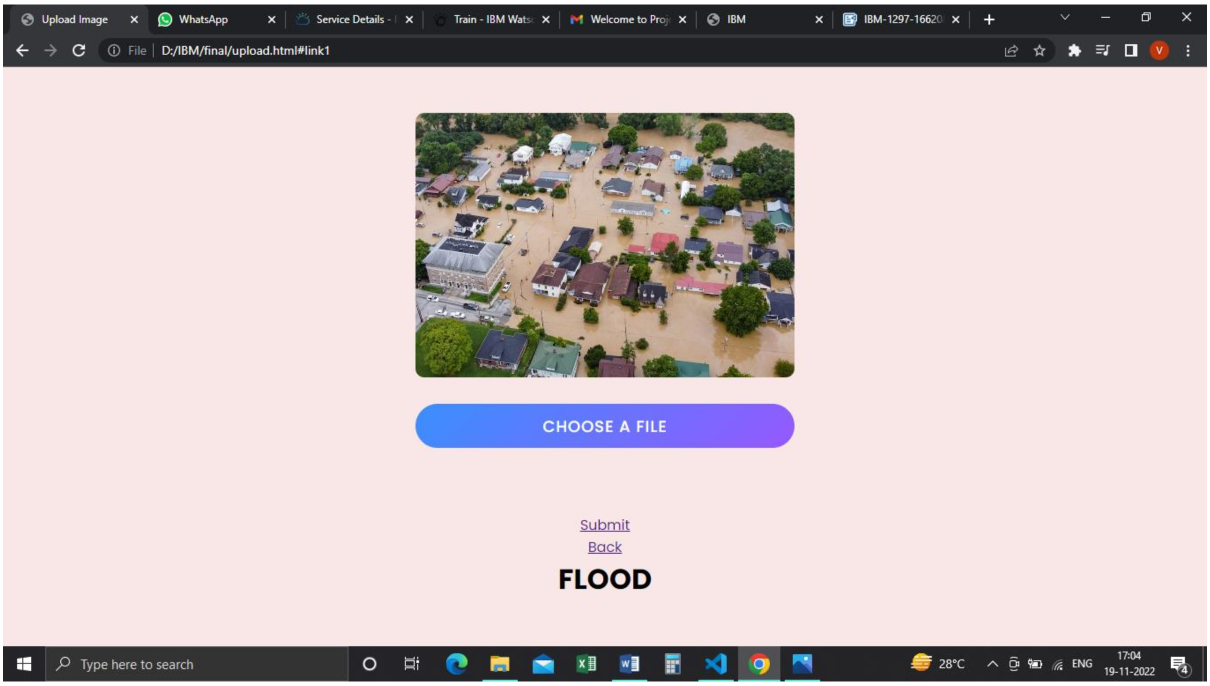
9. RESULTS

9.1 Performance Metrics






D:/IBM/final/intro.html
AI based natural disaster analysis
Home
Introduction
Natural calamities
Upload Image
China,India and the United States are among the countries of the world most affected by natural disasters.
Natural disaster have the potential to wreck and even end the lives of those people,who stand in their way.However, whether or not you are likely to be affected by a natural disaster greatly depends on where in the world you live, The objective of the project is to human build a web application to detect the type of disaster. The input is taken from the in built web cam,which in turn is given to the pre trained model.
The model predicts the type of disaster and displayed on UI
Type here to search
28°C
ENG
17:04
19-11-2022


D:/IBM/final/upload.html#link1
CHOOSE A FILE
Submit
Back
FLOOD
Type here to search
28°C
ENG
17:04
19-11-2022

10. ADVANTAGES AND DISADVANTAGES

Advantages

- In order to balance their personal and professional lives, people require breaks and vacation time. However, AI can operate continuously without rest.
- With the aid of various AI-based methods, we can also predict the weather for the present day and the coming days.
- Beneficial in regaining control of one's life.

Their alert temperament allows them to react quickly and effectively, protecting society from significant harm.

Disadvantages

- Getting outfitted costs a lot of money.
- Issues with basic necessities.
- Robots are one use of artificial intelligence that are replacing jobs and raising unemployment.

Machines can only do jobs for which they are created or programmed; if they are asked to complete anything else, they frequently fail or produce useless results, which can create serious problem.

11.CONCLUSION

Numerous researchers have tried to detect natural disasters using various deep learning techniques. Deep learning algorithms for natural disaster detection still have a number of concerns with noise and severe class imbalances. We suggested a multilayered deep convolutional neural network for natural disaster identification and intensity classification to overcome these issues. The suggested method consists of two blocks:the first block is used to identify natural disasters, and the second block is used to address concerns with unequal class representation. As average statistical values, the following findings were derived for the suggested model: sensitivity, 97.54%; specificity, 98.22%; accuracy rate,99.92%; precision, 97.79%; and F1-score, 97.97%. Due to its multilayered nature,the proposed model outperformed other cutting-edge techniques in terms of accuracy.

12.FUTURE SCOPE

Google's pilot effort in Patna, India, to use artificial intelligence to monitor floods, was a success last year. With an accuracy of over 90%, they were able to foresee floods and the areas that would be impacted by the natural calamity. It was made feasible by a mix of information from government organizations that supply on-the-ground data, including measurements taken with on-the-ground measuring devices and satellite photographs offlood-prone locations. To forecast the flow of water, they performed hundreds of thousands of simulations using its machine learning (ML)models. By using AI, disaster management organizations can deploy robots, sensors, and drones in the future to offer precise information on damaged structures and landscapes, impending floods, and safer rescue missions. Smart technology must be included into our neighborhood communities. The degree of the harm can be decreased with an immediate response and technological remedies. However, there are some restrictions and mistakes with AI because it is based on machine codes. However, combining human empathy with vigilance could be extremely beneficial in the realm of crisis management.

13.APPENDIX

GIT REPO LINK:

https://github.com/IBM-EPBL/IBM-Project-1297-1658383424

DEMO LINK:

https://youtu.be/Nib3RQdql2Y