Natural Disaster Intensity Analysis and Classification using Artificial Intelligence

PROJECT REPORT

Submitted by

Team ID:PNT2022TMI43250

S. MANOJ (715319104016)

V. ARAVINDH (715319104001)

S. MANIKANDAN (715319104015)

M. JOTHIRAJ (715319104010)

In partial fulfilment for the

award of the degree of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

ASIAN COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE - 641110.

TABLE OF CONTENTS

Natural Disasters Intensity Analysis and Classification Using Artificial Intelligence

1. INTRODUCTION :

1.1 Project Overview:

Natural Disasters are catastrophic events with atmospheric and historic origins (hurricanes, floods, tsunamis, earthquakes). That can cause fatalities, property damage and social environment disruption.

Natural disasters are the results of a hazard overwhelming highly vulnerable community, often resulting in mortality and morbidity. Over the past decade, over 300 natural disasters occur yearly around the world affecting millions and cost billions. The disaster cycle is a framework used to base a coordinated plan to respond, recover, prevent, and prepare for a disaster. Access to clean water, proper sanitation, /nutrition, shelter, and the threat of communicable diseases are concerns that have potential to be detrimental to the management of a natural disaster, slowing the recovery process.

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. To tackle this problem, we developed a multi layered deep convolutional neural network model that classifies the natural disaster and tells the intensity of disaster of natural The model uses an integrated webcam to capture the video frame and the video frame is compared with the Pre-trained model and the type of disaster is identified and showcased on the Open CV window

1.2 Purpose:

Basically the main objective of natural disaster management is to reduce the damage. However, there are several objectives that are integrated with it. Those are,

1.Identifying the hazard and its cause.

2. Reducing vulnerability and potential losses of hazard.

3. Assessing, reviewing and controlling the risk.

4. Applying efficient, effective, sustainable relief (food, shelter and money), medical and other facilities in disaster affected people thus they can survive.

5. Reducing the damage, death, sufferings and destruction of any natural and human induced disaster.

6. Giving protection to victims

7. Increasing the strength among people to survive against disasters.

8. Building up capacity in every sector like- individual, social, economic, environmental, regional, national and international.

9. Ensuring the availability of local emergency equipment and transportation.

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

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:

1. "Number of reported disasters by type." [Online]. Available: https://ourworldindata.org/natural- disasters.

2. Watusi and T. Hashish, "Disaster Prevention Education in Rapier Volcano Area Primary Schools: Focusing on Students' Perception and Teachers' Performance," Proceed Environment. Sci., vol. 20, pp. 668– 677, 2014.

3. "2015_43291_Sendaiframeworkfordrren_Disaster Reduction2015-2030," 2015.

4. S. Goswami, S. Chakraborty, S. Ghosh , A. Chakrabarti, and B. Chakraborty, "A review on application of data mining techniques to combat natural disasters," Ain Shams Eng. J., vol. 9, no. 3, pp. 365–378, 2018.

5. I. A. T. Hashed, I. Yaobang, N. B. Annular, S. Mortar A. Gain, and S. Allah Khan, "The rise of 'big data' on cloud computing: Reviewed open research issues," Inf. Cyst., vol. 47, pp. 98–115,2015.

6. M. Yu, C. Yang, and Y. Li, "Big Data in Natural Disaster Management: A Review," Geo sciences, vol. 8, no. 5, p. 165, 2018.

7. P. Sciences, "science direct," 2018. [Online]. Available: https://www.sciencedirect.com/.

8. Springer, "innerspring," Technology, 2018. [Online]. Available: https://www.springeropen.com/journals.

9. IEEE, "IEEE," 2018. [Online]. Available: http://ieeexplore.ieee.org.

10. Google Scholar, "Google Scholar," 2018. [Online]. Available: https://scholar.google.com/intl/en/scholar/about.html

2.3 Problem Statement Definition:

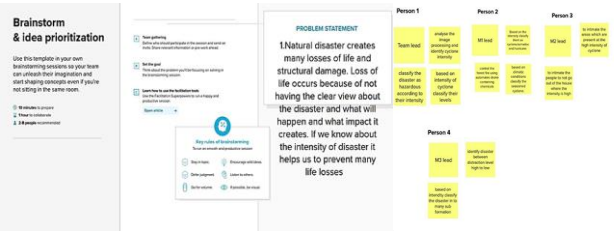
The purpose of the problem statement is to identify the issue that is a concern and focus it in a way thatallows it to be studied in a systematic way. It defines the problem and proposes a way to research a solution, or demonstrates why further information is needed for a solution to become possible.

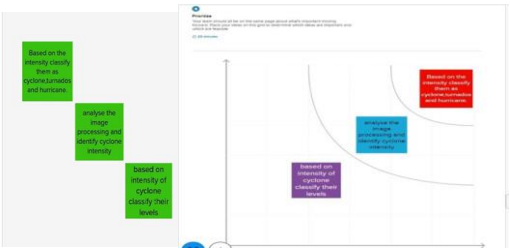
Problem Statement (PS)	Iam (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	An employee from NDRF	Classify the type of natural disaster	It is difficult to identify	The data is of images and images are of various forms	Tensed and frustrated
PS-2	A student	classify the type of natural disaster in order to learn about that disaster	It is difficult to identify	The data is of images and images are of various forms	Tensed and frustrated

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:

3.2 Ideation & Brainstorming:





Cyclone intensity evaluation:

An application of state-of-art revolutionize method can be developed for prediction of wind-intensity for tropical cyclones in the South Pacific region. The method employed data from cyclone wind-intensitytaken for the last three decades. This employs Cooperative Co evolution method for training Elm an recurrent neural networks for the prediction

Flood intensity evaluation:

A hybrid deep learning based flood forecasting can be developed. This approach has been made use of daily lagged IF and precipitation time series data to determine flood situations at multiple forecast horizons. The practicality of the model can be tested using datasets from nine locations in Fiji.

