



**NATURAL DISASTERS INTENSITY ANALYSIS AND  
CLASSIFICATION USING ARTIFICIAL INTELLIGENCE**



**NALAIYA THIRAN PROJECT BASED LEARNING**

**on**

**PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND  
ENTREPRENEURSHIP**

**A PROJECT REPORT**

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**BACHELOR OF ENGINEERING**

**IN**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

**HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY**

Approved by AICTE, New Delhi, Accredited with 'A' Grade by NAAC  
(An Autonomous Institutions, Affiliated to Anna University, Chennai)  
**COIMBATORE - 641 032**

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## ***Hindusthan College of Engineering and Technology***

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IBM

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 PROJECT OVERVIEW**

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 multilayered 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 OpenCV window.

## 1.2 PURPOSE

The use of artificial intelligence (AI) techniques is becoming more pervasive across a variety of industries, including consumer goods, driverless automobiles, fraud detection, and weather forecasting. The application of AI has changed a large number of these application domains.

An ongoing project aims to use AI for disaster risk analysis. This essay examines the use of AI in catastrophe risk assessments critically. Natural catastrophes not only disrupt the ecology that supports human life but they also obliterate vital facilities and properties in human society changing the ecosystem permanently. Natural occurrences like earthquakes, cyclones, floods, and wildfires can bring disaster. Several academics have used a variety of deep learning approaches to detect and categorize natural disasters to mitigate ecological damage. We suggest a multi-layered deep convolutional neural network to address this issue. The suggested model consists of two blocks: Block-I convolutional neural network (B-I CNN) for disaster detection and occurrence, and Block-II convolutional neural network (B-II CNN) for categorization of various filters and parameters for different types of natural disaster intensity. The model is put to the test on 4428 real-world photos, and its performance is calculated and expressed as the following statistical values: sensitivity (SE), specificity (SP), accuracy rate (AR), precision (PRE), and F1-score (F1). The entire model's total accuracy is 99.92%, which is competitive and correlates with cutting-edge algorithms.

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 EXISTING PROBLEM**

Floods are a terrible and amazing catastrophe. Floods have a serious negative influence on people's lives as well as on the economies of entire countries. It is possible to foresee floods and protect the general public from the calamity with the aid of a neural network. Convolutional neural networks and Modified Particle Swarm Optimization (MPSO) were used to create a deep learning method for anticipating flood conditions and identifying people in advance. Locating the source of a forest fire can help save lives and the economy. It is a challenging task to find victims quickly. With the aid of convolutional neural networks, assist firemen in locating casualties by spotting smoke density in photos from the unmanned aerial vehicle. Earthquakes and other calamities are more likely to happen in specific areas owing to geography. It is vital to find the victim quickly. Aerial pictures were obtained and victim location was made possible by victim detection using a convolution neural network-based architecture and a specialised ground station server.. To evaluate the framework, a simulation of actual catastrophes was created.

## 2.2 REFERENCE

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## 2.3 PROBLEM STATEMENT DEFINITION

### Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love. A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

<b>Problem Statement (PS):</b>	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 propose a multi-layered deep convolutional neural network.
<b>I am (CIVILIAN)</b>	A Civilian, who is aware about natural disasters and takes the prediction methods to save nature.
<b>I'm trying to</b>	Avoid natural disasters
<b>But</b>	Due to natural disasters, there are droughts, economic crises, capital destruction etc.

<b>Because</b>	Natural disasters are increasing because of population growth, Urbanization (a lot of people in small places), alteration of the natural environment (man-made islands).
<b>Which makes me feel</b>	Natural disasters affect human life and destroy natural resources.

## PROBLEM STATEMENT 1:



## PROBLEM STATEMENT 2:

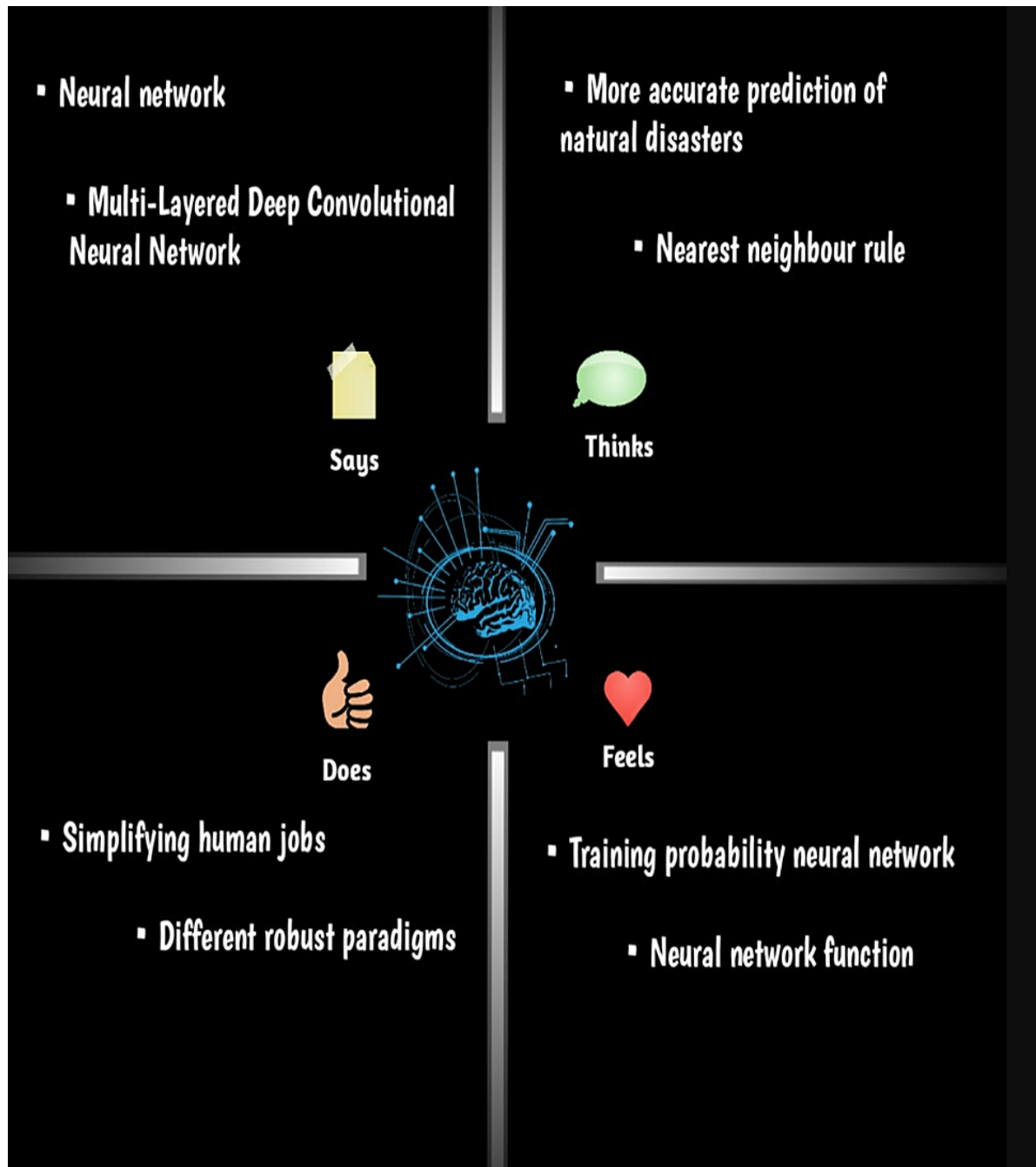


<b>Problem Statement (PS)</b>	<b>I am (Customer)</b>	<b>I'm trying to</b>	<b>But</b>	<b>Because</b>	<b>Which makes me feel</b>
PS-1	A civilian	Avoid natural disaster	Exists draughts, economic al crisis and capital destructio n, etc....	Of Urbanizati on and population growth	Affects millions of human lives and they an analyze the disaster priority and protect themselves from losses
PS-2	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

## CHAPTER 3

### IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP




## 3.2 IDEATION AND BRAINSTORMING

### Brainstorm & Idea Prioritization Template:

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

### Step-1: Team Gathering, Collaboration and Select the Problem Statement



## Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 🕒 10 minutes to prepare
- 🕒 1 hour to collaborate
- 👤 2-8 people recommended

[Share template feedback](#)

➡

#### Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕒 10 minutes

---

**A Team gathering**  
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

**B Set the goal**  
Think about the problem you'll be focusing on solving in the brainstorming session.

**C Learn how to use the facilitation tools**  
Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) ➡

1


#### Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

People need a way to classify and analyse the disaster priorly so that they can protect themselves from losses due to the Disaster and Millions of Lives,.



