Natural Disaster Intensity Analysis and Classification Using AI

1.INTRODUCTION

1.1 PROJECT OVERVIEW

AI refers to technologies that mimic or even outperform human intelligence when performing certain tasks. ML, which is a subset of AI that includes supervised (e.g., random forest or decision trees), unsupervised (e.g., *K*-means) or reinforcement (e.g., Markov decision process) learning, can be simplified as parsing data into algorithms that learn from data to make classifications or predictions. AI methods offer new opportunities related to applications in, for instance, observational data pre-processing as well as forecast model output post-processing. The methodological potential is strengthened by novel processor technologies that allow heavy-duty, parallel data processing.

In general, the performance of ML for a given task is predicated upon the availability of quality data and

the selection of an appropriate model architecture. Through remote sensing (e.g., from satellites, drones), instrumental networks (e.g., from meteorological, hydrometeorological, and seismic stations) and crowdsourcing, our foundation of Earth observational data has grown immensely. In addition, model architectures are constantly being refined. Therefore, it is to be expected that ML will be growing more prominent in DRR applications (Sun et al., 2020).

This preliminary survey clearly demonstrates that AI-related methods are being applied to help us better manage the impacts of many types of natural hazards and disasters. In the next paragraphs we present four specific examples of where AI is being implemented to support DRR.

1.2 PURPOSE

- Strengthen disaster risk governance at all levels from local to centre

• Invest in disaster risk reduction for resilience through structural, nonstructural and financial measures, as well as comprehensive capacity development

• Enhance disaster preparedness for effective response • Promote "Build Back Better" in recovery, rehabilitation and reconstruction

• Prevent disasters and achieve substantial reduction of disaster risk and losses in lives, livelihoods, health, and assets (economic, physical, social, cultural and environmental)

• Increase resilience and prevent the emergence of new disaster risks and reduce the existing risks

• Promote the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures to prevent and reduce hazard exposure and vulnerabilities to disaster

• Empower both local authorities and communities as partners to reduce and manage disaster risks

• Strengthen scientific and technical capabilities in all aspects of disaster management • Capacity development at all levels to effectively respond to multiple hazards and for community-based disaster management

• Provide clarity on roles and responsibilities of various Ministries and Departments involved in different aspects of disaster management

• Promote the culture of disaster risk prevention and mitigation at all levels

• Facilitate the mainstreaming of disaster management concerns into the developmental planning and processes.

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

Studies analyzing the intensity of natural disasters have gained significant attention in the current decade. A. Ashiquzzaman et al. utilized a video source for fire detection; processing video sources is a feasible task due to convolutional neural networks (CNNs), which require high performance computational resources including graphics hardware, and thus a smart and cost-effective fire detection network is proposed based on architecture of convolutional neural networks.

In convolutional neural networks, a model to detect wild fire smoke named wild fire smoke dilated dense net was proposed by Li et al. consisting of a candidate smoke region segmentation strategy using an advanced network architecture.Mangalathuetal performed an evaluation of building clusters affected by earthquakes by exploring the deep learning method, which uses long short-term memory.

Natural disasters are unpredictable events, Hartawan et al enhanced multilayer perceptron algorithm by including convolutional neural network implemented on raspberry pi to find out the victims of natural disasters using streaming cameras and to aid the evacuation team to rescue the disaster victims. Amit et al. proposed applying automatic natural disaster detection to a convolutional neural network using the features of disaster from resized satellite images of landslide and flood detections. Aerial images are able to show more specific and wider surface area of the ground, which helps acquire a vast amount of information about the occurrence of disaster.

Socialmedia have been used as data sources to carry out disaster analysis. S. Yang et al. used the information related to earthquake shared by users on Twitter as a dataset and input it to the real time event detection system based on convolutional neural networks. Implementation of a CNN module made it possible to successfully achieve the detection of an earthquake and its announcement by the government beforehand using information-based tweets. As the tweets provide a significant amount of information, Madichetty et al. implemented a convolutional neural network to perform feature extraction on informative as well as noninformative tweets, categorizing dataset containing tweets by an artificial neural network.

Social media is considered as a main sourceof bigdata,with datas hared in the form of images, videos and text; after the occurrence of a disaster, social platforms are overflowed with different sorts of information which helps response teams to rescue the victims. The majority of the data contain ambiguous contents which makes it difficult for the rescue teams to make the right decisions. Nunavath et al. reviewed previous research based on convolutional neural networks using social media as a dataset and efficiently analyzed the effectiveness of big data from social media during disaster management.

Using the two-layer architecture of a convolutional neural network(CNN),an efficient feature extraction method was applied to the extended Cohn-Kanade dataset to compare three object recognition techniques: linear support vector classification, linear discriminant analysis and softmax. More than 90% performance rates, with low standard deviations, were achieved by Boonsuk et al. The use of manpower is difficult in case of natural disaster occurrence in hilly areas, and continuous electric power supply is highly affected in these areas due to maintenance issues of transmission lines. Therefore, in this auto pilotaerial equipment is usedtogatherimages,andhiddencontentfromaerialimages needs to be identified in case of natural disasters such as landslides and heavysnowfall. Zhou et al. removed the noise from raw aerial images and extracted disaster characteristics using the interframe difference technique; they implemented a convolutional neural network to analyze the type of disaster. In some regions, disasters such as earthquakes are inclined to occur due to geographical factors. To locate the victim in a short time is crucial; Sulistijonoet al.acquired aerialimages, and locatingthe victimswas madepossibleby using a dedicated ground station server and proposed victim detection framework based on convolution neural networks. A simulation of real calamities was developed to test the framework.

2.2 REFERENCES

1 Natural Disasters Intensity Analysis and Classification Based on Multispectral Images Using Multi-Layered Deep Convolutional NeuralNetwork

Author: Muhammad Aamir , Tariq Ali, Muhammad Irfan, Ahmad Shaf, Muhammad Zeeshan Azam, Adam Glowacz, Frantisek Brumercik, Witold Glowacz,Samar Alqhtani and Saifur Rahman

Year: 2021

2 Establishing effectivecommunications in disasteraffected areas and artificial intelligence based detection using social media platform

Author: Mohsin Raza, Muhammad Awais, Kamran Ali, Nauman Aslam, Vishnu VardhanParanthaman, Muhammad Imran, Farman Ali

Year: 2020

3 Artificial neural network for predicting earthquake casualties and damages in Indonesia

Author: Rienna Oktarina, Senator Nur Bahagia,Lucia Diawati, Krisha S. Pribadi

Year: 2022

4 Flood susceptibility modelling using advancedensemble machine learning models

Author: Abu Reza Md Towfiqul Islam, Swapan Talukdar , Susanta Mahato, Sonali Kundu, KutubUddin Eibek, Quoc Bao Pham, Alban Kuriqi, Nguyen Thi Thuy Linh

