NATURAL DISASTERS INTENSITY ANALYSIS AND CLASSIFICATION USING ARTIFICIAL INTELLIGENCE

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CHAPTER 1
INTRODUCTION

1.1 PROJECT OVERVIEW

Natural disasters are inevitable, and the occurrence of disasters drastically affects the economy, ecosystem and human life. Natural disasters are now occurring with increasing severity, scope and impact. Buildings collapse, ailments spread and sometimes natural disasters such as tsunamis, earthquakes, and forest fires can devastate nations. When earthquakes occur, millions of buildings collapse due to seismological effects.The solution to the problem is Artificial Intelligence, which is being used to implement the proposed system. Artificial intelligence (AI) models have shown remarkable success and superiority to handle huge and non linear data owing to their higher accuracy and efficiency, making them perfect tools for disaster monitoring and management. AI-based methods can be very effective if a training dataset covers very large events. Natural Disasters Intensity Analysis and Classification using Artificial Intelligence is a network model that classifies the natural disaster .The model uses an integrated web-cam to capture the image and the image is compared with the Pre-trained model and the type of disaster is identified .

1.2 PURPOSE

The purpose of predicting the disaster reduces the losses of lives, livelihoods, health, and possessions (economic, physical, social, cultural and environmental) and significantly reduce the probability of disaster. It encourages the adoption of comprehensive and inclusive policies in the fields of politics, technology, and the environment, as well as in the fields of economics, institutions, law, culture, health, safety, and education, in order to prevent and reduce hazard exposure and disaster vulnerabilities. Predicting the disaster before it occurs can boost emergency preparation for quick action.

CHAPTER 2
LITERATURE SURVEY

2.1 EXSISTING PROBLEM

Natural disasters can cause great damage on the environment, property, wildlife and human health. These events may include earthquakes, floods, hurricanes, tornadoes, tsunamis, landslides, wildfires, volcanic eruptions, and extreme temperatures. Natural disasters generally constitute an emergency since they require immediate intervention due to their high impact on human health and safety; they affect the normal functioning of working infrastructure, interrupting normal day activities and representing a risk for residents and workers in affected areas.

2.2 REFERENCES

- Natural Disasters Intensity Analysis and Classification Based on Multi-spectral Images Using Multi-Layered Deep Convolutional Neural Network[Muhammad Aamir 1 , Tariq Ali 1,*, Muhammad Irfan 2 , Ahmad Shaf 1 , Muhammad Zeeshan Azam 3 , Adam Glowacz 4 , Frantisek Brumercik 5 , Witold Glowacz 4 , Samar Alqhtani 6 and Saifur Rahman 2]
- Artificial Intelligence for Natural Hazards Risk Analysis:[Seth Guikema∗]
- Multimodal deep learning based on multiple correspondence analysis for disaster management[Samira Pouyanfar1 · Yudong Tao2 ·Haiman Tian1 · Shu-Ching Chen1 · Mei-Ling Shyu]
- A Deep Learning Framework for the Detection of Tropical Cyclones From Satellite Images [Aravind Nair, K. S. S. Sai Srujan , Sayali R. Kulkarni, Kshitij Alwadhi, Navya Jain, Hariprasad Kodamana , S. Sandeep , and Viju O. John]
- Research on the identification method for the forest fire based on deep learning Zhaochun Liu a , Kai Zhang b, *, Chenyang Wang a , Siyu Huang c