#### Key rules of brainstorming

To run a smooth and productive session

➡ Stay in topic.	💡 Encourage wild ideas.
➡ Defer judgment.	👂 Listen to others.
🗒 Go for volume.	👁 If possible, be visual.

## Step-2: Brainstorm, Idea Listing and Grouping

**2 Brainstorm**  
Write down any ideas that come to mind that address your problem statement.  
⌚ 10 minutes

**Thendral R**

Danger zone Classification	Build institutions for making plans
Build hazard resistant buildings	Making computer app for Detection
Improve Early warning systems	Mitigating people residence near water infrastructure

**Manju D**

Developing an app for predetection	Safer zone in Danger zone Identification
Develop hazard buffers	Awareness with Govt's Budget for Disaster
Develop culture for prevention	Improve warning and response systems

**Deepa R**

Development of Policies and plans	Evaluation of Safer zone
Developing an AI model for Classification of Disaster	Construction of Hazard resistant Structures
Evacuation of people from danger zone	Analysis of previous Disaster

**Sowmiya M**

Protect and Develop Forests, Reefs.,	Map and avoid High risk zones
Develop culture for Resilience	Reduce Global warming by minimising GHGs
House and Farm Insurance	Develop a AI model for Detection of Disaster

**TP**  
You can select a sticky note and let the person beside to sketch/scan to start drawing!

**3 Group ideas**  
Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.  
⌚ 20 minutes

**TP**  
Add customizable tags to sticky notes to make it easier to find, remove, organize, and categorize important ideas as themes within your mural.

Developing an AI model for Classification of Disaster	Developing an app for Detection
Analysis of previous Disaster	Improve Early warning and response systems
Danger zone classification and evaluation of safer zone	Development of Insurance policies and plans

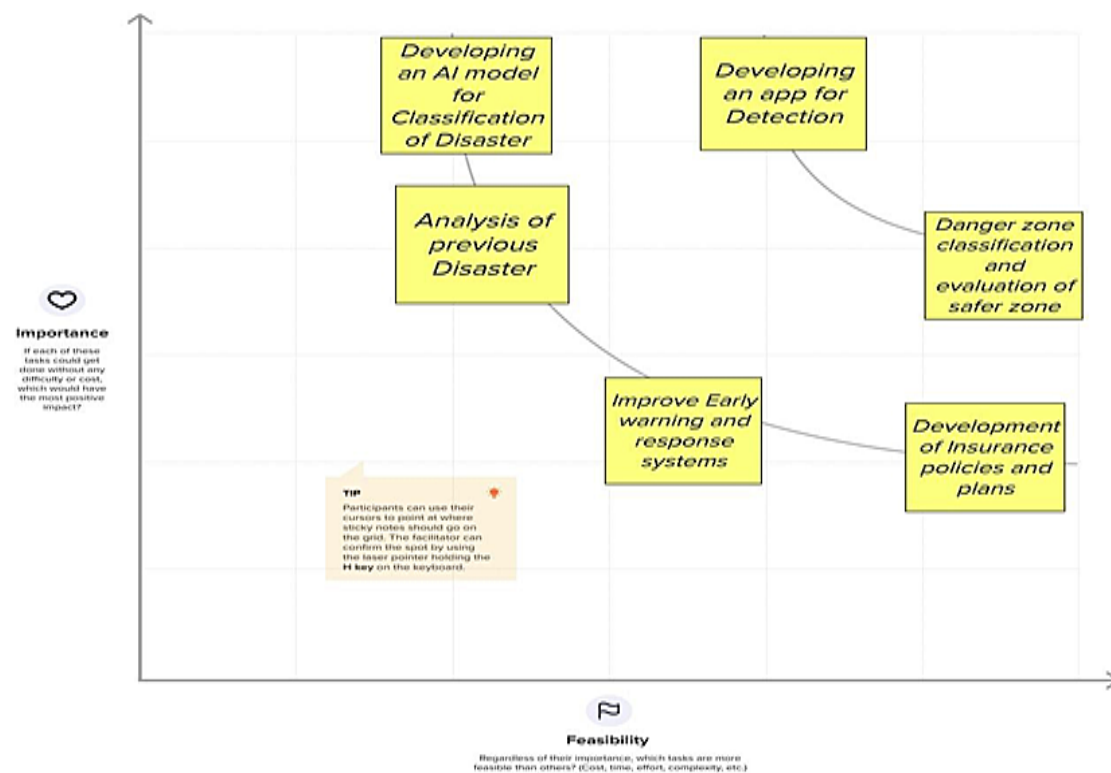
## Step-3: Idea Prioritization

4

### Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⌚ 20 minutes



### 3.3 PROPOSED SOLUTION

S.NO	PARAMETER	DESCRIPTION
1.	Proposed Statement (Problem to be solved)	<p>The main purpose of this model is to detect and classify the type of disaster with a high accuracy rate.</p> <p>To prevent natural disasters in the future, said model can be used to predict future disasters and take some action against heavy loss of human ecological systems and property</p>
2.	Idea / Solution Description	<p>We propose a multilayered deep convolutional neural network. The proposed model works in two blocks:</p> <ul style="list-style-type: none"><li>● Block-I convolutional neural network (B-I CNN), for detection and occurrence of disasters</li><li>● Block-II convolutional neural network (B-II CNN), for classification of natural disasters intensity types with different filters and parameters</li></ul>





3.	Novelty / Uniqueness	<p>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.</p> <p>To address these problems, we proposed multi-layered 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.</p>
4.	Social Impact / Customer Satisfaction	<p>Buildings collapse, ailments spread and sometimes natural disasters such as tsunamis, earthquakes, and forest fires can devastate nations. The aftermath of disasters leaves the humans in miserable situations, and sometimes the devastating effects cannot be detected; additionally, rescue operations cannot take place in most of the places and victims are unable to be identified due to geographical factors of the different areas. Disasters such as forest fires spread rapidly in dense areas, so firefighting is difficult to carry out; in this case, development of the strategy to predict such circumstances is crucial so that such disasters can be prevented beforehand.</p>

5.	Business Model (Revenue Model)	The proposed multilayered deep convolutional neural network was simulated on the computer system with Core i7, Central Processing Unit (CPU) 2.8 Ghz with 16 GB RAM in MATLAB 2018a and different types of results were calculated
6.	Scalability of the solution	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. The 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.