Year: 2021

5 A Machine Learning-Based Approach fo Wildfire Susceptibility Mapping. The Case Study ofthe Liguria Region in Italy

Author: Marj Tonini,Mirko D'Andrea, Guido Biondi, Silvia Degli Esposti,Andrea Trucchia

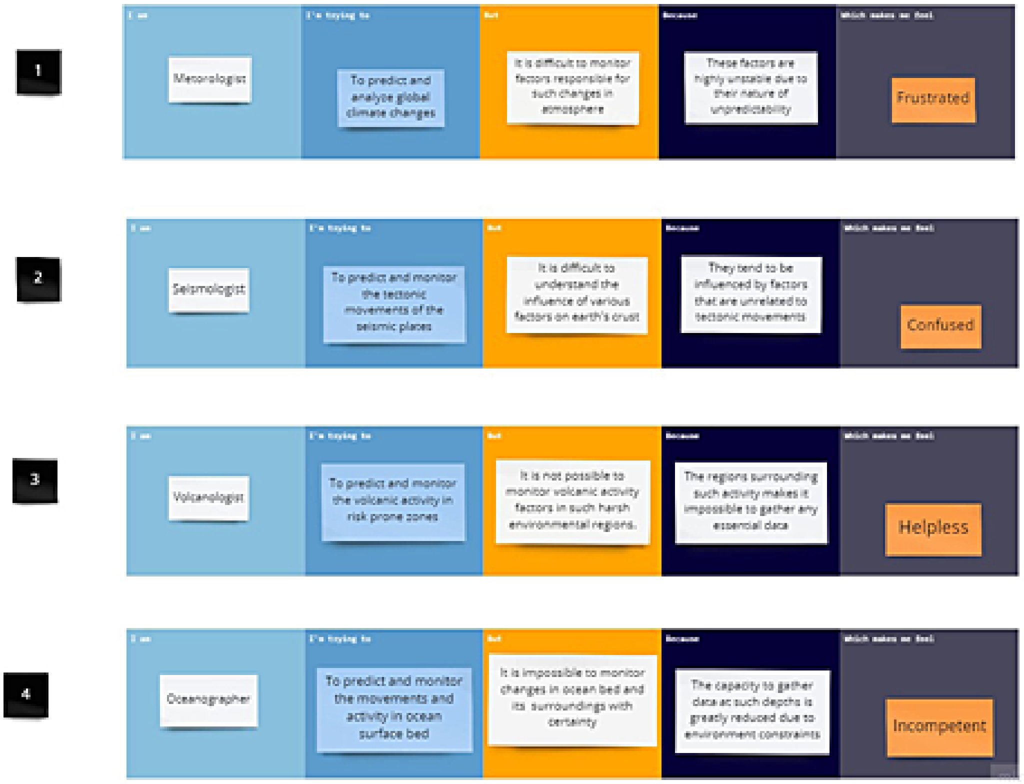
Year: 2020

6 A Deep Cascade of Convolutional Neural Networks for DynamicMR Image Reconstruction

Author: Jo Schlemper, Jose Caballero, Joseph V. Hajnal, Anthony Price, Daniel

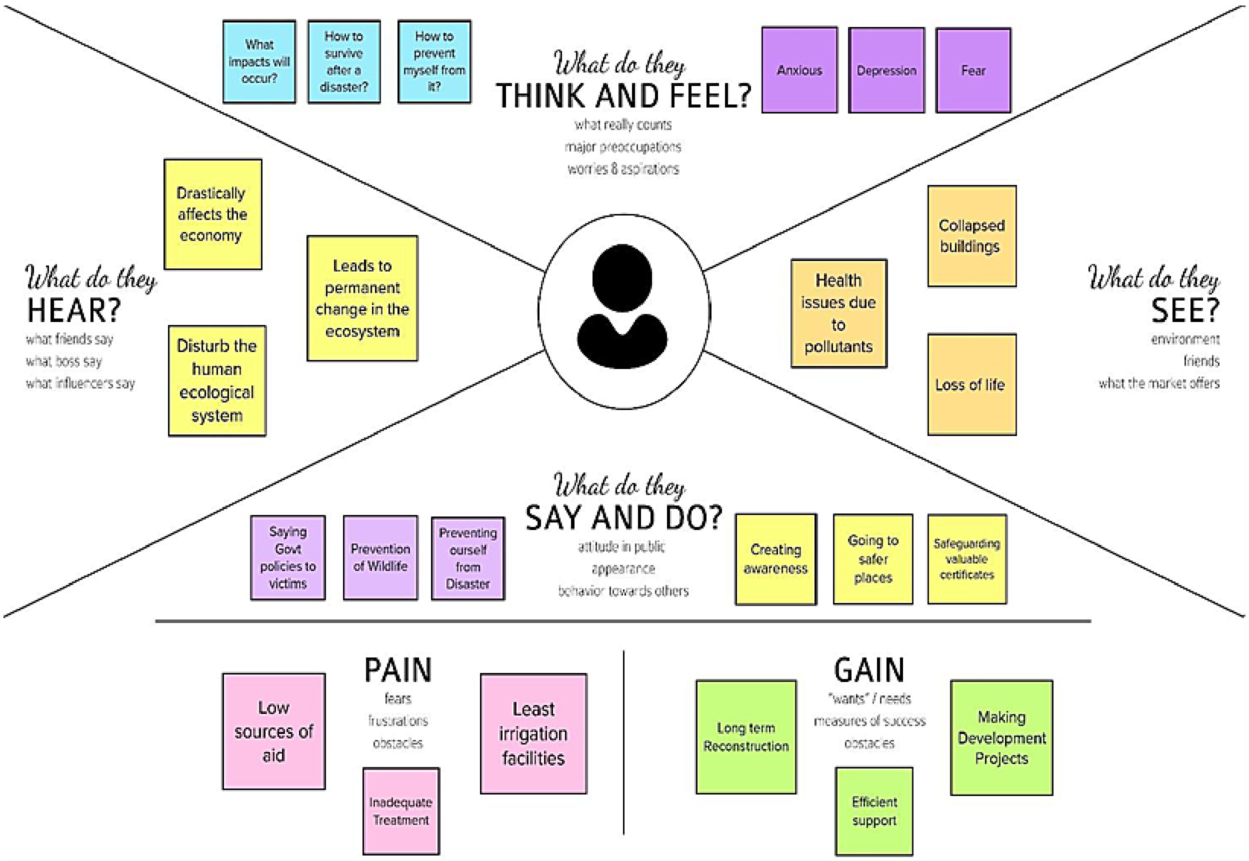
Year: 2017

2.3 PROBLEM STATEMENT



3.IDEATION &PROPOSED SOLUTION

3.1 EMPHATHY MAP CANVAS



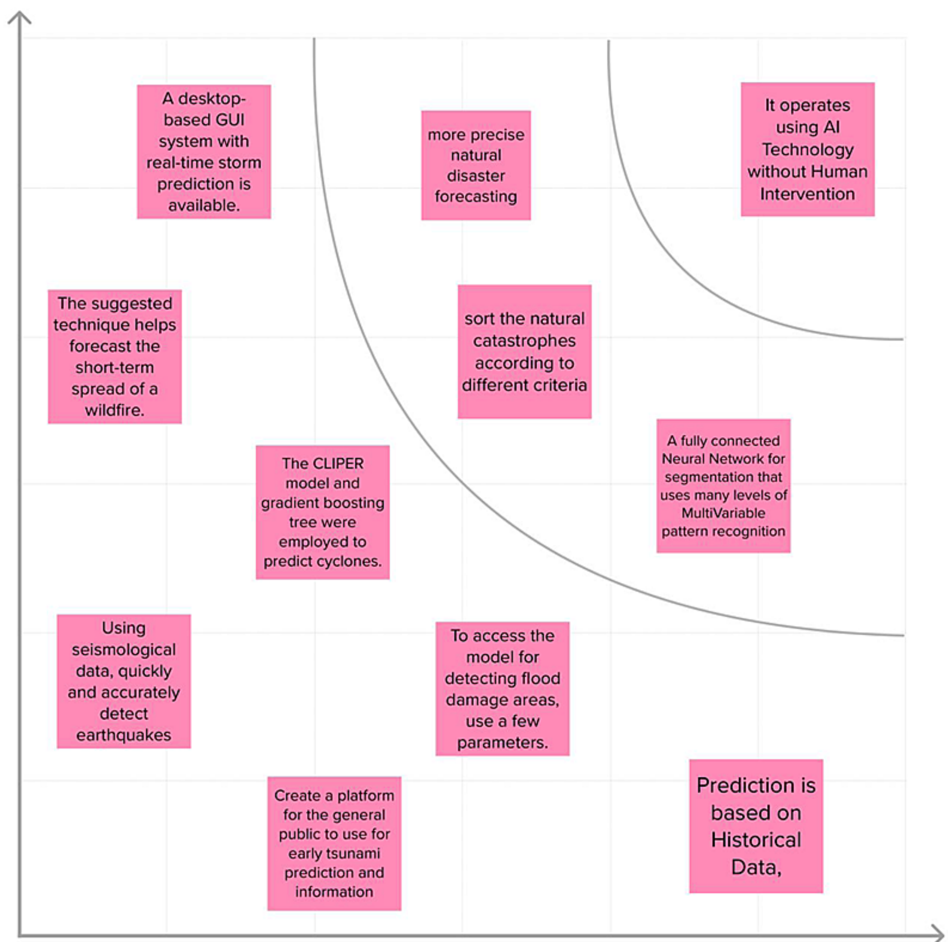
3.2 **IDEATION &BRAINSTORMING**

4

Prioritize

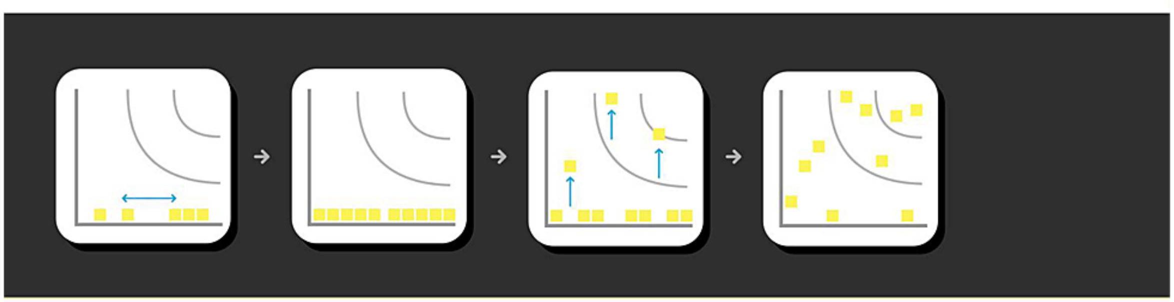
.

.



Feasibility

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



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In some areas there is a lack of proper practical disaster education and lack of knowledge of Disaster Risk Reduction (DDR).
2.	Idea / Solution description	Even when you know in advance that there will be a natural disaster, you may still not be adequately prepared to handle the aftermath. And that's especially true
3.	Social Impact / Customer Satisfaction	Even when you know in advance that there will be a natural disaster, you may still not be adequately prepared to handle the aftermath. And that's especially true for small businesses with limited resources. Let's look at
4	Business Model (Revenue Model)	• Risk identity • Develop a plan • Implement & train ◦ Be a leader in community
5.	Scalability of the Solution	Disaster recovery (DR) is a key tool for ensuring business continuity in the face of data or server environment loss. With an effective DR solution in place, businesses can **quickly recover from many different emergencies,** from user errors that delete mission- critical information and applications, to ransomware attacks that corrupt entire databases.

4 REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

FR NUMBER	Functional Requirement	Sub Requirement (Story / Sub-Task)
FR1	User Registration	Registration through Form
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Help Desk	User should be able to get guidance from the customer care
FR-4	Management	Administration must collect new datasets and keep the model trained
FR-5	User authentication	Verify the user