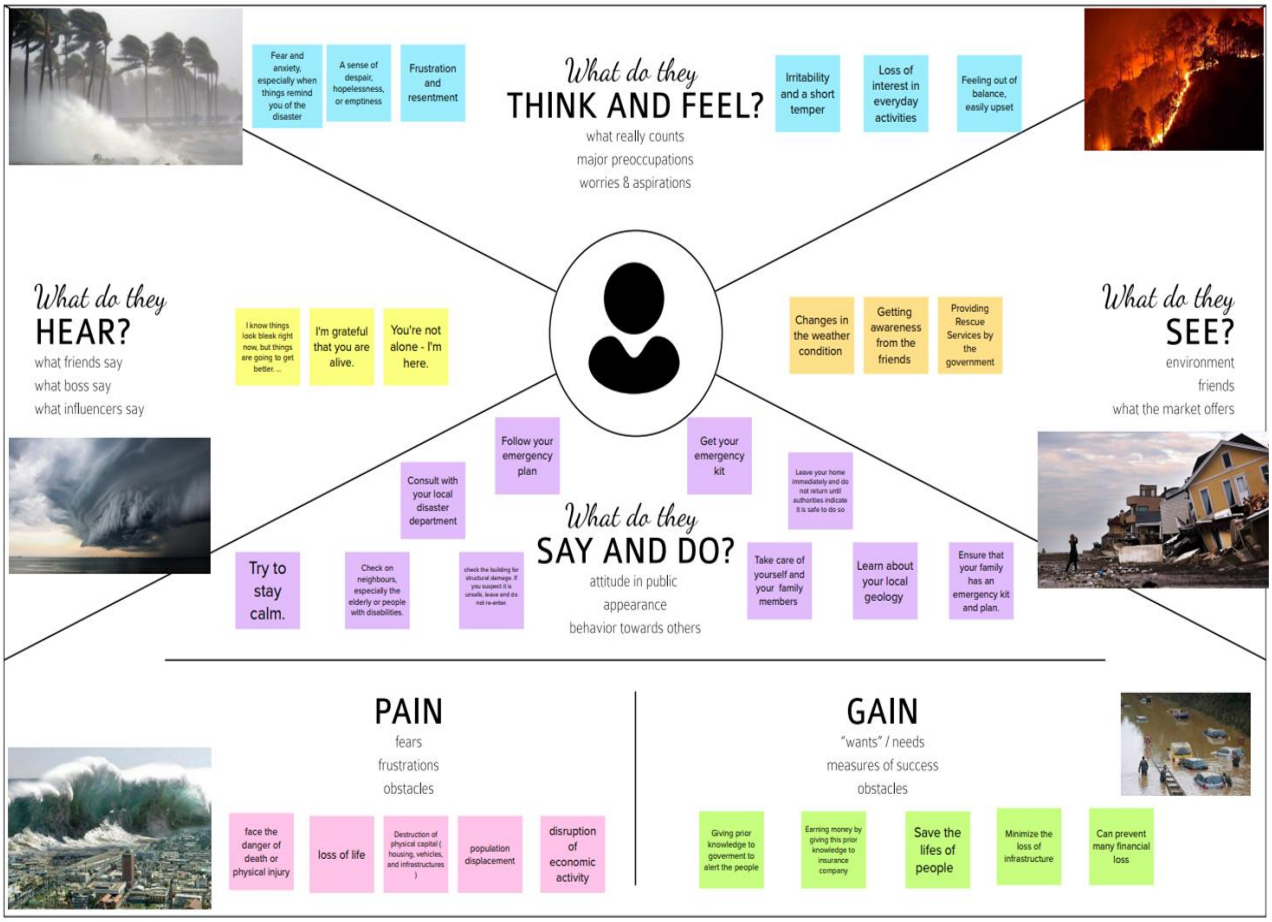
2.3 PROBLEM STATEMENT DEFINITION

Problem Statement (PS)	**I am (Customer)**	**I'm trying to**	**But**	**Because**	**Which makes me feel**
PS-1	Peoples	Escape from disaster before it occur	Can't able to predict	Sudden arrival of disaster or not having knowledge of find prior occurance of disaster	Depression on losses, migrate, frustration , short temper , fear and anxiety.
PS-2	Governments	Safeguarding peoples lives in disaster area, saving economic and minimizing infrastructure damages	Not able safe the economic and infrastructure damages ,cant able to safeguards many lives	No prior knowledge of knowing occurance of disaster And by if occurs cant able to reach the place in time	Changes in appetite, energy, and activity levels. Difficulty concentrating and making decisions
PS-3	Insurance companies	Notify the clients that disaster going to be happen	Cant able to notify the clients in the affected areas	So economics losses to the companies by giving insurance money to the affected people	Sad , worried and feeling out of balance