### 3.4 PROBLEM SOLUTION FIT

Problem-Solution fit canvas 2.0		Purpose / Vision	
Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Customers are regarded to be the general public who are affected by natural disasters.	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> Mitigation strategies include the adoption of zoning, land use policies, and building rules are required. Awareness, Education, Preparedness, Predictions and Warning Systems can lessen the disruptive effects of a natural catastrophe on communities. However, in order to stop or lessen actual harm from dangers	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Infrastructure Investment in risk reduction Reforestation Technology Education Issues and disease Stable buildings Economic support
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Loss of utilities including electricity and water, as well as structural damage to structures. Cleaning up after the mess and managing the trash. Road closures and communication breakdowns are examples of infrastructure-related issues.	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> All case studies identified a lack of resources and capacities (financial, human, and technical) as well as a lack of knowledge and education as the main root causes of several drivers of disaster risks.	<b>7. BEHAVIOUR</b> <span>BE</span> During a natural disaster, if you have not been told to evacuate, remain in a safe area or seek shelter. When local officials issue vital updates or build new infrastructure, listen to your portable radio. Utilize a generator with caution if the electricity goes out.
Identify strong TR & EM	<b>3. TRIGGERS</b> <span>TR</span> Overpopulation, pollution, the burning of fossil fuels and deforestation developments like those have caused climate change, soil erosion, poor air quality and undrinkable water are just a few of the ways that humans have an impact on the physical environment.	<b>10. YOUR SOLUTION</b> <span>SL</span> Replenishing forests preventing land degradation and stabilizing soil, for instance, as the trees and roots shield it from being washed or blown away. Making a house robust and airtight is essential, and using prediction and warning systems as well as raising public awareness and educating people can help communities avoid being negatively affected by natural disasters.	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> Using the web application to get notifications and integrating it with a live stream of a harsh environment
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> After a natural disaster occurs, people can have a variety of thoughts and actions, including sentiments of fear, wrath, sadness, worry, and frustration. variations in energy, activity, and hunger. Having trouble focusing, making decisions, and having nightmares		<b>8.2 OFFLINE</b> Considering the environment, letting more people know about the advantages of the web app and taking safety precautions.

 Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license  
 Created by Daria Nepriakhina / Amaltama.com



## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1 FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR - 1	User Registration	<ul style="list-style-type: none"><li>● Registering via Google Accounts</li><li>● Registering via Product's own user management system</li></ul>
FR - 2	User Authentication	<ul style="list-style-type: none"><li>● Verification through OTP</li><li>● Verification through Email Link</li></ul>
FR - 3	Designation of Region	<ul style="list-style-type: none"><li>● Ease of selection of necessary areas to be monitored</li><li>● Versatile and Flexible operations on designated areas</li></ul>
FR - 4	Analysis of Required Phenomenon	<ul style="list-style-type: none"><li>● Simple and easy analysis on the specific phenomenon to be observed</li></ul>

FR - 5	<b>Accumulation of required Data</b>	<ul style="list-style-type: none"> <li>● Fast and Efficient data gathering capabilities regarding past event analysis and future prediction</li> </ul>
FR - 6	<b>Organising Unstructured data</b>	<ul style="list-style-type: none"> <li>● Processing of raw and clustered data into clear and refined data which is useful for analysis and prediction tasks</li> </ul>
FR - 7	<b>Algorithm selection</b>	<ul style="list-style-type: none"> <li>● The freedom to choose from several classes of algorithm to be used in the process</li> <li>● Customization of algorithm to suit the needs of a specific purpose</li> </ul>
FR - 8	<b>Prediction and analysis of data</b>	<ul style="list-style-type: none"> <li>● Accurate results of the analysis provided by the process</li> <li>● Advanced visualization techniques to help visualize the processed data for effective observation</li> </ul>
FR - 9	<b>Report generation</b>	<ul style="list-style-type: none"> <li>● Restructuring of obtained results into clear and detailed report for future studies</li> </ul>

## 4.2 NON FUNCTIONAL REQUIREMENTS

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

<b>NFR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR - 1	<b>Usability</b>	<ul style="list-style-type: none"><li>● It is well suited for fields requiring diverse application of processes with efficiency, precision and ease.</li></ul>
NFR - 2	<b>Security</b>	<ul style="list-style-type: none"><li>● It provides a distinct and secure encryption layer to the system interface for additional security standards.</li></ul>
NFR - 3	<b>Reliability</b>	<ul style="list-style-type: none"><li>● The product is robust and is capable of execution of processes even in the most difficult and unpredictable environments.</li></ul>
NFR - 4	<b>Performance</b>	<ul style="list-style-type: none"><li>● The product boasts high precision and efficient working capacity which helps in escalating its performance to the highest degree.</li></ul>

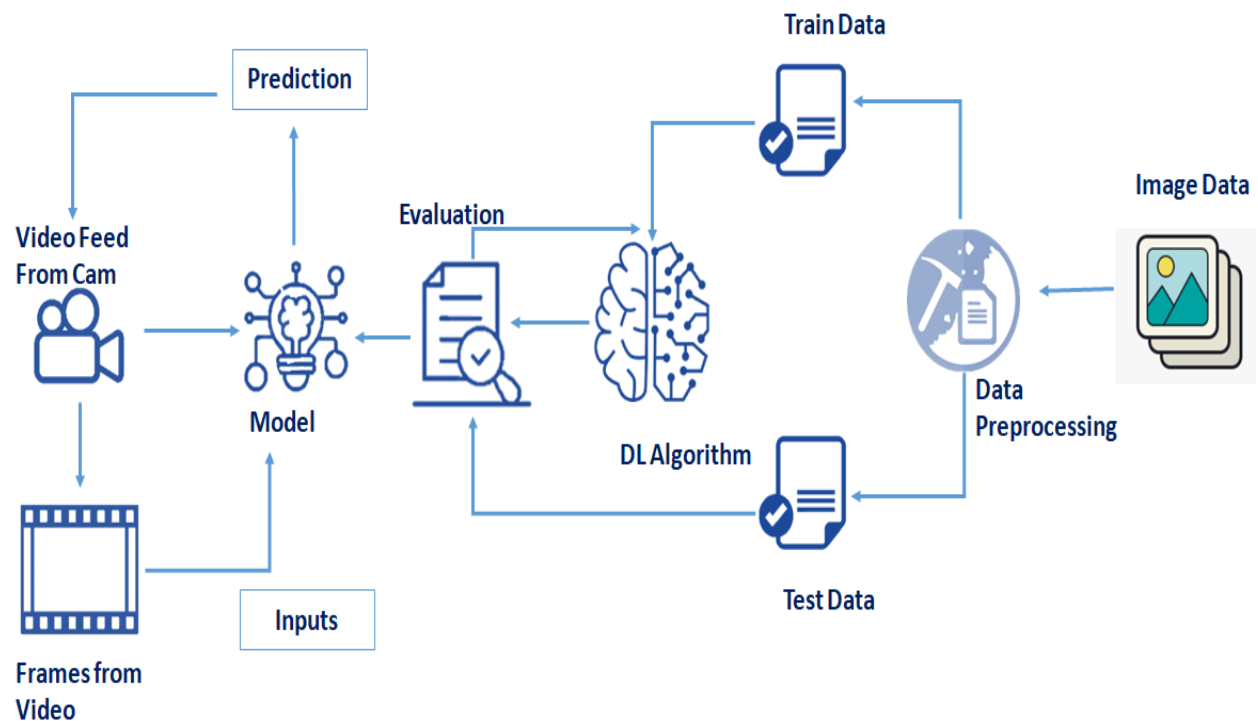
NFR - 5	<b>Availability</b>	<ul style="list-style-type: none"> <li>Despite the complexity and degree of difficulty in its operation, the product is equipped with all-round maintenance and readily available technical services which provides the necessary support any individual requires in their duties.</li> </ul>
NFR - 6	<b>Scalability</b>	<ul style="list-style-type: none"> <li>The product also possess enough room for the improvement of its specifications to upgrade its capabilities according to the needs of the user and their organization</li> </ul>