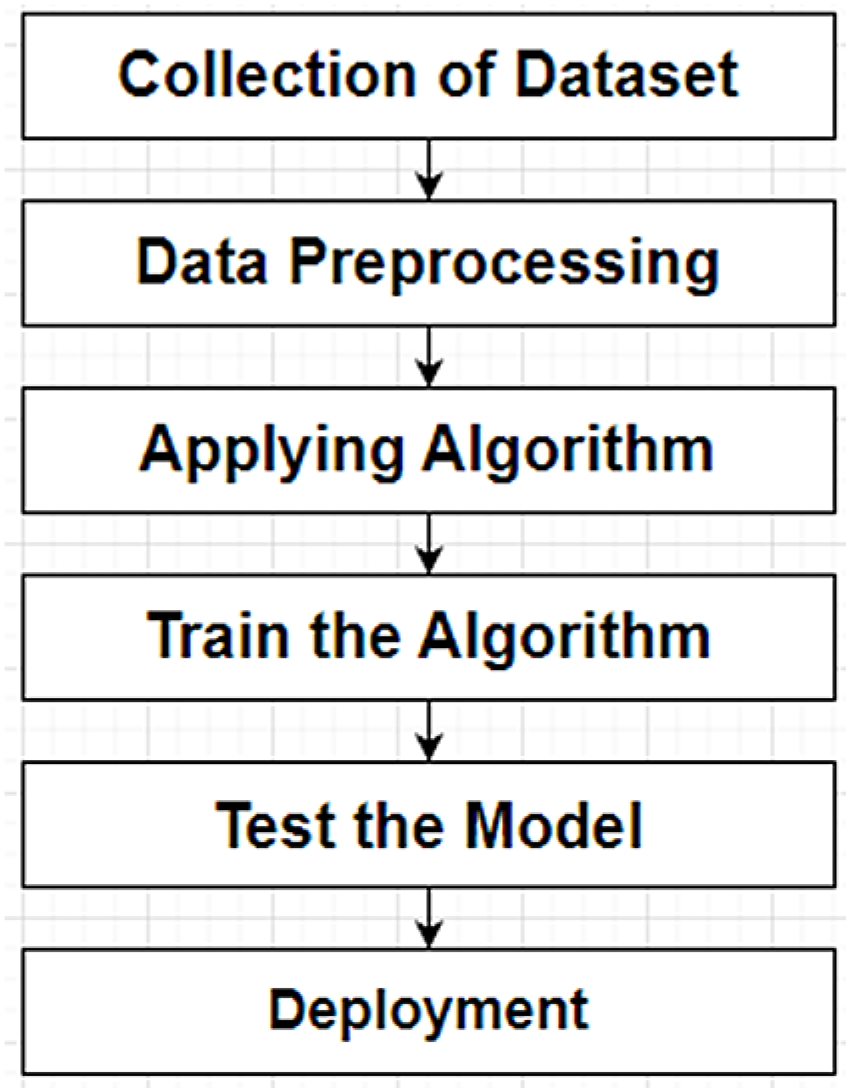
4.2 NONFUNCTIONAL REQUIREMENT

FR No.	Non-Functional Requirement	Description
NFR-1	USABILITY	The system must be efficient and easy for the user to carry out tasks.
NFR-2	RELIABILTY	User details must be secured.
NFR-3	SECURITY	The output produced should be reliable to the users.
		The system should be able to

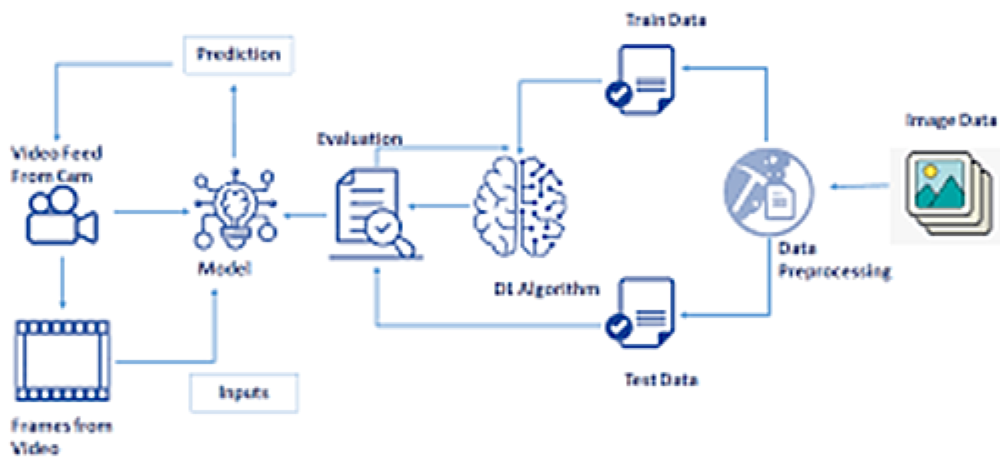
NFR-4	PERFORMANCE	handle many users without performance deterioration**.**
NFR-5	AVAILABILITY	The system should be accessible to a user at a given point in time
NFR-6	SCALABILITY	The website pages should load fast with the total number of simultaneous users.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION AND TECHNICAL ARCHIETCTURE



5.3 USER STORIES

sprint	functional requirement	user story number	user story	story point	priority	team member
sprint 2	Registration	USN-1	As a user, Registering into the product using a valid email address	5	high	Durga praveena
sprint 1	Registration	USN-2	As a user, Registering into the product using a valid username and password	3	medium	pirya
sprint 2	Authentication	USN-3	As a user , I adept to logging into the system	4	high	Benila

			with credentials			
sprint 1	Authentication	USN-4	As a user , I adept to logging into the system with OTP	2	high	Brilliya Twinkle
sprint 2	Designation of Region	USN-5	selecting the region of interest to be monitored and analysed	3	high	Durga praveena
sprint 1	Analysis of Required Phenomenon	USN-6	Regulating certain factors influencing the actions of the phenomenon	3	medium	Beilliya Twinkle
sprint 4	Accumulation of required Data	USN-7	Gathering data and detailed report on past event analysis	4	low	Benila
sprint 1	Organizing Unstructured data	USN-8	Organizing and reorienting the raw data into a refined data	3	high	Piriya
sprint 3	Algorithm selection	USN-9	Choosing a required algorithm for specific	3	low	Brilliya Twinkle

			analysis			
sprint 2	Prediction and analysis of data	USN-10	Predicting and visualizing the data effectively	6	high	Durga Pravena

6.PROJECT PLANNING & SCEDULING

6.1 SPRINT PLANNING AND ESTIMATION

IDEATION PHASE--------------------SPRINT 1

PROJECT PLANNING PHASE1-----------------SPRINT 2

PROJECT PLANING PHASE 2-------------------SPRINT 3

PROJECT PLANNING--------------------SPRINT 4

6.2 SPRINT DELIVERY SCHEDULE

SPRINT PLAN

1.Identify the problem

2.Prepare a abstract,problem statement

3.List a require needed

4.Create a code and run it

5.Make a prototype

6.Test the code

7.Solution for the problem is found

7.CODING&SOLUTION

```
#extract zip file

!unzip '/content/dataset.zip'
#importing image data generator library
from tensorflow.keras.preprocessing.image import ImageDataGenerator
Image Data Augmentation
```

```
#Configuring image Data Generator Class

#Setting Parameter for Image Augmentation for training data

train_datagen = ImageDataGenerator(rescale = 1./255, shear_range =
0.2, zoom_range = 0.2, horizontal_flip = True)

#Image Data Augmentation for testing data

test_datagen = ImageDataGenerator(rescale = 1./255)
```