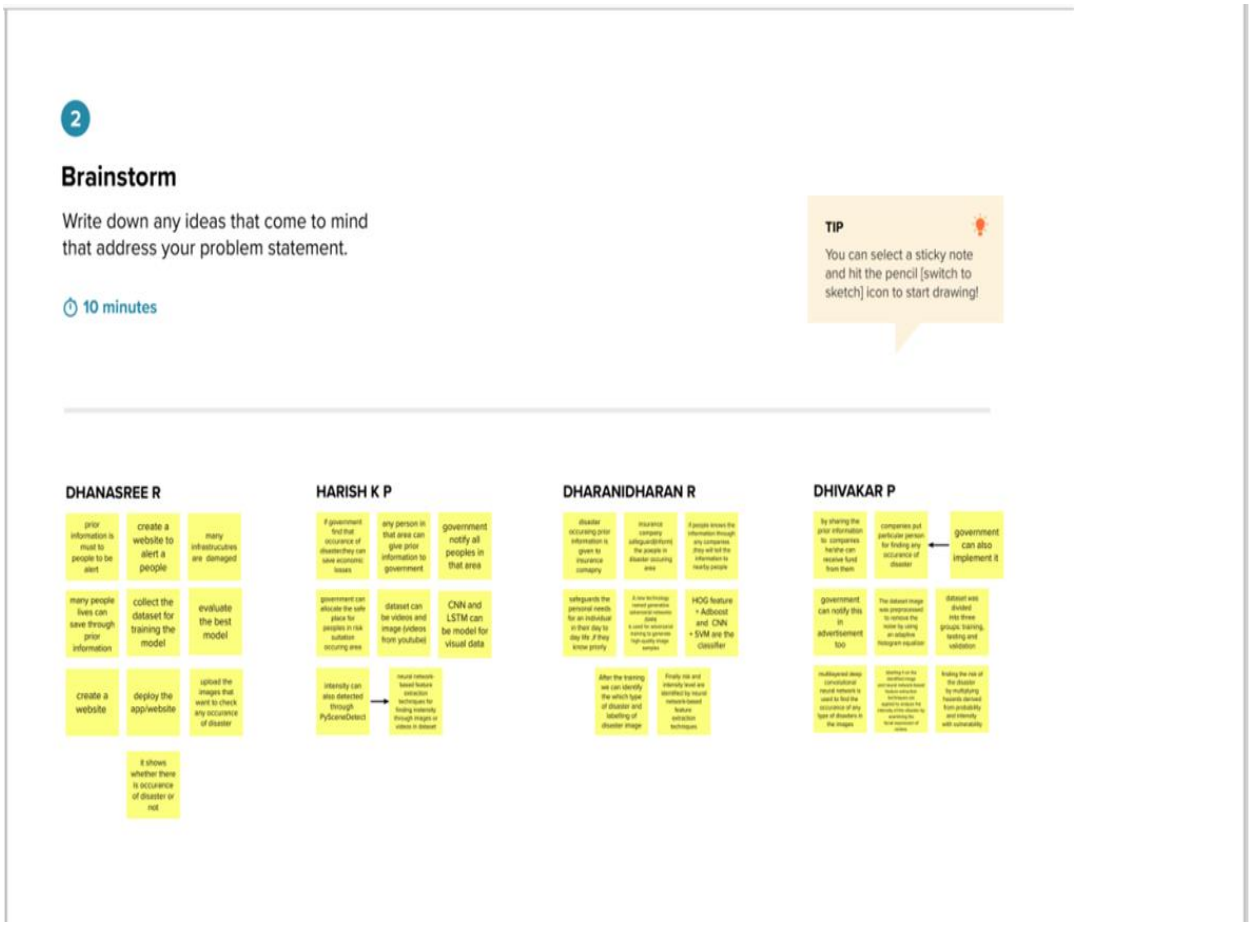
CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