## CHAPTER 5

### PROJECT DESIGN

#### 5.1 DATA FLOW DIAGRAM

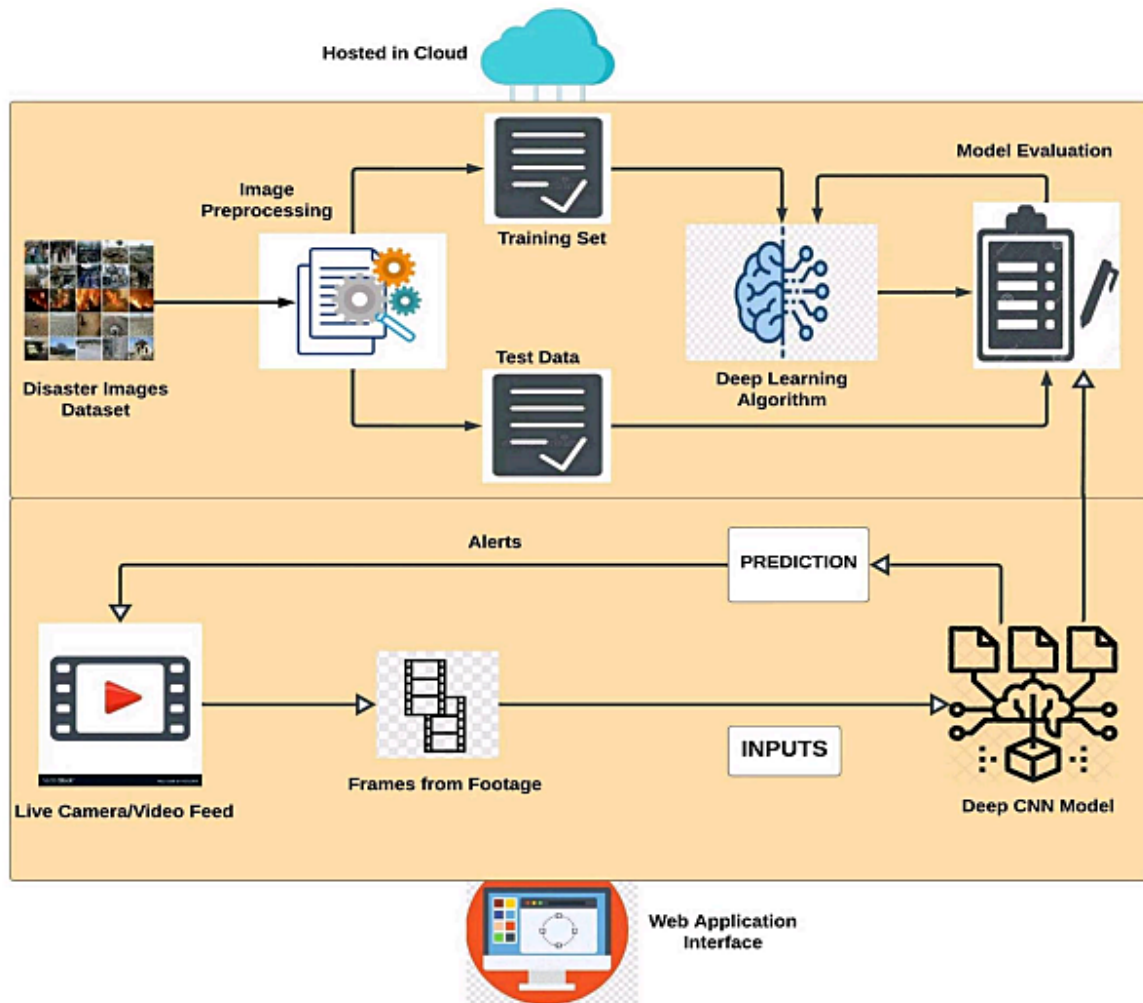
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.





## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2



## TECHNICAL ARCHITECTURE

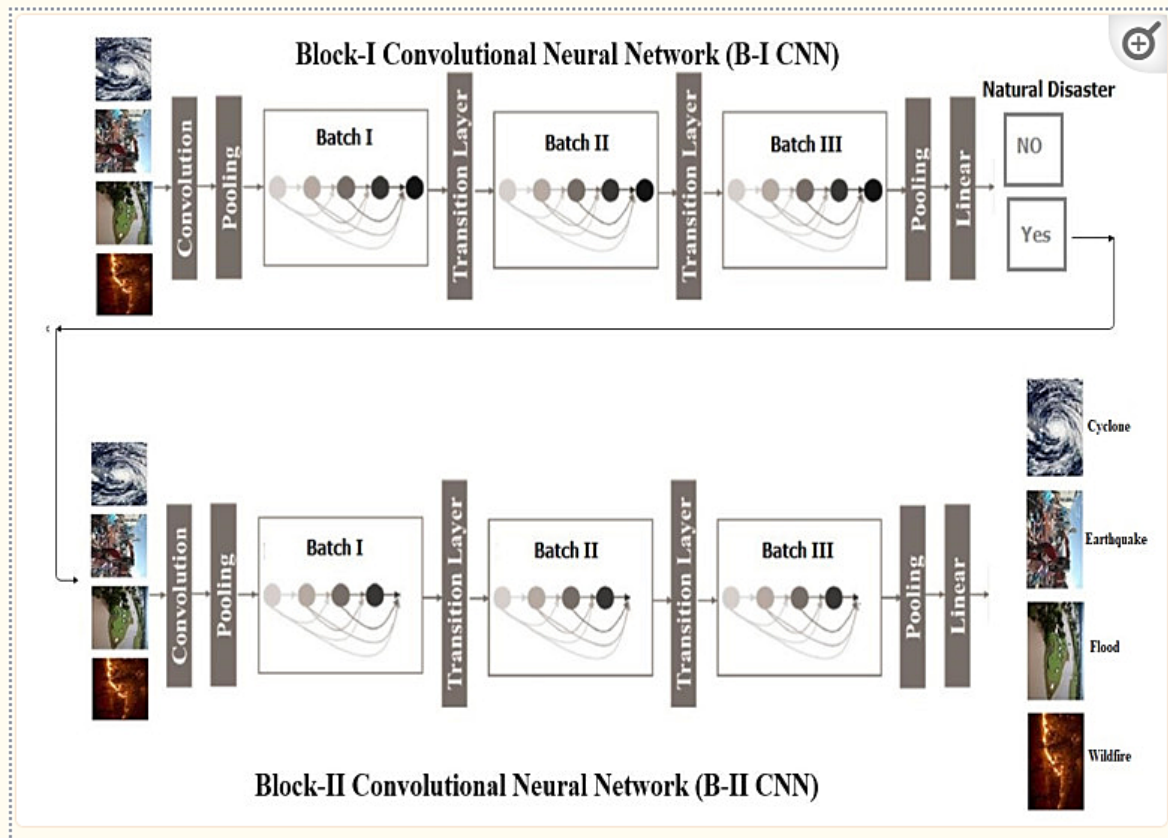


Figure 2

**Table-1: Components & Technologies:**

S.No	Component	Description	Technology
<b>1</b>	User Interface	User interacts with the application for the prediction of Any Natural disaster which will happen in future minutes.	HTML, CSS, JavaScript, Django, Python.
<b>2</b>	Feature Engineering Pipeline	Algorithms can't make sense of raw data. We have to select, transform, combine, and otherwise prepare our data so the algorithm can find useful patterns.	Image processing, pattern extraction, etc.
<b>3</b>	Model Training kit	It learns patterns from the data. Then they use these patterns to perform particular tasks.	Multiclass Classification Model, Regression Model, etc.
<b>4</b>	Prediction unit	This function is used to predict outcomes from the new trained data to perform new tasks and solve new problems.	Decision trees, Regression, Neural networks.
<b>5</b>	Evaluation system	It monitors how Algorithms perform on data as well as during training.	Chi-Square, Confusion Matrix, etc.