Storm intensity evaluation:

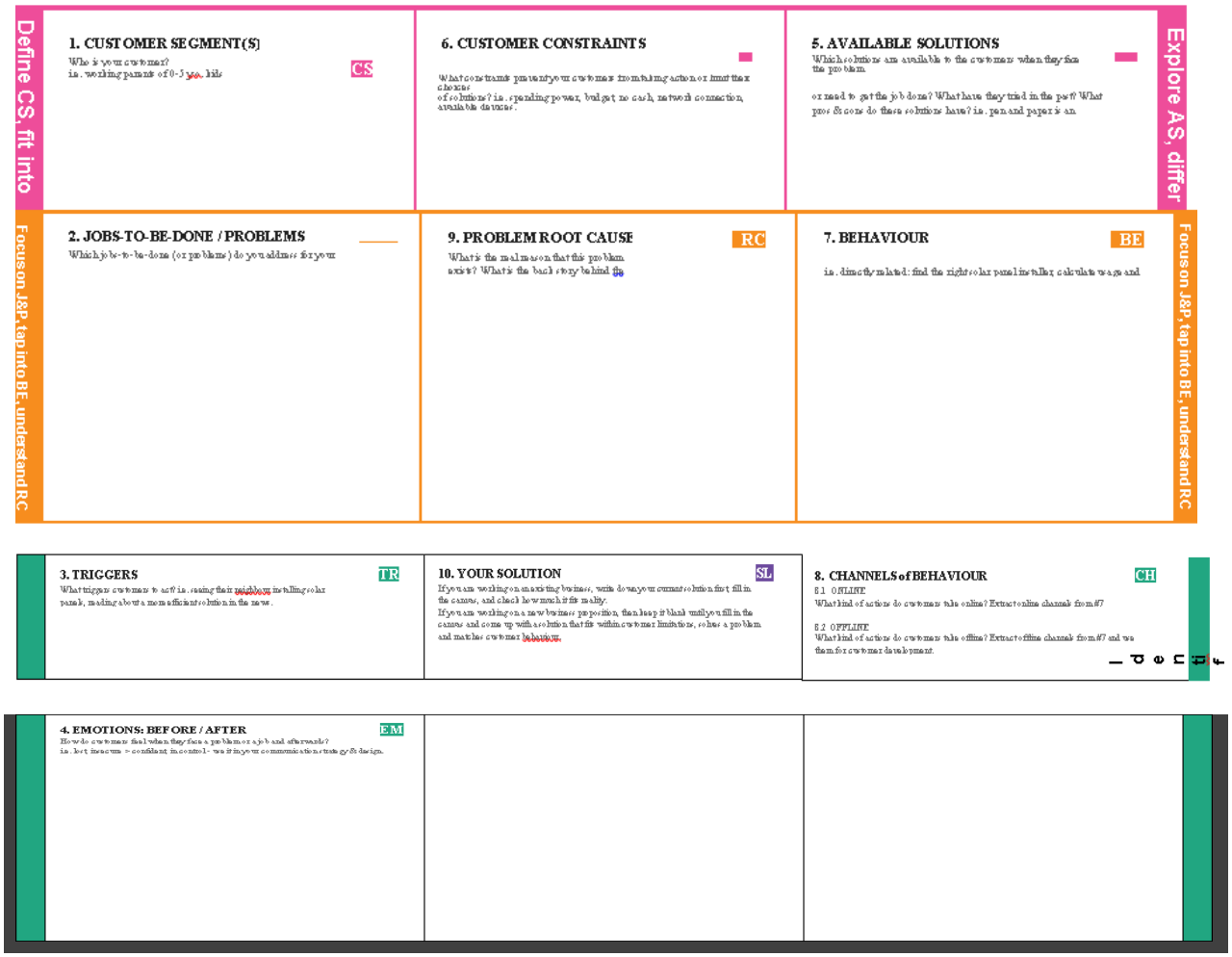
A storm scale ensemble post-processing system based on ensemble machine learning algorithms, radar mosaic verification, and ensemble variable statistics can provide improved precipitation forecasts.

Multiple machine learning models of varying complexity were applied to forecasts. Probabilistic, deterministic, and interval forecasts of 1-hour precipitation accumulation were created with the different models. Verification statistics showed that random forests, multiple logistic regression, and MARS provided significant improvements for probabilistic and continuous forecasts by both increasing the range of precipitation and probabilistic values predicted and by increasing the areal coverage of the precipitation forecasts

3.3 Proposed Solution:

S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	To keep track of, foresee, and assess disasters and their severity as they affect the area
•	Idea / Solution description	House classification algorithm to identify the impacts of disaster
•	Novelty / Uniqueness	Usage of reinforcement learning algorithm to let the AI to be independent and capable of collecting necessary data for prediction on its own.
•	Social Impact / Customer Satisfaction	This program me will both increase general knowledge of the effects of disasters and assist in making critical decisions in emergency situations
•	Business Model(Revenue Model)	Revenue generated through Royalty payments, product license costs in department , research and educational platforms
•	Scalability of the Solution	Disintegration of geographical terrains into multiple provinces which can be interconnected as a grid to help alleviate its scale.

3.4 Proposed Solution fit:



4. REQUIREMENT ANALYSIS:

4.1 Functional requirement:

Following are the functional requirements of the proposed solution

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration throughGmail Registration through LinkedIN

FR-2	User Confirmation	Confirmation via EmailConfirmation via OTP
FR-3	Accuracy	Training and testing data fed to the model must be accurate to provide correct results.
FR-4	Speed	The generation of the predicted results must be faster in order to take the necessary actions.
FR-5	Resolution	The resolution of the integrated web camera should be high enough to capture the video frames in order to feed it to the model as inputs.
FR-5	User Interface	Maximizing the uptime of the Web App Service.

4.2 Non-functional Requirements:

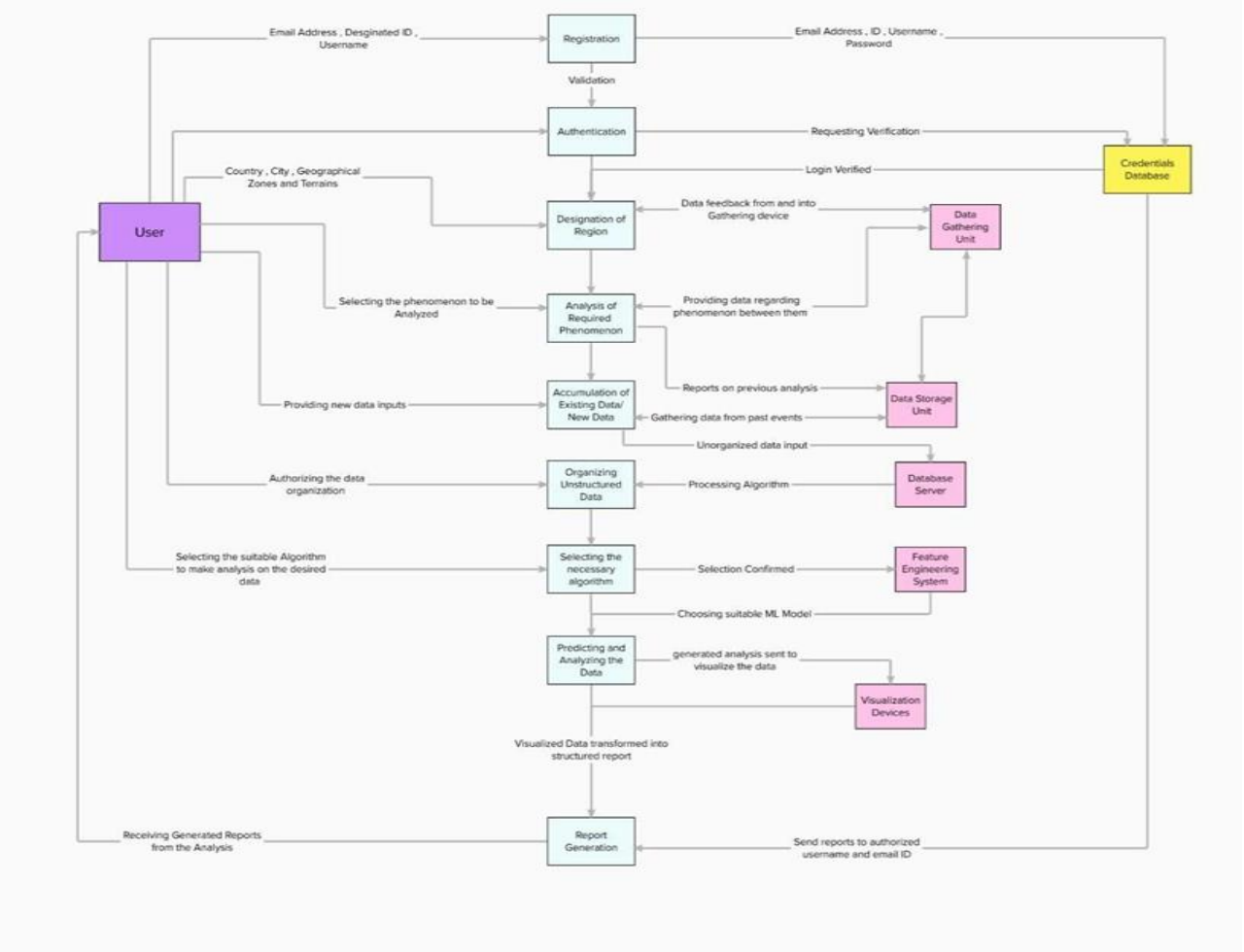
Following are the non-functional requirements of the proposed solution.