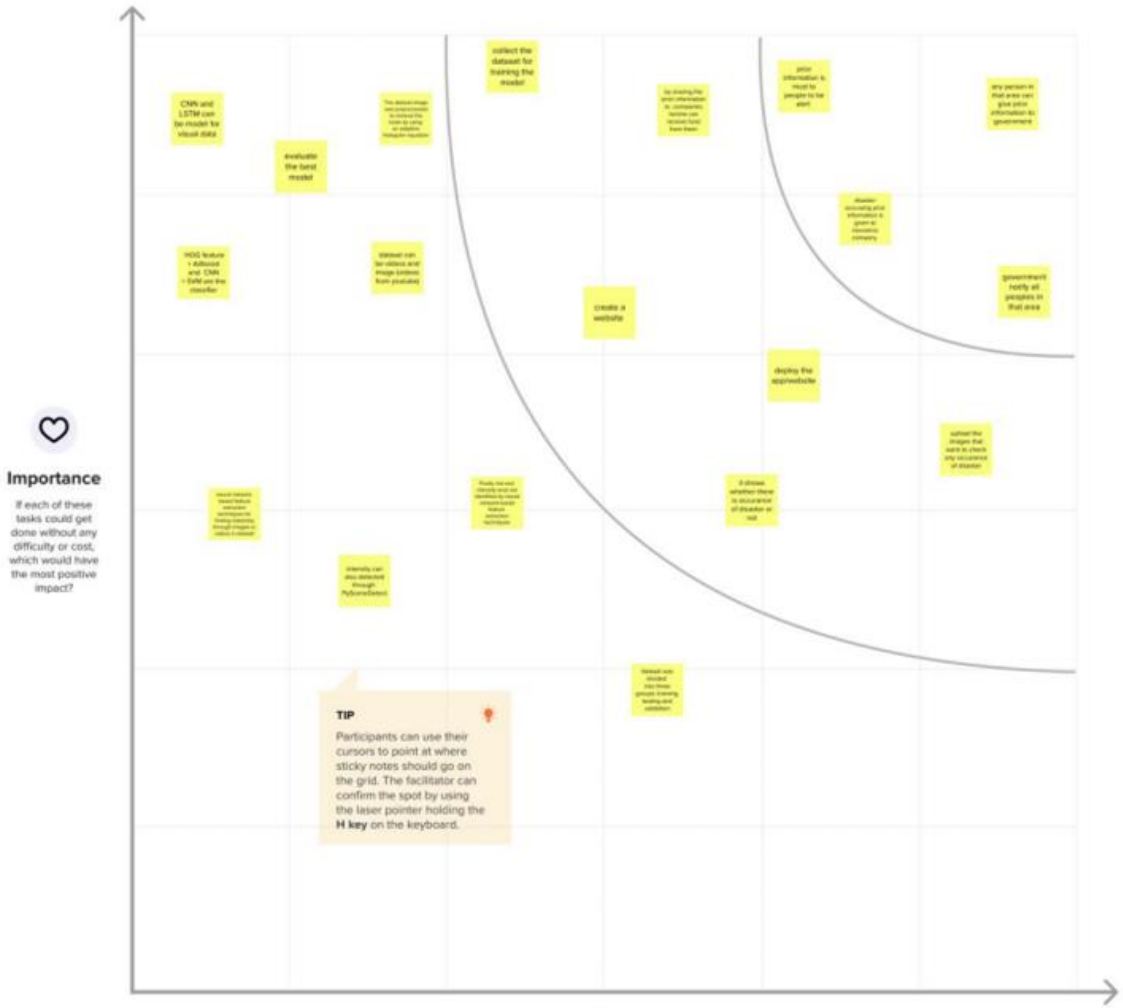


4

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



Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

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)	● A natural disaster cause loss of life or damage property like buildings will collapse due to seismological effects. ● Make some economic damages and disease/virus spread and sometimes natural disaster can devastate nations.
2.	Idea / Solution description	● Loading a current situation images or video in app or website to know the occurrence of disaster or not. ● And also to check its intensity and risk level of the disaster. ● If the intensity or risk level is known before the disaster happens it is easy for people to escape from the disaster and also for government to prevent the people in that area and government can also stop the disaster before it leads to big damages.
3.	Novelty / Uniqueness	● This is the real-time problem which is more benefits for people in that area and government to stop the disaster before it causing some economic damages. ● We can save many livelihood and to stop it before it expands.