<b>6</b>	Interactive services	To interact with our model and give it problems to solve. Usually this takes the form of an API, a user interface, or a command-line interface.	Application programming interface, etc.
<b>7</b>	Data collection unit	Data is only useful if it's accessible, so it needs to be stored ideally in a consistent structure and conveniently in one place.	IBM Cloud, SQL Server.
<b>8</b>	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 business functions.	Synthetic data generation.
<b>9</b>	Database management system	An organized collection of data stored in database, so that it can be easily accessed and managed.	MySQL, DynamoDB etc.
<b>10</b>	IBM Cloud services	Processed data stored in cloud service which can be access by the admin anywhere over the internet.	IBM Cloud etc.

### 5.3 USER STORIES

User Type	Functional Requirements (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Upload Data	USN-1	As a user, I can upload either a live stream, video or photo of the disaster	I can upload the data.	High	Sprint-1
Customer (Mobile user)	Obtain Output	USN-2	As a user, I can receive the classification and the intensity of the disaster	I can receive the information about the disaster	High	Sprint-2
Customer (Web user)	Upload Data	USN-1	As a user, I can upload either a live stream, video or photo of the disaster	I can upload the data.	High	Sprint-3
Customer (Web user)	Obtain Output	USN-1	As a user, I can receive the classification and the intensity of the disaster	I can receive the information about the disaster	High	Sprint-4

## CHAPTER 6

### PROJECT PLANNING & SCHEDULING

#### 6.1 SPRINT PLANNING AND SOLUTION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User input	USN-1	As a user, I can input the particular URL in the required field and waiting for validation.	2	High	Gowthamen, Geethanjaly
Sprint-1	Feature extraction	USN-1	Here system can extract feature using heuristic and visual similarity approach	1	High	Gowthamen, Archana
Sprint-1	Prediction	USN-1	Here the Model will predict the URL websites using Machine Learning algorithms	2	High	Archana, Geethanjaly

Sprint-1	Classifier	USN-1	Here it will send all the model output to classifier in order to produce final result	2	High	Archana, Anisha
Sprint-1	Announcement	USN-1	Displays whether website is a legal site or a phishing site.	1	High	Gowthamen, Anisha
Sprint-2	Bugs	USN-2	As a user, I can report bugs in the application	1	Medium	Anisha, Gowthamen
Sprint-2	Feedback	USN-3	As a user, I can send feedback about the application and opinions for improvement	1	Low	Geethanjaly, Anisha
Sprint-3	Tips	USN-4	Here cyber security tips are provided for the Customers/ Users	1	Low	Geethanjaly, Archana

## 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	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

### VELOCITY :

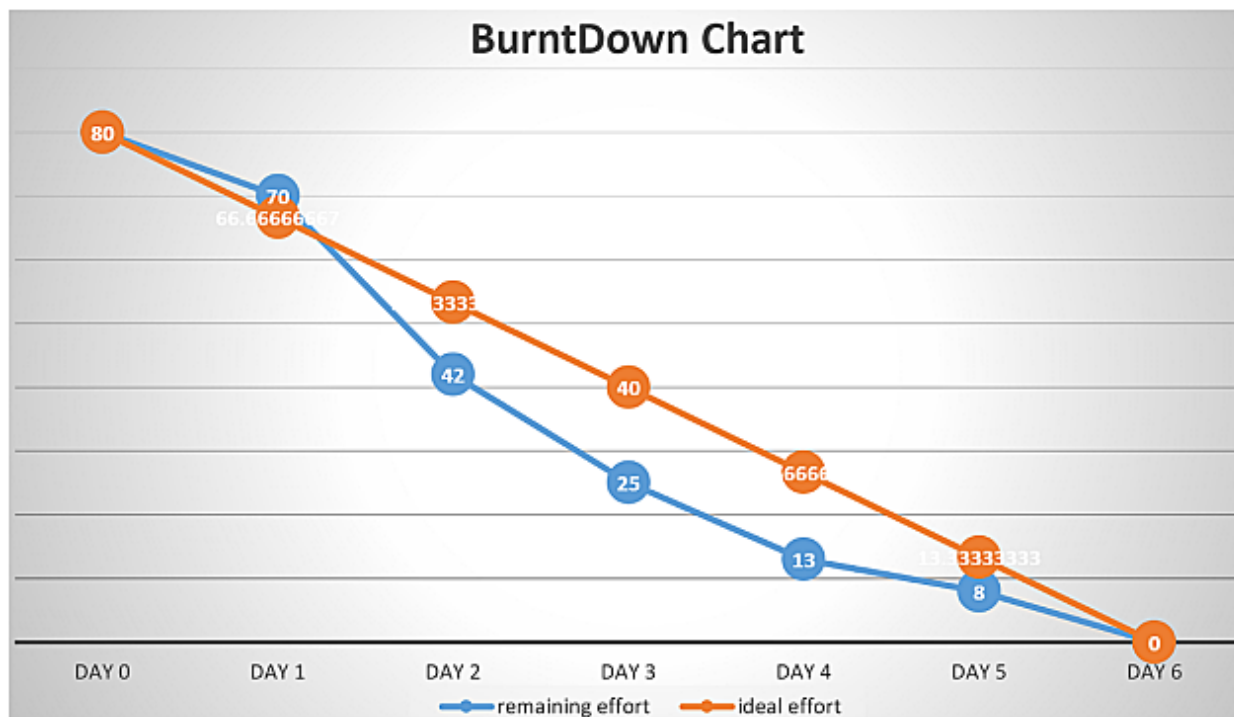
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