FR No.	**Non-Functional Requirement**	**Description**
NFR-1	Usability	Classifying disasters and zones prone to it.
NFR-2	Security	The model is very secure due to the cloud deployment and the additional security boosts it provides.
NFR-3	Reliability	Accurate prediction of the disaster and determining the approximatetime at which the disaster may occur.
NFR-4	Performance	Maintaining Balance between Speed and Accuracy delivered by the AIModel.
NFR-5	Availability	24 hrs monitoring of the disaster prone zone to predict the disaster.
NFR-6	Scalability	The model prototype can be extended to private and government forecast organizations which can help in global recognition.

5. PROJECT DESIGN:

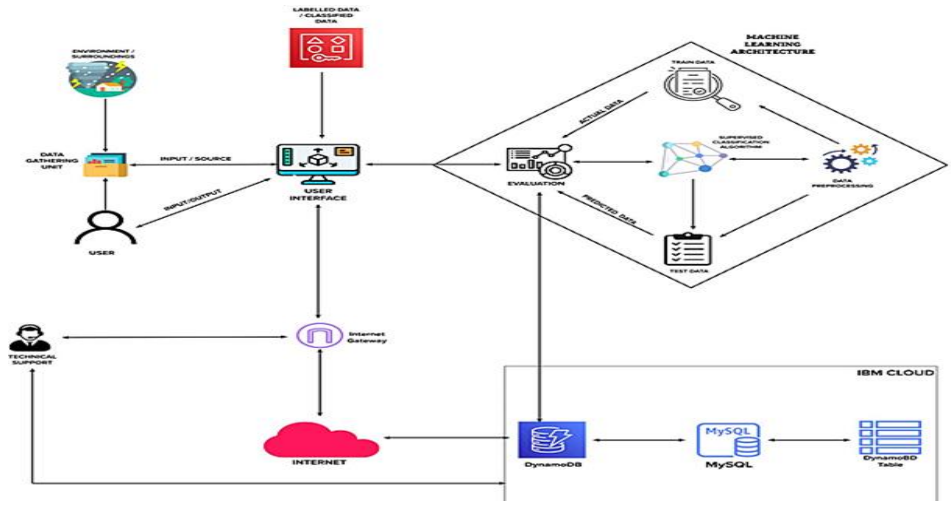
5.1 Data Flow Diagrams:

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



5.2 Solution & Technical Architecture:

Solution Architecture:



Technical Architecture:

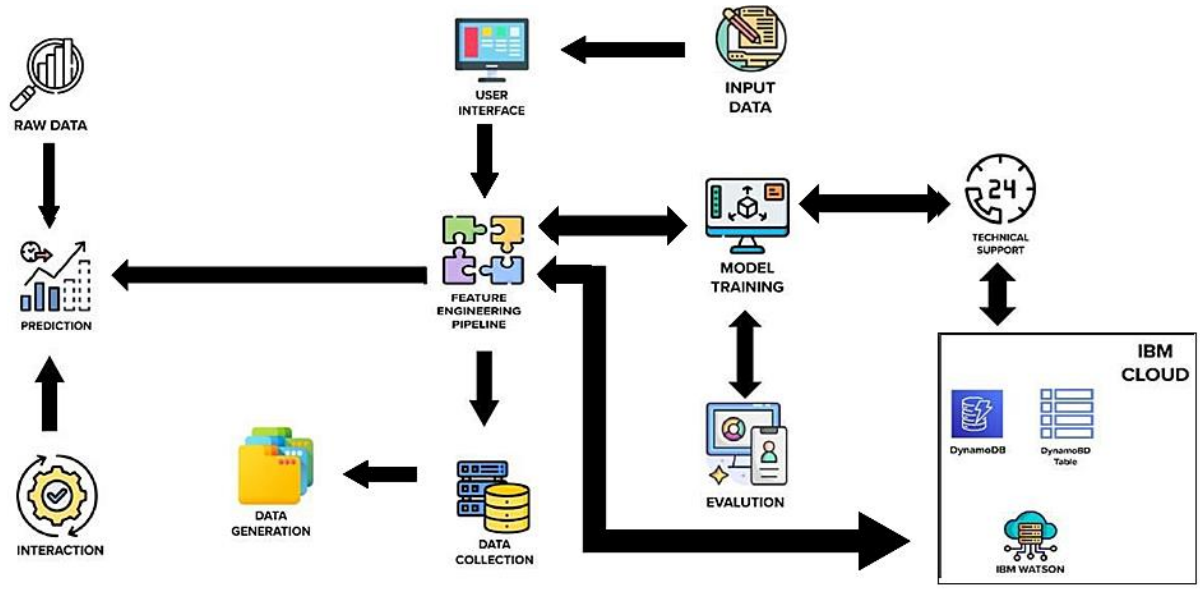


Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	User interacts with application for the prediction of Any Natural disaster which will happen in futureminutes.	HTML, CSS, JavaScript, Django, Python.
2.	Feature Engineering Pipeline	Algorithms can't make sense of raw data. We haveto select, transform, combine, and otherwise prepare our data so the algorithm can find useful patterns.	Image processing, pattern extraction,etc.
3.	Model Training kit	It learns patterns from the data. Then they use thesepatterns to perform particular tasks.	Multiclass Classification Model, Regression Model, etc.
4.	Prediction unit	This function is used to predict outcomes from thenew trained data to perform new tasks and solve new problems.	Decision trees, Regression, Neural networks.
5.	Evaluation system	It monitors that how Algorithm performs on data aswell as during training.	Chi-Square, Confusion Matrix, etc.
6.	Interactive services	To interact with our model and give it problems to solve. Usually this takes the form of an API, a userinterface, or a command-line interface.	Application programming interface, etc.
7.	Data collection unit	Data is only useful if it's accessible, so it needs to be stored ideally in a consistent structure andconveniently in one place.	IBM Cloud, SQL Server.
8.	Data generation system	Every machine learning application lives off data.That data has to come from somewhere. Usually, it's generated by one of your core businessfunctions.	Synthetic data generation.
9.	Database management system	An organized collection of data stored in database,so that it can be easily accessed and managed.	MySQL, Dynamo DB etc.
10.	IBM Cloud services	Processed data stored in cloud service which can be access by the admin anywhere over the internet.	IBM Cloud etc.

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	An open source framework is a template for software development that is designed by a social network of software developers. These frameworks are free for public use and provide thefoundation for building a software application.	Karas, Tensor Flow.
2.	Authentication	This keeps our models secure and makes sure only those who have permission can use them.	Encryption and Decryption (OTP).
3.	Application interface	User uses mobile application and web applicationto interact with model	Android and Web Development
4.	Availability (both Online and Offlinework)	Its include both online and offline work. As good internet connection is need for online work to explore the software perfectly. Offline work includes the saved data to explore for later time.	Caching, backend server.
5.	Regular Updates	The truly excellent software product needs a continuous process of improvements and updates.Maintain your server and make sure that your content is always up-to-date. Regularly update an app and enrich it with new features.	Waterfall Approach Incremental Approach Spiral Approach
6.	Personalization	Software has features like flexible fonts, backgrounds, settings, colour themes, etc. whichmake a software interface looks good and functional.	HubSpot Proof

5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number (USN)	User Story/ Task	Acceptance criteria	Priority	Release
End user (Customer)	Registration	USN - 1	As a user, I am able toregister with the product using my valid email address	I should be able to register with my account credentials	High	Sprint - 1
End User (Customer)	Authentication	USN - 2	As a user, I am able to login into the system with my credentials	It should ensure smooth login capabilities without delay	High	Sprint - 1
End User (Customer)	Designation of Region	USN - 3	I can select the region of interest to be monitored and analyzed	I must be able to choose certain specific places without error	High	Sprint - 1
End User (Customer)	Analysis of Required Phenomenon	USN - 4	I am able to monitor certain factors that influence the actions ofthe phenomenon	It should consider and monitor mostof the factors involved in the action	High	Sprint - 2

End User (Customer)	Accumulation of required Data	USN - 5	I am able to gather data regarding past events and a detailed report on past analysis	It should allow the storage of data of past events for certain extent	Medium	Sprint - 2
End User (Customer)	Organizing Unstructured data	USN - 6	I am able to organizeand restructure the raw data into refined data	It should ensure easy and efficient processing methods	Low	Sprint - 3
End User (Customer)	Algorithm selection	USN - 7	I am able to choose the required algorithm for a specific analysis	It must provide various options for the algorithm to be used	High	Sprint - 2
End User (Customer)	Prediction and analysis of data	USN - 8	I am able to easily predict and visualize the data	It should allow easyto use prediction and visualization techniques	High	Sprint - 3
End User (Customer)	Report generation	USN - 9	I am able to generatea clear and detailed report on the analysis	Report generationmust be fast and efficient and should not be complex	Medium	Sprint - 4

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning and Estimation:

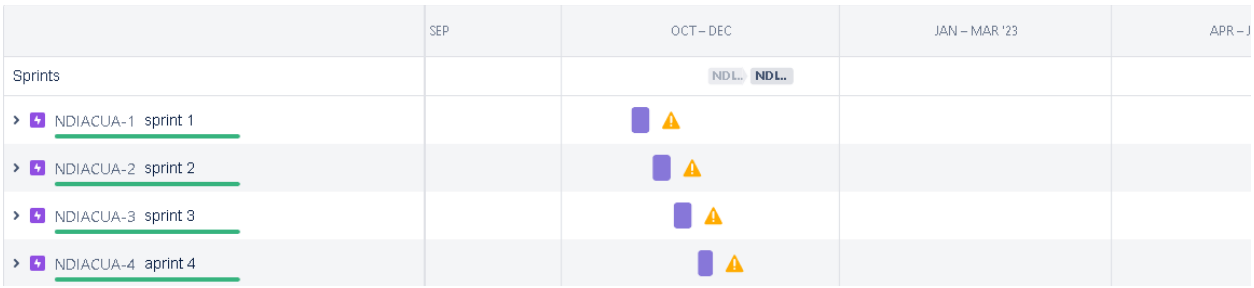
Sprint	Functional Requirement (Epic)	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a user, I can collect the dataset from different images of cyclone.	12	Medium	V.Aravindh
Sprint-1	Data Pre-processing	USN-2	As a user, I can loathe dataset, scalingand split data into train and test.	8	High	S.Manoj
Sprint-2	Model Building	USN-3	As a user, I will get an application with MLmodel	12	High	M.Jothiraj
Sprint-2	Train & test & Save model	USN-4	As a user, let us train our model with our image dataset.	8	Medium	S.Manikandan
Sprint-3	Building UI Application HTML Page	USN-5	As a user, I will upload the cycloneimage tothe application by clicking an uploadbutton.	10	High	S.Manoj
Sprint-3	Python Page	USN-6	As a user, I can know the details of the fundamental usage of the application.	10	High	V.Aravindh
Sprint-4	Train the model on IBM	USN-7	As a user,I train the model and integrate them on IBM.	7	Medium	S.Manikandan

Sprint-4	Cloud Deployment	USN-8	As a user, I can access the web applicationand make the use of the product from anywhere.	13	High	M.Jothiraj

6.2 Sprint Delivery Schedule:

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date(Planned)**	**Story PointsCompleted(as on planned End Date)**
Sprint 1	20	6 Days	24 Oct 2022	29 Oct 2022	20
Sprint 2	20	6 Days	31 Oct2022	05 Nov 2022	20
Sprint 3	20	6 Days	07 Nov 2022	12 Nov 2022	20
Sprint 4	20	6 Days	14 Nov 2022	19 Nov 2022	20

6.3 Reports Form Jair



7. CODING & SOLUTIONING:

7.1 Feature 1:

A convolution al neural network is a class of artificial neural networks. It is a Deep Learning algorithm that can take in an input image, assign importance to various objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared toother classification algorithms.