Apply ImageDataGenerator Functionality To Trainset And Testset

```
#Performing data augmentation to train data

x_train =
train_datagen.flow_from_directory('/content/dataset/train_set',
target_size = (64,64), batch_size = 5, color_mode = 'rgb', class_mode
= 'categorical')

#performing data augmentation to test data

x_test = test_datagen.flow_from_directory('/content/dataset/test_set',
target_size = (64,64), batch_size = 5, color_mode = 'rgb', class_mode
= 'categorical')
Found 742 images belonging to 4 classes.
Found 198 images belonging to 4 classes.
#importing neccessary libraries

import numpy as np
import tensorflow
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Conv2D,MaxPooling2D,Flatten
# initialising the model and adding CNN layers

model = Sequential()

# First convolution layer and pooling
model.add(Conv2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))

#Second convolution layer and pooling
```

```
model.add(Conv2D(32,(3,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))

#Flattening the layers
model.add(Flatten())

#Adding Dense Layers
model.add(Dense(units=128,activation='relu'))
model.add(Dense(units=4,activation='softmax'))
# Summary of our model

model.summary()
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896       
                                                                 
 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0         
 )                                                               
                                                                 
 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248      
                                                                 
 max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0         
 2D)                                                             
                                                                 
 flatten (Flatten)           (None, 6272)              0         
                                                                 
 dense (Dense)               (None, 128)               802944    
                                                                 
 dense_1 (Dense)             (None, 4)                 516       
                                                                 
=================================================================
Total params: 813,604
Trainable params: 813,604
Non-trainable params: 0
_________________________________________________________________
# Compiling the model

model.compile(optimizer='adam', loss='categorical_crossentropy',
metrics=['accuracy'])
```

```
# Fitting the model

model.fit_generator(generator=x_train,steps_per_epoch=len(x_train),epoc
hs=20,validation_data=x_test,validation_steps=len(x_test))
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:3:
UserWarning: `Model.fit_generator` is deprecated and will be removed in
a future version. Please use `Model.fit`, which supports generators.
  This is separate from the ipykernel package so we can avoid doing
imports until
Epoch 1/20
149/149 [==============================] - 42s 272ms/step - loss:
1.1632 - accuracy: 0.5216 - val_loss: 0.9812 - val_accuracy: 0.5354
Epoch 2/20
149/149 [==============================] - 38s 252ms/step - loss:
0.8483 - accuracy: 0.6712 - val_loss: 0.7859 - val_accuracy: 0.7374
Epoch 3/20
149/149 [==============================] - 39s 263ms/step - loss:
0.6883 - accuracy: 0.7278 - val_loss: 0.8899 - val_accuracy: 0.6970
Epoch 4/20
149/149 [==============================] - 41s 279ms/step - loss:
0.6571 - accuracy: 0.7170 - val_loss: 1.0388 - val_accuracy: 0.6111
Epoch 5/20
149/149 [==============================] - 38s 253ms/step - loss:
0.5828 - accuracy: 0.7655 - val_loss: 0.7886 - val_accuracy: 0.7525
Epoch 6/20
149/149 [==============================] - 39s 265ms/step - loss:
0.5124 - accuracy: 0.8113 - val_loss: 0.9449 - val_accuracy: 0.6616
Epoch 7/20
149/149 [==============================] - 38s 252ms/step - loss:
0.4475 - accuracy: 0.8208 - val_loss: 0.9295 - val_accuracy: 0.7626
Epoch 8/20
149/149 [==============================] - 37s 253ms/step - loss:
0.5198 - accuracy: 0.8208 - val_loss: 1.0729 - val_accuracy: 0.7172
Epoch 9/20
149/149 [==============================] - 39s 261ms/step - loss:
0.4103 - accuracy: 0.8423 - val_loss: 1.0310 - val_accuracy: 0.6768
Epoch 10/20
149/149 [==============================] - 42s 280ms/step - loss:
0.4223 - accuracy: 0.8491 - val_loss: 0.7108 - val_accuracy: 0.7929
Epoch 11/20
149/149 [==============================] - 38s 254ms/step - loss:
```

```
0.4170 - accuracy: 0.8544 - val_loss: 0.8419 - val_accuracy: 0.7121
Epoch 12/20
149/149 [==============================] - 40s 268ms/step - loss:
0.3207 - accuracy: 0.8841 - val_loss: 0.7221 - val_accuracy: 0.8030
Epoch 13/20
149/149 [==============================] - 38s 249ms/step - loss:
0.3373 - accuracy: 0.8585 - val_loss: 0.9803 - val_accuracy: 0.7525
Epoch 14/20
149/149 [==============================] - 43s 287ms/step - loss:
0.3147 - accuracy: 0.8922 - val_loss: 1.3861 - val_accuracy: 0.6667
Epoch 15/20
149/149 [==============================] - 40s 267ms/step - loss:
0.2967 - accuracy: 0.8841 - val_loss: 1.0562 - val_accuracy: 0.7626
Epoch 16/20
149/149 [==============================] - 39s 261ms/step - loss:
0.2683 - accuracy: 0.9003 - val_loss: 0.9182 - val_accuracy: 0.8182
Epoch 17/20
149/149 [==============================] - 40s 272ms/step - loss:
0.2650 - accuracy: 0.8976 - val_loss: 1.0180 - val_accuracy: 0.7677
Epoch 18/20
149/149 [==============================] - 39s 264ms/step - loss:
0.2661 - accuracy: 0.9164 - val_loss: 0.8409 - val_accuracy: 0.7929
Epoch 19/20
149/149 [==============================] - 38s 256ms/step - loss:
0.2089 - accuracy: 0.9313 - val_loss: 1.0649 - val_accuracy: 0.7677
Epoch 20/20
149/149 [==============================] - 37s 251ms/step - loss:
0.2323 - accuracy: 0.9111 - val_loss: 0.9940 - val_accuracy: 0.7879
# Save the model

model.save('disaster.h5')
model_json = model.to_json()
with open("model-bw.json", "w") as json_file:
  json_file.write(model_json)
# Load the saved model

from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model = load_model('disaster.h5')
x_train.class_indices
{'Cyclone': 0, 'Earthquake': 1, 'Flood': 2, 'Wildfire': 3}
```

```
# taking image as input

img =
image.load_img('/content/dataset/test_set/Flood/1003.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 22ms/step
Flood
# input 2

img =
image.load_img('/content/dataset/test_set/Wildfire/1065.jpg',target_siz
e=(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 27ms/step
Wildfire
```

7.2 FEATURE 2

```
!DOCTYPE html>

<html lang="en">

<title>Home - Natural Disasters Database</title>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1">
```

```
<link rel="stylesheet" href="https://www.w3schools.com/w3css/4/w3.css">

<link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Lato">

<link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Montserrat">

<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">

<style>

body,h1,h2,h3,h4,h5,h6 {font-family: "Lato", sans-serif}

.w3-bar,h1,button {font-family: "Montserrat", sans-serif}

.fa-anchor,.fa-coffee {font-size:200px}

</style>

<body>



<!-- Navbar -->

<div class="w3-top">
```