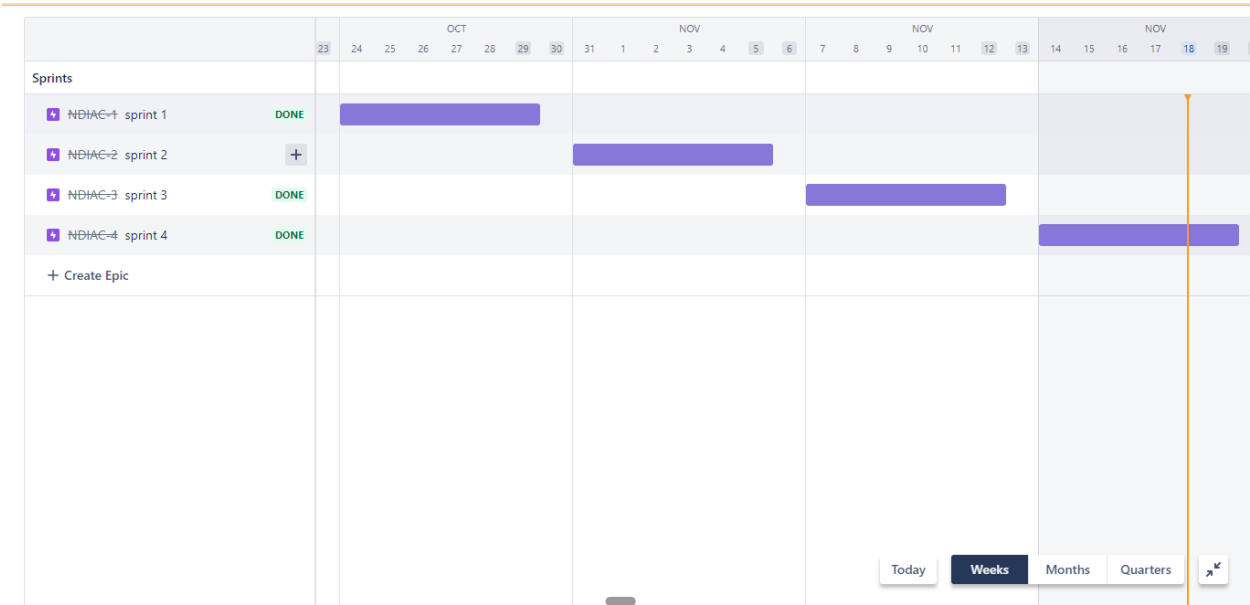


## Burndown Chart:

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



6.3 REPORT FROM JIRA



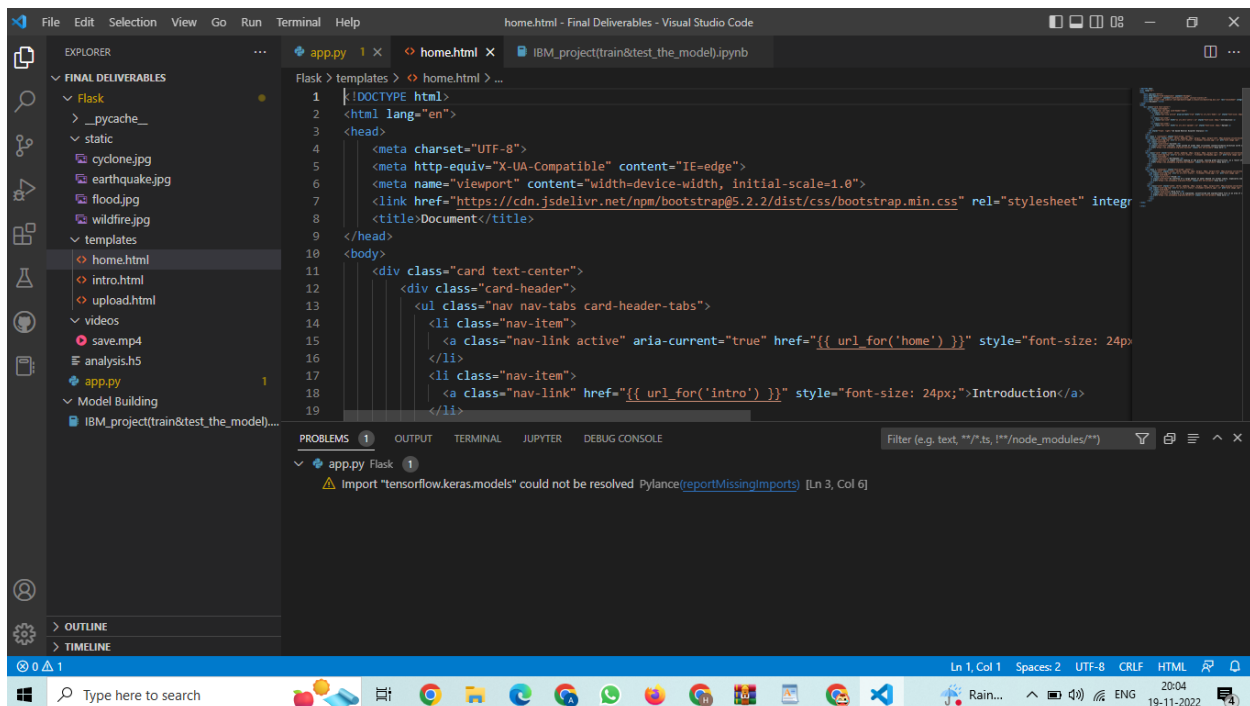
## CHAPTER 7

### CODING AND SOLUTION

#### 7.1 FEATURE 1

A convolutional 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 to other classification algorithms. The advantage of CNNs is to provide an efficient dense network which performs the prediction or identification efficiently. Code is attached below.

#### Home.html



```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta http-equiv="X-UA-Compatible" content="IE=edge">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0">
7   <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-Zy9kua6YFW2p08Nkuz0X82Dq2236+yZ3aYvtrf06770bbWtPvm9v9kVi08644" crossorigin="anonymous">
8   <title>Document</title>
9 </head>
10 <body>
11   <div class="card text-center">
12     <div class="card-header">
13       <ul class="nav nav-tabs card-header-tabs">
14         <li class="nav-item">
15           <a class="nav-link active" aria-current="true" href="{{ url_for('home') }}" style="font-size: 24px">Home</a>
16         </li>
17         <li class="nav-item">
18           <a class="nav-link" href="{{ url_for('intro') }}" style="font-size: 24px;">Introduction</a>
19         </li>
20       </ul>
21     </div>
22   </div>
23 </body>
24 </html>
```

## Intro.html

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta http-equiv="X-UA-Compatible" content="IE=edge">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0">
7   <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-DyNbrvIsbXcblRZp8O1bpcPFpRGbvBNf6dffdRpx平地O'tzzlU024Xp" crossorigin="anonymous">
8   <title>Document</title>
9 </head>
10 <body>
11   <div class="card text-center">
12     <div class="card-header">
13       <ul class="nav nav-tabs card-header-tabs">
14         <li class="nav-item">
15           <a class="nav-link" aria-current="true" href="{{ url_for('home') }}" style="font-size: 24px;">Home</a>
16         </li>
17         <li class="nav-item">
18           <a class="nav-link active" href="{{ url_for('intro') }}" style="font-size: 24px;">Introduction</a>
19         </li>
20       </ul>
21     </div>
22   </div>
23 </body>
24 </html>
```

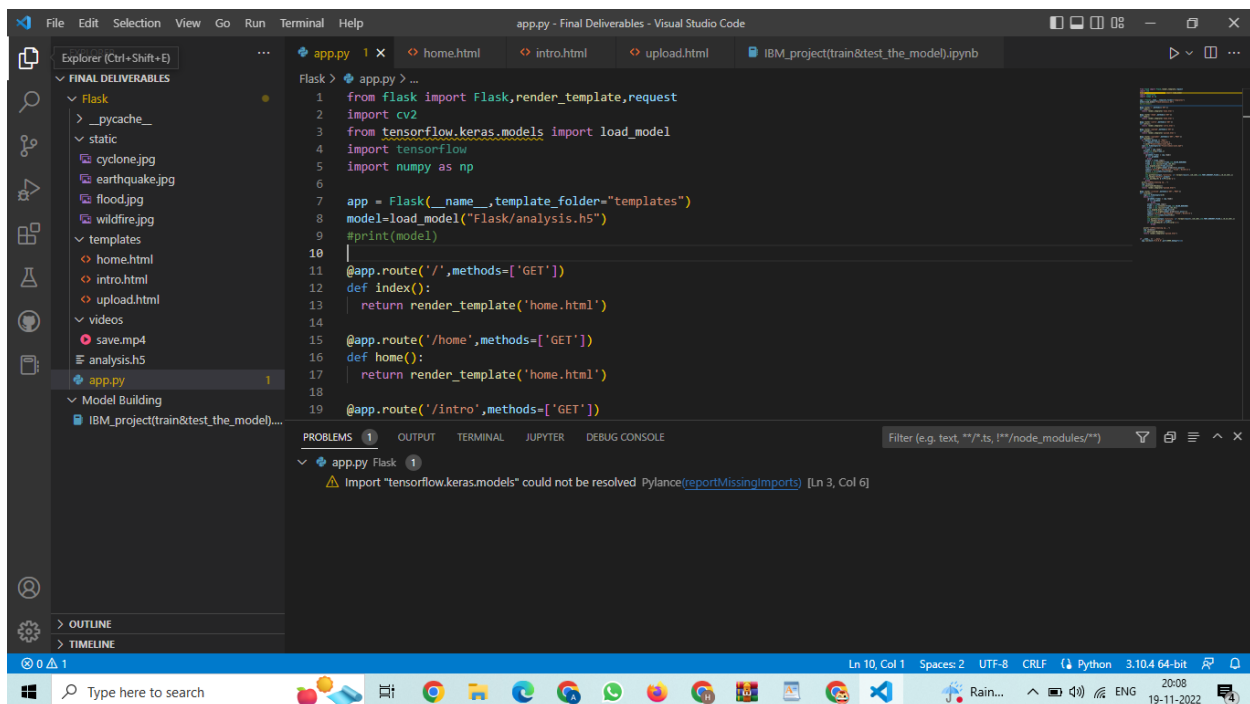
## Upload.html

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta http-equiv="X-UA-Compatible" content="IE=edge">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0">
7   <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-DyNbrvIsbXcblRZp8O1bpcPFpRGbvBNf6dffdRpx平地O'tzzlU024Xp" crossorigin="anonymous">
8   <title>Document</title>
9 </head>
10 <body>
11   <table>
12     <tr>
13       <td>
14         <div class="card text-center">
15           <div class="card-header">
16             <ul class="nav nav-tabs card-header-tabs">
17               <li class="nav-item">
18                 <a class="nav-link" aria-current="true" href="{{ url_for('home') }}" style="font-size: 24px;">Home</a>
19               </li>
20               <li class="nav-item">
21                 <a class="nav-link active" href="{{ url_for('intro') }}" style="font-size: 24px;">Introduction</a>
22               </li>
23             </ul>
24           </div>
25         </div>
26       </td>
27       <td>
28         <div class="card text-center">
29           <div class="card-header">
30             <ul class="nav nav-tabs card-header-tabs">
31               <li class="nav-item">
32                 <a class="nav-link" aria-current="true" href="{{ url_for('home') }}" style="font-size: 24px;">Home</a>
33               </li>
34               <li class="nav-item">
35                 <a class="nav-link active" href="{{ url_for('intro') }}" style="font-size: 24px;">Introduction</a>
36               </li>
37             </ul>
38           </div>
39         </div>
40       </td>
41     </tr>
42   </table>
43 </body>
44 </html>
```