The advantage of CNNs is to provide an efficient dense network which performs the prediction or identification efficiently.

7.2 Feature 2:

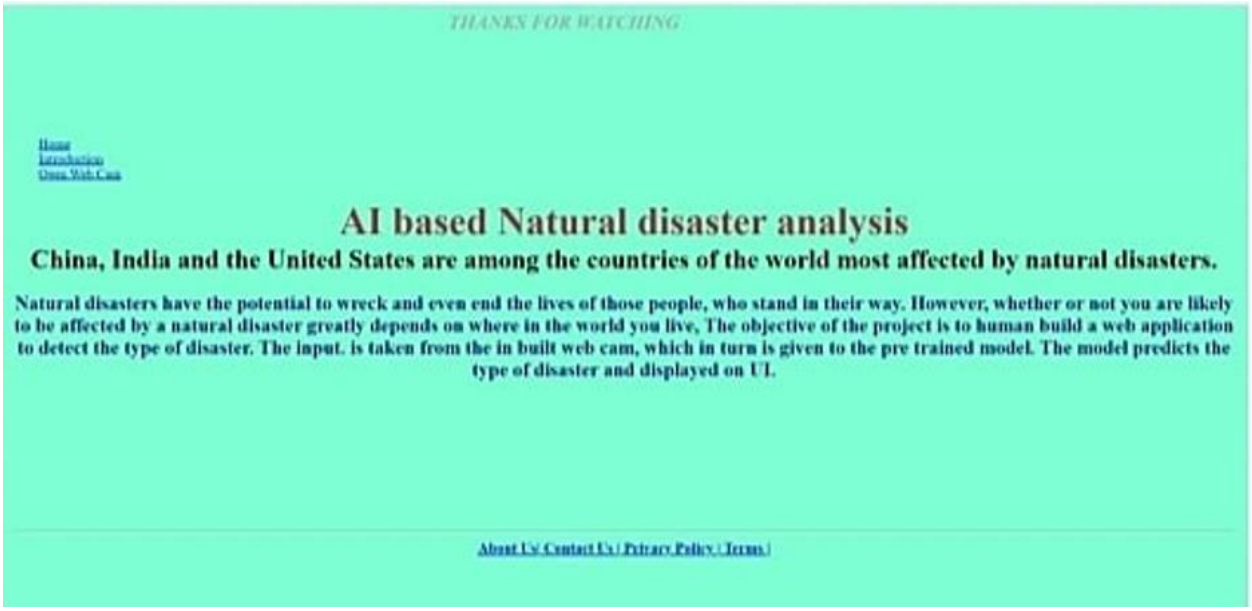
We developed a multilayered deep convolution al neural network model that classifies the natural disaster and tells the intensity of disaster of natural The model uses an integrated webcam to capture the video frame and the video frame is compared with the Pre-trained model and the type of disaster is identified andshowcased on the OpenCV window. A multi layer neural network with appropriate weights has been shown **to be able to approximate any input-output function making it an attractive tool for modeling and forecasting**.

8. TESTING:

8.1 TestCases:

home.html:

Intro.html:



Run.html:

8.2 User Acceptance Testing:

This document serves as a quick reference for the Deep Learning Fund us Image Analysis for Early Detection of DiabeticRetinopathy project's test coverage and open issues as of theproject's release for user acceptance testing.

Defect Analysis:

This shows how many bugs were fixed or closed at each severity level and how theywere fixed.

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	4	5	2	3	14
Duplicate	1	0	3	1	5
External	2	3	0	1	6
Fixed	9	2	4	15	30
NotReproduced	0	0	1	0	1
Skipped	1	0	1	1	3
Won't Fix	0	5	2	1	8
Totals	17	14	13	22	64

Test-Case Analysis:

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	9	0	0	9
Client Application	40	0	0	40
Security	3	0	0	3
Out-source Shipping	3	0	0	3
Exception Reporting	8	0	0	8
Final ReportOutput	4	0	0	4
Version Control	2	0	0	2

9. RESULTS:

9.1 Performance Metrics:

S.No.	**Parameter**	**Values(Percentage)**
1.	Model Summary	-96%
2.	Accuracy	Training Accuracy - 96.5% Validation Accuracy -92.3%
3.	Confidence Score (Only Yolo Projects)	Class Detected - Nil Confidence Score- Nil

Our Project marks the successive performance by implementing in order to be cost effective and more reliable to use and to predict the future from the natural disaster that we are ahead of. The successive way includes the objectives, activities and the approaches for the project. It mainly includes the trained dataset which gives an excessive measure of success which helps to overcome the future from this natural disaster.

10. ADVANTAGES AND DISADVANTAGES:

ADVANTAGES:

1. The use of AI to forecast natural disasters would save millions of lives. Furthermore, the information evaluated by AI-powered systems can aid in understanding the scale and patterns of natural catastrophes such as floods, earthquakes, and tsunamis, which would aid in improved infrastructure development in disaster-prone areas.

2. Disaster management plays an integral role in keeping communities safe. It involves coordinating the resources, such as pollution control systems, and responsibilities, such as following best practice policies, needed to prevent, prepare for, respond to, and recover from emergencies

DISADVANTAGES:

1. A forest fire is a natural disaster that cannot be forecasted.
2. Sometimes the prediction may fail and result in huge loss.

11. CONCLUSION:

Natural disasters inflict severe damage on almost the entire spectrum of social and natural habitats, ranging from housing and shelter, water, food, health, sanitation, and waste management to information and communication networks, supply of power and energy, and transportation infrastructure. The major challenges faced in all disasters include pre-disaster early warning infrastructure; the supply of food and clean drinking water; health and sanitation; information and communication; power and energy for lighting and cooking; waste collection and disposal, includingrapid disposal of dead bodies of humans and animals; disaster-proof housing and shelter; emergency and post-disaster shelters; rescue and relief operations; and transport infrastructure. Though it is not possible to prevent most of the disasters, still their effects can be alleviated or mitigated in magnitudeby anticipated preparedness. Advanced disaster management technology could provide a critical support system for disaster management authorities at times of disaster-related crises. Such a technology also provides important inputs for any disaster management plan of action in modern times. Communities and individuals have to be educated on pre-disaster planning and preparedness. Awareness must be created amongst masses, for which first-aid training at grass roots level is essential. There should be a National Disaster Plan that defines the tasks of the communities and local health personnel.

For the evaluation of the model ROC and 30% landslide point's residual was used. The results showed that the accuracy of the model was estimated by ANFIS in the study area of 77.48%(good accuracy); this data-mining method depends on the number of pairs of training, experimental and fuzzy data used in the research, and, in particular, by increasing the number of fuzzy rules of the process, more accurate simulation can be provided. So far, different methods have been proposed for landslide susceptibility donation. The accuracy or the error of each of these methods, as well as the use and comparison of each of these methods, requires knowledge of the foundations on which the methods are based. So far, different approaches to landslide susceptibility donation have been proposed, but what is certain is that all these methods can provide accurate results with minimal data and costs and at measure levels. Combining these models with GIS and RS systems not only increases the accuracy of dealing with complex issues and uncertainties, but also leads to the emergence and development of new theories and methods in a variety of issues.