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```
  <div class="w3-bar w3-black w3-card w3-left-align w3-large">

    <a class="w3-bar-item w3-button w3-hide-medium w3-hide-large w3-right w3-padding-large w3-hover-white w3-large w3-red" href="javascript:void(0);" onclick="myFunction()" title="Toggle Navigation Menu"><i class="fa fa-bars"></i></a>

    <a href="{% url 'home' %}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Home</a>

    <a class="w3-bar-item w3-button w3-padding-large w3-white">Earthquake</a>

    <a href="{%url 'tsunami'%}" class="w3-bar-item w3-button w3-hide-small w3-
```

```
padding-large w3-hover-white">Tsunami</a>

    <a href="{%url 'tornado'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Tornado</a>

    <a href="{%url 'volcano'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Volcanic Activity</a>

  </div>



  <!-- Navbar on small screens -->

  <div id="navDemo" class="w3-bar-block w3-white w3-hide w3-hide-large w3-hide-medium w3-large">

    <a href="#" class="w3-bar-item w3-button w3-padding-large">Earthquake</a>

    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tsunami</a>

    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tornado</a>

    <a href="#" class="w3-bar-item w3-button w3-padding-large">Volcanic Activity</a>

  </div>

</div>



<!-- Header -->
```

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```
<header class="w3-container w3-grey w3-center" style="padding:128px 16px">

  <h1 class="w3-margin w3-jumbo">Earthquakes</h1>

  <p class="w3-xlarge">Natural Disasters Database</p>
```

```
</header>

<div class="w3-container">

  <h2>Earthquakes</h2>

  <table class="w3-table-all">

    <tr>

      <th>Earthquake_id</th>

      <th>Intensity</th>

      <th>Date</th>

      <th>Country</th>

      <th>Place</th>

      <th>Latitude</th>

      <th>Longitude</th>

    {% for quake in all_quakes %}

      <tr>

        <td>{{quake.earthquake_id}}</td>

        <td>{{quake.intensity}}</td>

        <td>{{quake.date}}</td>

        <td>{{quake.country}}</td>

        <td>{{quake.place}}</td>

        <td>{{quake.latitude}}</td>
```

```
        <td>{{quake.longitude}}</td>
      </tr>
    {% endfor %}

  </table>
</div>

<div class="w3-container">
  <h2>Damage caused by the quakes</h2>
  <table class="w3-table-all">
    <tr>
      <th>Earthquake_id</th>
      <th>Amount (in million)</th>
      <th>Deaths (in thousands)</th>
      <th>House_destroyed (in thousands)</th>
    </tr>
    {% for d in damage %}
      <tr>
        <td>{{d.earthquake_id}}</td>
        <td>{{d.amount}}</td>
        <td>{{d.deaths}}</td>
```

```
      <td>{{d.house_destroyed}}</td>

    </tr>
```

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```
  {% endfor %}


 </table>

</div>


<div class="w3-container w3-black w3-center w3-opacity w3-padding-50">

  <h1 class="w3-margin w3-xlarge">Thanks for visiting the website</h1>

</div>


<!-- Footer -->

<footer class="w3-container w3-padding-40 w3-center w3-opacity">

 <div class="w3-xlarge w3-padding-20">

  <h1>A Database project </h1>

</footer>


<script>

// Used to toggle the menu on small screens when clicking on the menu button

function myFunction() {
```

```
  var x = document.getElementById("navDemo");
  if (x.className.indexOf("w3-show") == -1) {
    x.className += " w3-show";
  } else {
    x.className = x.className.replace(" w3-show", "");
```

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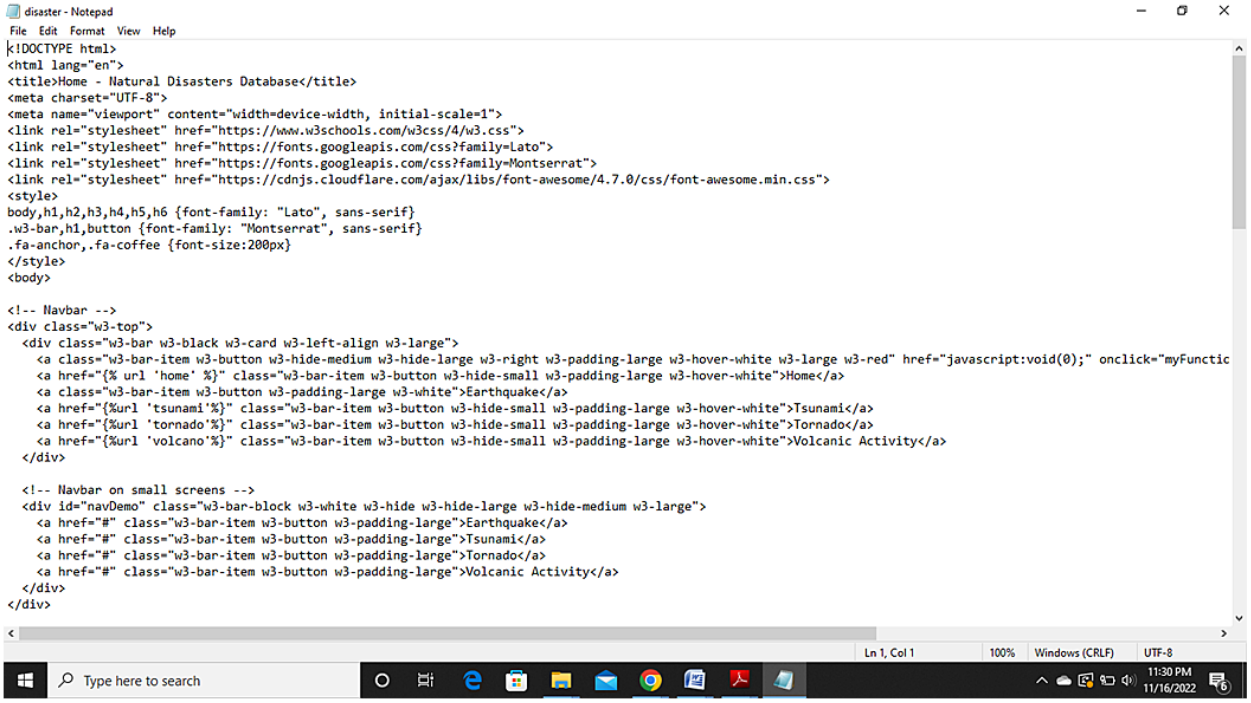
```
  }
}
</script>