## 7.2 FEATURE 2

We developed a multilayered 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 OpenCV window. A multilayer 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. Code is attached below.

### APP.PY



```
Flask > app.py > ...
1  from flask import Flask,render_template,request
2  import cv2
3  from tensorflow.keras.models import load_model
4  import tensorflow
5  import numpy as np
6
7  app = Flask(__name__,template_folder="templates")
8  model=load_model("Flask/analysis.h5")
9  #print(model)
10
11  @app.route('/',methods=['GET'])
12  def index():
13      return render_template('home.html')
14
15  @app.route('/home',methods=['GET'])
16  def home():
17      return render_template('home.html')
18
19  @app.route('/intro',methods=['GET'])
```

PROBLEMS 1 OUTPUT TERMINAL JUPYTER DEBUG CONSOLE

app.py Flask 1

Import "tensorflow.keras.models" could not be resolved Pylance(reportMissingImports) [Ln 3, Col 6]

Ln 10, Col 1 Spaces: 2 UTF-8 CRLF Python 3.10.4 64-bit

## CHAPTER 8

### TESTING

#### 8.1 TEST CASES

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

It is to briefly explain the test coverage and open issues of the natural disasters intensity analysis and classification using artificial intelligence project at the time of the release to User Acceptance Testing (UAT).

##### **Defect Analysis:**

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

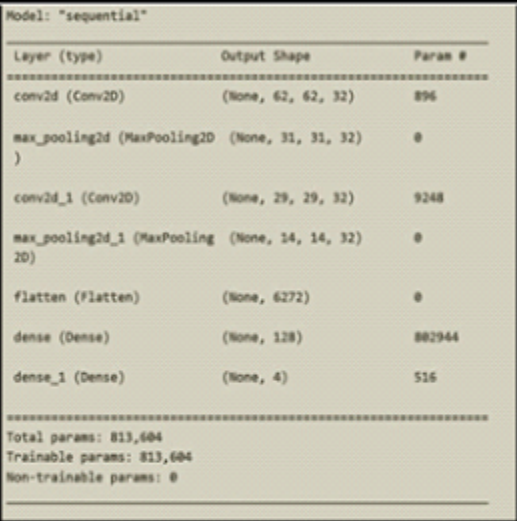
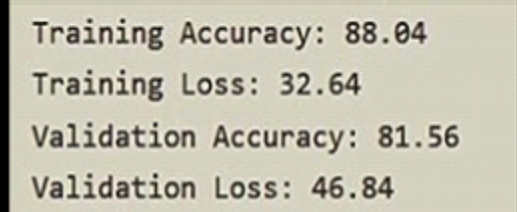
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Total
By Design	1	0	1	0	2
Duplicate	0	0	0	0	0
External	0	0	2	0	2
Fixed	4	1	0	1	6
Not Reproduced	0	0	0	1	1
Skipped	0	0	0	1	1
Won't Fix	1	0	1	0	2
Total	6	1	4	3	14