12. FUTURE SCOPE:

The term “Natural Disaster” encompasses the complete realm of disaster-related activities. Traditionally people tend to think of disaster management only in terms of the post-disaster actions taken by relief and reconstruction officials; yet disaster management covers a much broader scope,and many modern disaster managers may find themselves far more involved in pre-disaster activities than in post-disaster response. Those are:

- The refugee field of disaster management is highly specialized and requires not only many development skills but also a broader awareness of political, legal, and humanitarian issues

- DM aims and objectives, elements,Natural/man-made Disasters, Victims,Relief Systems.

- Phases of DisasterResponse/Relief Operations, Government’s Role

To Safeguard and make available vital materials, supplies and equipment to ensure the safety and recovery of records from predictable disasters.To reduce the risk of disasters caused by human error, deliberate destruction, and building or equipment failures. Be better prepared to recover from a major natural catastrophe.

In this project we help to build preparedness for threats and hazards by providing a low-risk, cost-effective environment to: Test and validate plans, policies, procedures and capabilities. Identify resource requirements, capability gaps, strengths, areas for improvement, and potential best practices. 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. Disaster Risk Management includes the sum total of all activities, program mes and measures which can be taken up before,during and after a disaster with the purpose to avoid a disaster, reduce its impact or recover from its losses.

13. APPENDIX:

SOURCE CODE

home.html:

```
<!DOCTYPE html>

<html lang="en">
<head>
<title>Home Page</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
<link href="https://fonts.googleapis.com/css?family=Montserrat" rel="stylesheet"
type="text/css">
<link href="https://fonts.googleapis.com/css?family=Lato" rel="stylesheet"
type="text/css">
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>


<style> body {
  font: 400 15px Lato, sans-serif; line-height: 1.8;
color: #818181;
}
h2 {
font-size: 24px;
text-transform: uppercase; color: #303030;
font-weight: 600; margin-bottom: 30px;
}
h4 {
font-size: 19px;
line-height: 1.375em; color: #303030;
font-weight: 400; margin-bottom: 30px;
}
.jumbotron {
background-color: #f4511e; color: #fff;
```

```
font-family: Montserrat, sans-serif;
}
.container-fluid { padding: 60px 50px;
}
.bg-grey {
background-color: #f6f6f6;
}
.logo-small { color: #f4511e; font-size: 50px;
}
.logo {
color: #f4511e; font-size: 200px;
}
.thumbnail {
padding: 0 0 15px 0; border: none;
border-radius: 0;
}
.thumbnail i mg { width: 100%;
height: 100%;
margin-bottom: 10px;
}
.carousel-control.right, .carousel-control.left { background-image: none;
color: #f4511e;
}
.carousel-indicators li { border-color: #f4511e;
}
.carousel-indicators li.active { background-color: #f4511e;

}
.item h4 {
font-size: 19px;
line-height: 1.375em; font-weight: 400; font-style: italic; margin: 70px 0;
}
.item span {
font-style: normal;
}
.panel {
border: 1px solid #f4511e; border-radius:0 !important; transition: box-shadow 0.5s;
}
```

```
.panel:hover {
box-shadow: 5px 0px 40px rgba(0,0,0, .2);
}
.panel-footer .btn:hover { border: 1px solid #f4511e;
background-color: #fff !important; color: #f4511e;
}
.panel-heading {
color: #fff !important;
background-color: #f4511e !important; padding: 25px;
border-bottom: 1px solid transparent; border-top-left-radius: 0px;
border-top-right-radius: 0px; border-bottom-left-radius: 0px; border-bottom-right-radius:
0px;
}
.panel-footer {

background-color: white !important;
}
.panel-footer h3 { font-size: 32px;
}
.panel-footer h4 { color: #aaa;
font-size: 14px;
}
.panel-footer .btn { margin: 15px 0;
background-color: #f4511e; color: #fff;
}
.navbar {
margin-bottom: 0; background-color: #0059ff; z-index: 9999;
border: 0;
font-size: 12px !important;
line-height: 1.42857143 !important; letter-spacing: 4px;
border-radius: 0;
font-family: Montserrat, sans-serif;
}
.navbar li a, .navbar .navbar-brand { color: #fff !important;
}
.navbar-n av li a:hover, .navbar-n av li.active a { color: #f4511e !important;
background-color: #fff !important;
}
.navbar-default .navbar-toggle { border-color: transparent; color: #fff !important;
```

```
}
footer .glyphicon { font-size: 20px; margin-bottom: 20px; color: #f4511e;
}
.slideanim {visibility:hidden;}
.slide {
animation-name: slide;
-webkit-animation-name: slide; animation-duration: 1s;
-webkit-animation-duration: 1s; visibility: visible;
}
@keyframes slide { 0% {
opacity: 0;
transform: translateY(70%);
} 100% {
opacity: 1;
transform: translateY(0%);
}
}
@-webkit-key frames slide { 0% {
opacity: 0;
-webkit-transform: translateY(70%);
} 100% {
opacity: 1;
-webkit-transform: translateY(0%);
}
}
@media screen and (max-width: 768px) {

.col-sm-4 {
text-align: center; margin: 25px 0;
}
.btn-lg { width: 100%;
margin-bottom: 35px;
}
}
@media screen and (max-width: 480px) {
.logo {
font-size: 150px;
}
```

```
}


.container {
padding: 16px;
max-width: max-content;
}


.container {
max-width: 1376px; margin: auto;
padding: 2rem 1.5rem;
}


.cards {
display: flex; flex-wrap: wrap;
align-items: center; justify-content: center;
}

.card {
cursor: pointer;

background-color: transparent; height: 300px;
perspective: 1000px; margin: 1rem;
align-items: center; justify-content: center;
}


.card h3 {
border-bottom: 1px #fff solid; padding-bottom: 10px; margin-bottom: 10px;
text-align: center; font-size: 1.6rem; word-spacing: 3px;
}


.card p{ opacity: 0.75;
font-size: 0.8rem; line-height: 1.4;
}
```

```
.card i mg { width: 360px; height: 300px; object-fit: cover;
border-radius: 3px;
}


.card-inner { position: relative; width: 360px; height: 100%;
transition: transform 0.9s;

transform-style: preserve-3d;
}


.card:hover .card-inner { transform: rotateY(180deg);
}


.card-front,
.card-back { position: absolute; width: 360px; height: 100%;
-webkit-back face-visibility: hidden; back face-visibility: hidden;
}


.card-back {
background-color: #222; color: #fff;
padding: 1.5rem;
transform: rotateY(180deg);
}
.text-block { position: absolute; bottom: 20px; right: 20px;
background-color: black; color: white;

padding-left: 20px; padding-right: 20px;
}
.features-section img { display: none;
}


.testimonials-section {
background: var(--primary-color); color: white;
}
```

```
.testimonials-section li { background: #0059ff; text-align: center; width: 80%;
border-radius: 1em;
}

.testimonials-section li i mg { width: 6em;
height: 6em;
border: 3px solid #ffffff; border-radius: 50%; margin-top: -2.5em;
}


ul {
list-style-type: none; margin: 0;
padding: 0;
}



ul.features-list { margin: 0;
padding-left: .1em;
}

ul.features-list li { font-size: 1.1em;

margin-bottom: 1em; margin-left: 2em; position: relative;
}


ul.features-list li:before { content: '';
left: -2em; position: absolute; width: 20px; height: 20px;
background-image: url("#"); background-size: contain; margin-right: .5em;
}


.features-section img { display: none;
}
</style>
</head>
```

```
<body>
<div class="card text-center">
<div class="card-header">
<ul class="nav nav-tabs card-header-tabs">
<li class="nav-item">
<a class="nav-link active" aria-current="true" href="home.html" style="font-size:
24px;">Home</a>
</li>
<li class="nav-item">
<a class="nav-link" href="intro.html" style="font-size: 24px;">Introduction</a>
</li>
<li class="nav-item">
<a class="nav-link" href="upload.html" style="font-size: 24px;">Upload</a>
</li>

</ul>
<h3 style="float: right;">AI based Natural Disaster Analysis</h3>
</div>
<div class="container-fluid">
<div class="container">


<div class="cards">

<div class="card">
<div class="card-inner">
<div class="card-front">
<img src="https://images.unsplash.com/photo-1454789476662-
53eb23ba5907?ixid=MXwxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHw%3D
&ixlib=rb- 1.2.1&auto=format&fit=crop&w=689&q=80"
alt="">
<div class="text-block">
<h1>Cyclone</h1>
<h3>violent winds, torrential rain, high waves and, very destructive storm</h3>
</div>
```