</body>
</html>
```

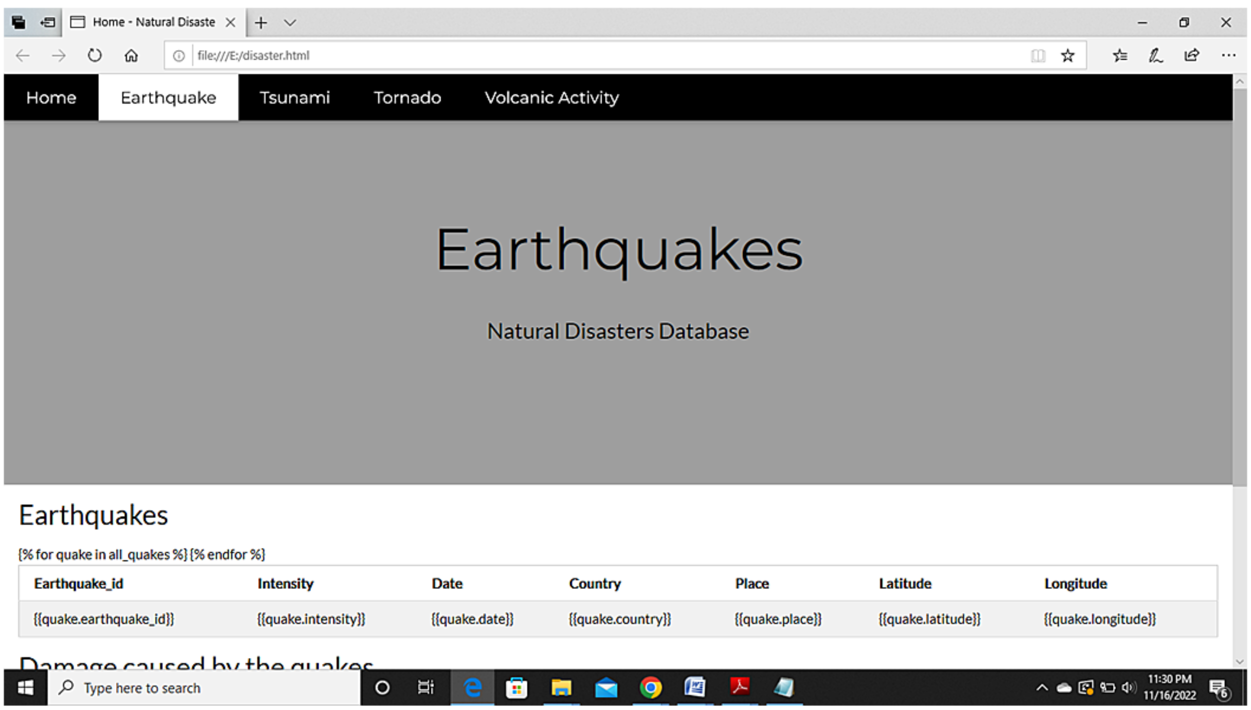
OUTPUT



```
<!DOCTYPE html>
<html lang="en">
<title>Home - Natural Disasters Database</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href="https://www.w3schools.com/w3css/4/w3.css">
<link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Lato">
<link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Montserrat">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">
<style>
body,h1,h2,h3,h4,h5,h6 {font-family: "Lato", sans-serif}
.w3-bar,h1,button {font-family: "Montserrat", sans-serif}
.fa-anchor,.fa-coffee {font-size:200px}
</style>
<body>

<!-- Navbar -->
<div class="w3-top">
  <div class="w3-bar w3-black w3-card w3-left-align w3-large">
    <a class="w3-bar-item w3-button w3-hide-medium w3-hide-large w3-right w3-padding-large w3-hover-white w3-large w3-red" href="javascript:void(0);" onclick="myFunctic
    <a href="{% url 'home' %}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Home</a>
    <a class="w3-bar-item w3-button w3-padding-large w3-white">Earthquake</a>
    <a href="{%url 'tsunami'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Tsunami</a>
    <a href="{%url 'tornado'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Tornado</a>
    <a href="{%url 'volcano'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Volcanic Activity</a>
  </div>