## CHAPTER 9

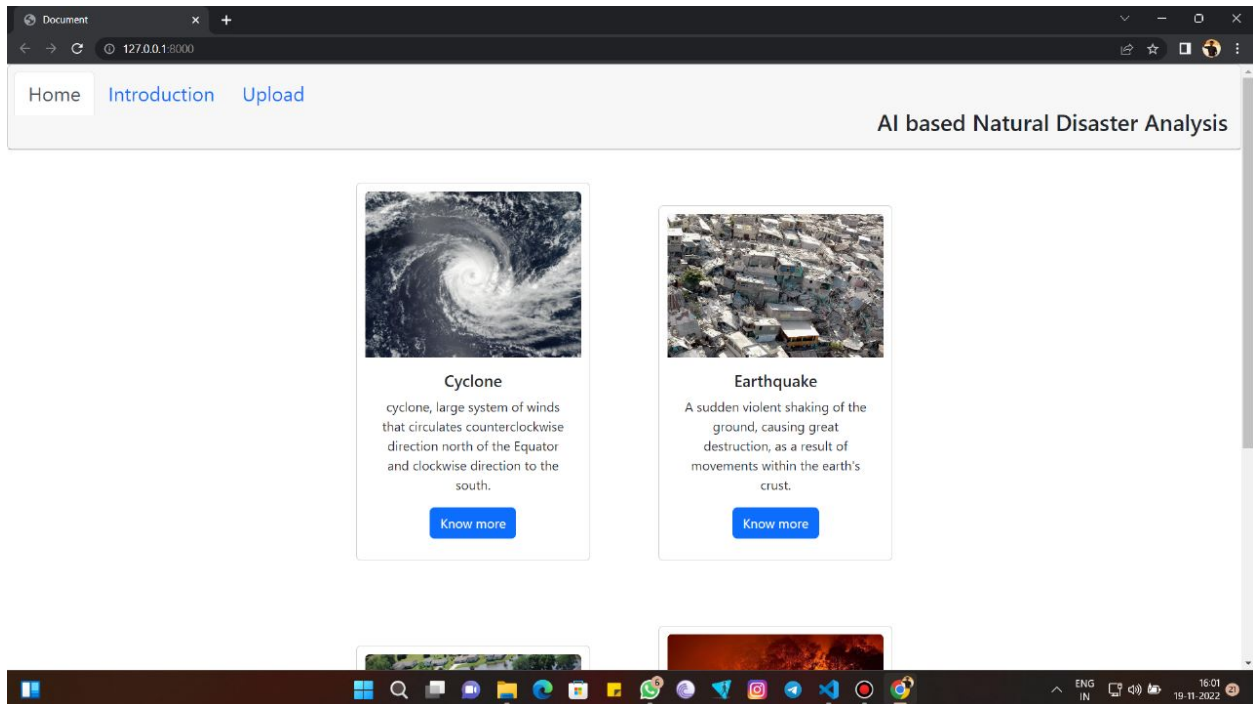
### RESULTS

#### 9.1 PERFORMANCE METRICES

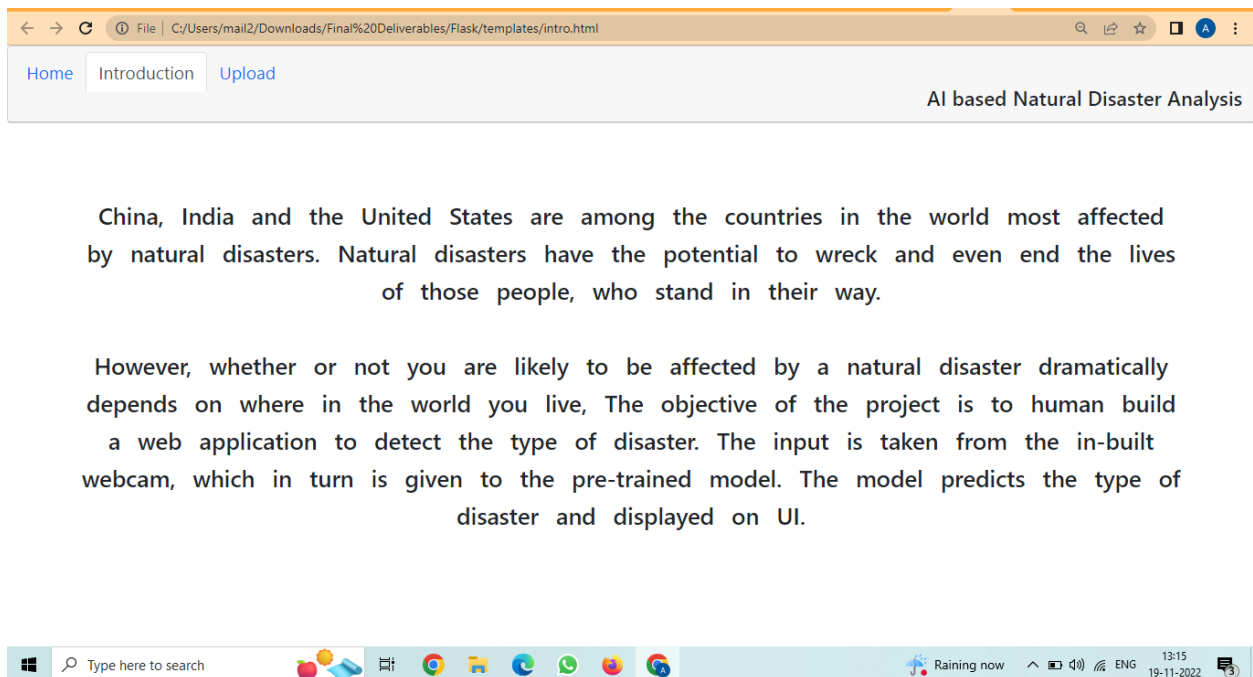
The nature disaster intensity analysis and classification with test data and train data has been executed successfully. The model has been trained over 1000+ images and the model have an accuracy of nearly 99% and the model has been tested with the data which is separate from the trained data and has predicted the data well.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	-	
2.	Accuracy	Training Accuracy - 88.04% Validation Accuracy - 81.56%	

## HOME PAGE

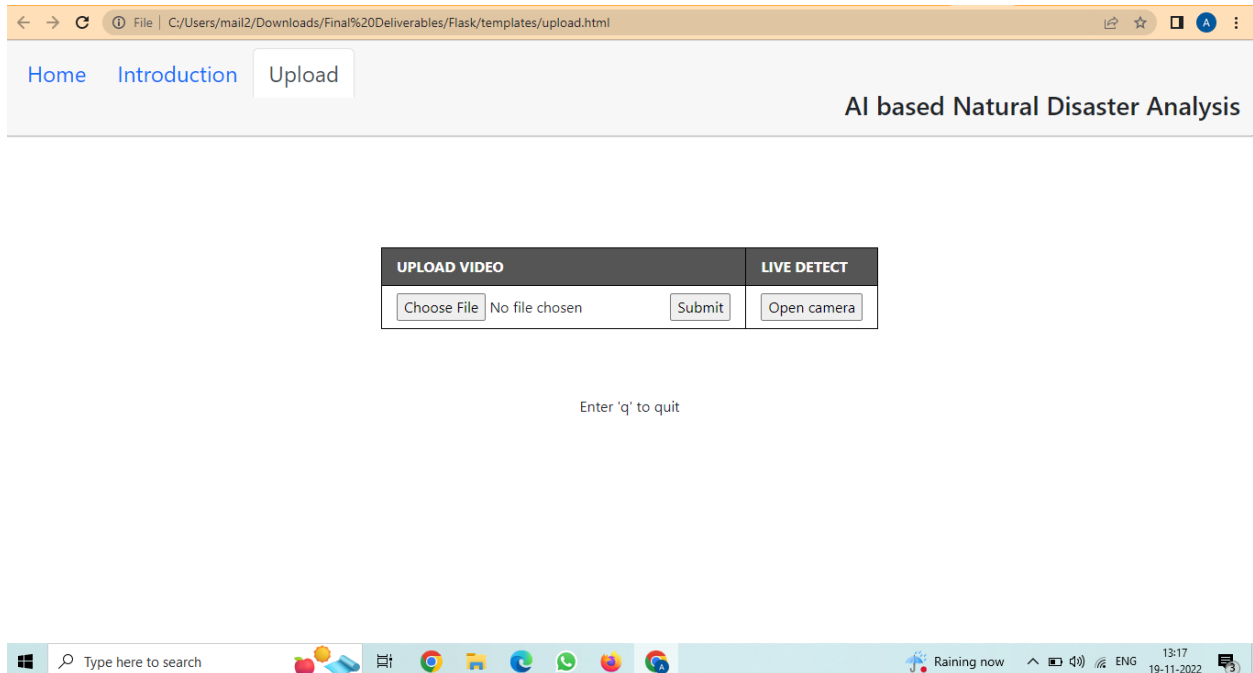


## INTRO PAGE





## UPLOAD PAGE



## RESULT PAGE



## CHAPTER 10

### ADVANTAGES AND DISADVANTAGES

#### 10.1 ADVANTAGES

- By predicting the occurrence of natural disasters, we can save thousands of lives and take appropriate measures to reduce property damage.
- Update current in the government organization.
- Predictions and warnings can also reduce damage and economic losses.
- AI can help detect and prepare for extreme weather and other hazards. A team at Lancaster University created a disaster mapping and damage detection system that allows rescue teams to prioritize designated areas in their relief efforts.
- Technology has enabled governments to look into measures that were not possible before. With efficient geo-location and scanning technologies, it is beneficial for the government to predict the area of impact before a disaster. Big data and other technologies also help in early information.
- So errors are reduced and the chance of reaching accuracy with a greater degree of precision is a possibility. Example: In Weather Forecasting using AI they have reduced the majority of human error.
- It improves work efficiency so reduce the duration of time to accomplish a task in comparison to humans.

## **10.2 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 problems.

## **CHAPTER 11**

### **CONCLUSION**

Several researchers have tried to employ various deep learning techniques for detection. List natural catastrophes 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. Average statistical values for the outcomes were determined, and they were as follows for the proposed 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. So the suggested approach performs noticeably better at identifying and categorizing natural disasters, but it can be used for a variety of natural disaster detection procedures in the future.

## **CHAPTER 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 of flood-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.

## CHAPTER 13

### 13.1 SOURCE CODE

#### APP.PY :

```
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="templates")
model=load_model("Flask/analysis.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 intro():
    return render_template('intro.html')
@app.route('/upload', methods=['GET'])
def upload():
    return render_template('upload.html')
@app.route('/uploader', methods=['GET', 'POST'])
def uploader():
    if request.method == "POST":
        f = request.files['filename']
        f.save("Flask/videos/save.mp4")
        cap=cv2.VideoCapture("Flask/videos/save.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_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(0) & 0xFF==ord('q'):
        break
print("[INFO]cleaning up...")
cap.release()
cv2.destroyAllWindows()
return render_template("upload.html")
@app.route('/livecam', methods=['GET', 'POST'])
def livecam():
    cap=cv2.VideoCapture(0)
    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(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=False
```

## 13.2 GITHUB AND PROJECT DEMO LINK



GITHUB LINK : [Click here](#)



DEMO LINK : [Click here](#)