near

<h3>Cyclone</h3>
<h3>The effects of tropical cyclones include heavy rain, strong wind, large storm surges

landfall, and tornadoes. The destruction from a tropical cyclone, such as a hurricane or tropical storm, depends mainly on its intensity, its size, and its location.</h3>

<img src="https://images.unsplash.com/photo-1603869311144-66b03d340b32?ixid=MXwxMjA3fDB8MHxzZWFyY2h8M3x8ZWFydGhxdWFrZXxlbnwwfHwwfA%3 D%3D&ixlib=rb-1.2.1&auto=format&fit=crop&w=500&q=60" alt="">

<h1>Earth Quake</h1>
<h3>Sudden release of stored energy in the Earth's crust that creates seismic

waves.

fault. shake.

</h3>

<h3>Earth Quake</h3>
<h3>Earthquakes are usually caused when rock underground suddenly breaks along a
This sudden release of energy causes the seismic waves that make the ground
... During the earthquake and afterward, the plates or blocks of rock start moving, and
they continue to move until they get stuck again.</h3>

<img src="https://images.unsplash.com/photo-1547683905-
f686c993aae5?ixid=MXwxMjA3fDB8MHxzZWFyY2h8MXx8Zmxvb2R8ZW58MHx8
MHw%3D&ixlib
=rb-1.2.1&auto=format&fit=crop&w=500&q=60"
alt="">

<h1>Flood</h1>
<h3>A flood is an overflow of water on normally dry ground</h3>

by

crossings

<h3>Flood</h3>
<h3>During heavy rain, the storm drains can become overwhelmed or plugged

debris and flood the roads and buildings nearby. Low spots, such as underpasses, underground parking garages, basements, and low water

can become death traps. Areas near rivers are at risk from floods.</h3>

<img src="https://images.unsplash.com/photo-1473260079709-83c808703435?ixid=MXwxMjA3fDB8MHxzZWFyY2h8NHx8d2lsZGZpcmV8ZW58MHx8MHw%3D &ixlib=rb-1.2.1&auto=format&fit=crop&w=500&q=60"
alt="">

<h1>WildFire</h1>

```
<h3>Uncontrolled fire in a forest, grassland, brushland</h3>
</div>


</div>
<div class="card-back">
<h3>Wildfire</h3>
<h3>Wildfires can be caused by an accumulation of dead matter (leaves, twigs, and trees) that can create enough heat in some instances to combust spontaneously and ignite the surrounding area. Lightning strikes the earth over 100,000 times a day. 10 to 20% of these
lightning strikes can cause fire.</h3>
</div>
</div>
</div>
</div>
```

intro.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta http-equiv="X-UA-Compatible" content="IE=edge">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-Zenh87qX5JnK2Jl0vWa8Ck2rdkQ2Bzep5IDxbcnCeuOxjzrPF/et3URy9Bv1WTRi" crossorigin="anonymous">
<title>Document</title>
</head>
<body>
<div class="card text-center">
<div class="card-header">
<ul class="nav nav-tabs card-header-tabs">
<li class="nav-item">
```

```
<a class="nav-link" aria-current="true" href="home.html" style="font-size:
24px;">Home</a>
</li>
<li class="nav-item">
<a class="nav-link active" href="intro.html" style="font-size:
24px;">Introduction</a></li>
<li class="nav-item">
<a class="nav-link" href="upload.html" style="font-size: 24px;">Upload</a>
</li>
</ul>
<h3 style="float: right;">AI based Natural Disaster Analysis</h3>
</div>

</div>
<h2 style="padding: 50px; margin: 50px; word-spacing: 15px; text-align: center ;line-
height: 1.6;">
China, India and the United States are among the countries in the world most
affected by natural disasters. Natural disasters have the potential to wreck and even end
the lives of those people, who stand in their way. <br><br> However, whether or not you
are likely to be
affected by a natural disaster dramatically depends on where in the world you live, The
objectiveness project is to human build a web application to detect the type of disaster.
The input
is taken from the in-built webcam, which in turn is given to the pre-trained model. The
model predicts the type of disaster and displayed on UI. </h2>
</body>
</html>
```

run.html

```
<<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta http-equiv="X-UA-Compatible" content="IE=edge">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css"
```

```
rel="stylesheet" integrity="sha384-
Zenh87qX5JnK2Jl0vWa8Ck2rdkQ2Bzep5IDxbcnCeuOxjzrPF/et3URy9Bv1WTRi"
crossorigin="anonymous">
<title>Document</title>
</head>
<body>
<div class="card text-center">
<div class="card-header">
<ul class="nav nav-tabs card-header-tabs">
<li class="nav-item">
<a class="nav-link" aria-current="true" href="home.html" style="font-size:
24px;">Home</a>
</li>
<li class="nav-item">