  <!-- Navbar on small screens -->
  <div id="navDemo" class="w3-bar-block w3-white w3-hide w3-hide-large w3-hide-medium w3-large">
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Earthquake</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tsunami</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tornado</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Volcanic Activity</a>
  </div>
</div>
```



7.3 DATABASE SCHEMA

Being prepared can reduce fear, anxiety, and losses that accompany disasters.

Communities, families, and individuals should know what to do in the event of a fire and where to seek shelter during a powerful storm. They should be ready to evacuate their homes and take refuge in public shelters and know how to care for their basic medical needs

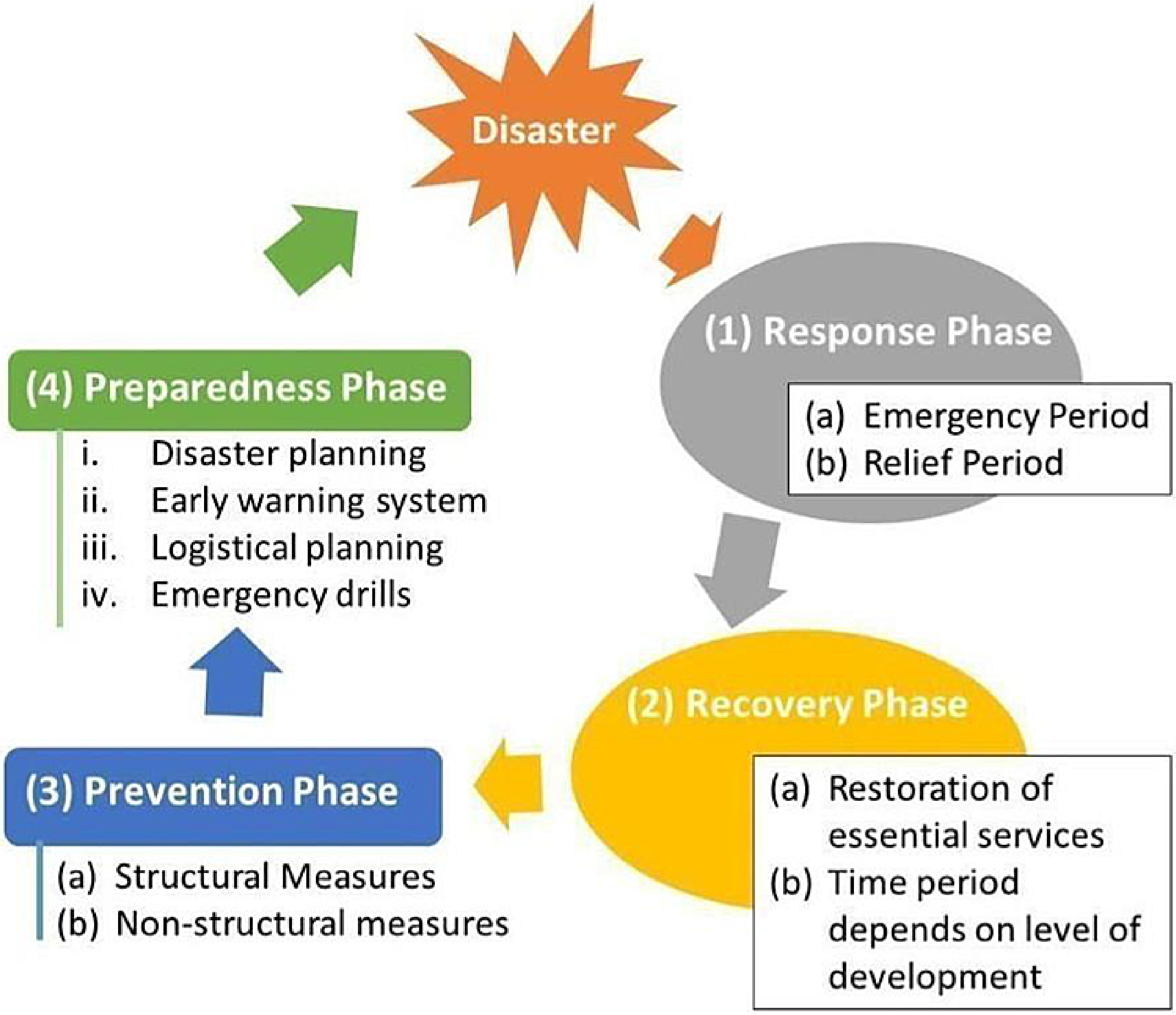
People also can reduce the impact of disasters (flood proofing, elevating a home or moving a home out of harm's way, and securing items that could shake loose in an earthquake) and sometimes avoid the danger completely.

You should know how to respond to severe weather or any disaster that could occur in your area – hurricanes, earthquakes, extreme cold, flooding, or terrorism.

You should also be ready to be self-sufficient for at least three days. This may mean providing for your own shelter, first aid, food, water, and sanitation.

There are many types of disasters and emergencies: fires, floods, earthquakes or manmade disasters. You and your family may need to survive on your own after an emergency. Having sufficient supplies such as food, water, medicine and emergency essentials is important. Local officials and relief workers will be on the scene after a disaster but they cannot reach everyone immediately.

You could get help in hours or it might take days. It is estimated that after a major disaster, it may take up to three days for relief workers to reach some area.



8.TESTING

8.1 TEST CASES

Test cases contains:

1. GUI testing
2. Navigation testing

3.Functional testing
4.Non functional testing (Performance Security)
5. Data validation testing
6. Negative testing
7. Data Base Testing

Test cases for natural diaster

1. A three-day supply of non-perishable food suitable for your family'ssize
2. A three-day supplyof water – one gallon of water per person, per day
3. Portable, battery-powered radio or television and extra batteries
4. Flashlight and extra batteries
5. First aid kit and manual
6. Sanitation and hygieneitems (moist towelettes and toilet paper)
7. Matches and a waterproof container
8. Whistle
9. Extra clothing
10. Kitchen accessories and cooking utensils, including a can opener
11. Photocopies of credit and identification cards
12. Cash and coins

8.2 USER ACCEPTENCE TESTING

9.RESULTS

9.1 PERFORMANCE METRICES

- Productivity.
- Effectiveness, Upgrade / Renewal.
- RELIABILITY
- Efficiency, Rentability,
- Performance, Capacity, Quality.

10.ADVANTAGES &DISADVANTAGES

ADVANTAGES

The potential for AI to assist with disaster resilience is tremendous - directing relief operations, providing optimum evacuations, and delivering supplies that might benefit tens of millions, if not hundreds of millions, of people each year.

While there are obstacles to overcome, with the correct amount of cooperation and collaboration, a brighter future may be a little more within grasp.

1. <u>Better Communicate Across Existing Programmes</u>

2. Building Necessary Tools for the Future

3 Domain-Specific Agreements on AI Principles

AI, like any other evolving technology, will expand on its current capabilities. **It has the ability to detect and remove outages before they occur with a more informed and clear image of the disaster region, thus saving lives**.

DISADVANTAGES

- High Costs. The ability to create a machine that can simulate human intelligence is no small feat.
- No creativity. A big disadvantage of AI is that it cannot learn to think outside
- No Ethics.
- Emotionless.
- No Improvement

11.CONCLUSION

Many researchers have attempted to use different deep learning methods for detection of natural disasters. However, the detection of natural disasters by using deep learning techniques still faces various issues due to noise and serious class imbalance problems. To address these problems, we proposed a multilayered deep convolutional neural network for detection and intensity classification of natural disasters. The proposed method works in two blocks—one for detection of natural disaster occurrence and the second block is used to remove imbalanced class issues. Th results were calculated as average statistical values: sensitivity, 97.54%; specificity, 98.22%; accuracy rate, 99.92%; precision, 97.79%; and F1-score, 97.97% for the proposed model. The proposed model achieved the highest accuracy as compared to other state-of-the-art methods due to its multilayered structure. The proposed model performs significantly better for natural disaster detection and classification, but in the future the model can be used for various natural disaster detection processes.

12.FUTURE SCOPE

Within the field of DRR, there is considerable interest in exploring the benefits of using AI to bolster existing methods and strategies. This article introduced several use cases demonstrating how AI-based models are enhancing DRR; however, it also showed that AI comes with challenges. Fortunately, the promise of AI in DRR has motivated research to find solutions to these challenges and inspired new partnerships; bringing together experts from multiple United Nations agencies, from various scientific fields (computer science, geosciences), from diverse sectors (from academia to NGOs) and from around the globe. Such partnerships are key for driving AI in DRR forward. In particular, we believe that efforts are still needed in the creation of educational materials to support capacity building, for ensuring the availability of computational resources and other hardware and for bridging the digital divide. Only this way can we make sure that no one is left behind as AI for DRR advances.

For members of the WMO community with an interest in learning more about the use of AI for DRR, there are many committees, conferences, and reports, which can serve as a resource. For instance, the American Meteorological Society's Committee on Artificial Intelligence for Environmental Science and Climate Change AI offer the opportunity to liaise with other experts in this field. The "AI for Earth Sciences" session at the recent Neural Information Processing Systems (NeurIPS) meeting or the "Artificial Intelligence for Natural Hazard and Disaster Management" session at the upcoming European Geosciences Union General Assembly are two examples of conferences featuring groundbreaking research and use cases. Finally, reports such as "Responsible AI for Disaster Risk Management: Working Group Summary" can provide additional guidance.

DEMO LINK

https://drive.google.com/drive/folders/1mRHuf3TOMlI6Ei7Qhdsdyx8kM-7opyLm?usp=sharing