<a class="nav-link" href="intro.html" style="font-size: 24px;">Introduction</a>
</li>
<li class="nav-item">
<a class="nav-link active" href="upload.html" style="font-size: 24px;">Upload</a>
</li>
</ul>
<h3 style="float: right;">AI based Natural Disaster Analysis</h3>
</div>
</div>
<form action = "uploader.html" method = "POST" enctype = "multipart/form-data">
<input type = "file" name = "filename" />
<input type = "submit" value="Submit"/>
</form>
<script
src="https://cdn.jsdelivr.net/npm/@popperjs/core@2.11.6/dist/umd/popper.min.js"
integrity="sha384-
oBqDVmMz9ATKxIep9tiCxS/Z9fNfEXiDAYTujMAeBAsjFuCZSmKbSSUnQlmh/jp3"
crossorigin="anonymous"></script>
<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/js/bootstrap.min.js"
integrity="sha384-
IDwe1+LCz02ROU9k972gdyvl+AESN10+x7tBKgc9I5HFtuNz0wWnPclzo6p9vxnk"cro
ssorigin="anony
mous"></script>
</body>
```

```
</html>
```

App.py:

```
from flask import Flask,render_template,request
import cv2
from tensorflow import keras
from tensorflow.keras import models
from tensorflow.keras.models import load_model
import numpy as np
import random
from time import time, sleep
import time
def ran(result):
  if(result=='Cyclone'):
     return 2
  elif (result=='Earthquake'):
     return 3
  elif (result=='Flood'):
     return 1
  elif (result=='Wildfire'):
     return 4
# from time import time, sleep
# import time
# result1=1
app = Flask(__name__,template_folder="Templates")
model=load_model("disaster.h5")
#print(model)

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

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

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

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

@app.route('/uploader',methods=['GET','POST'])
def predict():
  # if request.method == "POST":
  #   f = request.files['filename'].stream
  #   f.save("videos/save.mp4")
  #   print("saved")


  # Create a VideoCapture object and read from input file
  # If the input is the camera, pass 0 instead of the video file name
  cap = cv2.VideoCapture(0)

  # Check if camera opened successfully
  if (cap.isOpened()== False):
    print("Error opening video stream or file")
  # start = time.process_time()
  # Read until video is completed
  while(True):
    # Capture frame-by-frame
    ret, frame = cap.read()
    if ret == True:
      frame=cv2.flip(frame,1)
      output = frame.copy()
      frame = cv2.cvtColor(frame,cv2.COLOR_BGR2RGB)
      frame = cv2.resize(frame,(64,64))
      x=np.expand_dims(frame,axis=0)
      result = np.argmax(model.predict(x),axis=1)
      index=['Cyclone','Earthquake','Flood','Wildfire']
      result = str(index[result[0]])
      #print(result)
      res=ran(result)
```

```
    cv2.putText(output,"Intensity:
{}".format(res),(10,120),cv2.FONT_HERSHEY_PLAIN,1,(0,25,255),1)
    cv2.putText(output,"Disaster:
{}".format(result),(10,100),cv2.FONT_HERSHEY_PLAIN,1,(0,25,255),1)
    # Display the resulting frame
    cv2.imshow('Frame',output)
    # Press Q on keyboard to  exit
    if cv2.waitKey(1) & 0xFF == ord('q'):
      break

  # Break the loop
  else:
    break
 # When everything done, release the video capture object
 cap.release()

 # Closes all the frames
 cv2.destroyAllWindows()
 return render_template('run.html')
 # cap=cv2.VideoCapture(0)
 # 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_BGR2RGB)
 #     frame = cv2.resize(frame,(64,64))
 #     x=np.expand_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(1000) | 0xFF==ord('q'):
```

```
#    break
#   print("[INFO]cleaning up...")
#   cap.release()
#   cv2.destroyAllWindows()

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

SCRIPT.JS:

```
var btnLogin = document.getElementById('do-login');
var btnRun = document.getElementById('do-run');
var idLogin = document.getElementById('login');
var username = document.getElementById('username');
btnLogin.onclick = function(){
  idLogin.innerHTML = '<p>Hi, </p><h1>' +username.value+ '</h1><p>We hope you
are safe :)<br>This application aims to solve real life problem of disaster identification
<br>along with its estimated intensity on a level of 1-5.<br>1 denotes low level intensity
while 5 denotes the highest intensity level.The users are requested<br> to use the run
button to upload good, clarity pictures to run our conventional network ... </p><a
href="run.html" style="font-size: 24px;">Run</a>';
}
btnRun.onclick = function(){
  idLogin.innerHTML = '<p>Hi, </p><h1>' +username.value+ '</h1><form
action="/action_page.php"><input type="file" id="myFile"
name="filename"><br><input type="Submit"></form>';
}
```

Style.css:

```
body {
  background-color:    #ffffff;
  background-image: url(myImage.gif);
  /* background-image:url_for('static', filename='myImage.gif'); */
  background-repeat: no-repeat;
  background-size: cover;
  background-attachment: fixed;
  background-position: center;
  font-family: Assistant, sans-serif;
  display: flex;
  min-height: 90vh;
}
.login {
  color: white;
  background: #000000;
  background: #000000;
  background: #000000;
  margin: auto;
  box-shadow:
    0px 2px 10px rgba(0,0,0,0.2),
    0px 10px 20px rgba(0,0,0,0.3),
    0px 30px 60px 1px rgba(0,0,0,0.5);
  border-radius: 8px;
  padding: 50px;
}
.login .head {
  display: flex;
  align-items: center;
  justify-content: center;
}
.login .head .company {
  font-size: 2.2em;
}
.login .msg {
  text-align: center;
}
.login .form input[type=text].text {
```

```
  border: none;
  background: none;
  box-shadow: 0px 2px 0px 0px white;
  width: 100%;
  color: white;
  font-size: 1em;
  outline: none;
}
.login .form .text::placeholder {
  color: #D3D3D3;
}
.login .form input[type=password].password {
  border: none;
  background: none;
  box-shadow: 0px 2px 0px 0px white;
  width: 100%;
  color: white;
  font-size: 1em;
  outline: none;
  margin-bottom: 20px;
  margin-top: 20px;
}
.login .form .password::placeholder {
  color: #D3D3D3;
}
.login .form .btn-login {
  background: none;
  text-decoration: none;
  color: white;
  box-shadow: 0px 0px 0px 2px white;
  border-radius: 3px;
  padding: 5px 2em;
  transition: 0.5s;
}
.login .form .btn-login:hover {
  background: white;
  color: dimgray;
  transition: 0.5s;
}
```

```
.login .forgot {
  text-decoration: none;
  color: white;
  float: right;
}
footer {
  position: absolute;
  color: #136a8a;
  bottom: 10px;
  padding-left: 20px;
}
footer p {
  display: inline;
}
footer a {
  color: green;
  text-decoration: none;
}
footer a:hover {
  text-decoration: underline;
}
footer .heart {
  color: #B22222;
  font-size: 1.5em
}
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-55022-1663578977