4.	Social Impact / Customer Satisfaction	• It saves many financial loss from the damage for the government. • • Can save many lives. • Can minimize loss of infrastructure
5.	Business Model (Revenue Model)	• By helping the government and getting fund from it. • By giving information to the companies. • By giving information to insurance companies , they can notify their clients to safeguard them from disaster. • We can get fund by giving the information to corporates. • Also we can get jobs from the company.
6.	Scalability of the Solution	• The primary model is targeted for mainly for peoples , governments and some companies. • If it is used by everyone in critical condition of before disaster there is no loss of lives and no economic damage for government and peoples.

3.4 PROBLEM SOLUTION FIT

Project Title: - Natural Disasters Intensity Analysis And Classification Using Artificial Intelligence

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID04308

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

Who is your customer?
i.e. working parents of 0-5 y.o. Kids

- People
- Government
- Companies

6. CUSTOMER CONSTRAINTS — CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

- No prior knowledge of internet
- No big connection or investing the occurrence of disaster
- Not need to know the konwledge of machine learning or dl for finding the disaster

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

- Existing solution is the GDACS for alerting the peoples.
- GDACS is collaboration of many countries
- If there is any symptoms ,peoples need to take photo and upload it to our application .then we can prevent the people before the disaster
- Government should always take the survey of environment .It helps to find the occurrence of disaster before it occures.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

- Building DL model
- Saving the peoples life
- Helping the government to avoid some infrastructure and economic damage
- Giving information to companies to save their clients life

9. PROBLEM ROOT CAUSE — RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

- Not knowing the occurrence of the disaster priorly
- Knowing laterly causes many infrastructure and economic loses
- Peoples have to upload the image prior to safeguard their lives and economic loses

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

- Anyone can upload the image in the application
- If he knows any occurrence of disaster through our website he can notify to all of them.
- Not all need to upload the image one person if enough
- Through that government can also know

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS — TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

- Making the application more reliable
- Giving some money for uploading the information before disaster
- Providing quick result for the user

4. EMOTIONS: BEFORE / AFTER — EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

Before

- Losses of many life
- Many infrastructure has been damaged
- Many economic losses for government

After

- Infrastructure damage and economic losses can be prevented by the government.
- Many lives can be saved before the disaster
- Insurance companies can safeguard their money

10. YOUR SOLUTION — SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

- Dl model is used to identify the occurrence
- Neural network techniques are used
- Loading all types of disaster image to identify the occurance.

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

8.1 ONLINE

- People who were in that area can upload the images to the application or website.
- If he knows that any occurrence of disaster from app he can notify to all other peoples

8.2 OFFLINE

- Helping the old or disabled people to get out of that area.
- Safeguard the personal needs for an individual in their day to day life

Identify strong TR & EM

CHAPTER 4
REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User login	● Login through username or Gmail id. ● Sign in through google,linkedin,facebook. ● Login through phone number.
FR-2	User Registration	● Filling the necessary form. ● Registration through Gmail. ● Registration through facebook.
FR-3	User Conformation	● Verification through Gmail. ● Verification through sending the otp. ● Verification through calling the phone by register phone no.
FR-4	User forgot password	● Sending the change password page through register gmail. ● Sending the otp and changing the password.
FR-5	Authentication	● User(normal people). ● Government. ● Insurance companies
FR-6	Authorization levels	● Users,government and some companies(insurance)
FR-7	Uploading the photo	● Upload the photo through selecting the files in the user's device. ● Directly taking the photo through application
FR-8	Showing occurrence (page)	● Showing with colour code for occurrence of disasters or not ,by green for not and red for occurrence of disaster

FR-9	Notifying(users nearby person)page	● Message chat functions for notify there nearby person through adding phone no and messaging them
FR-10	Notifying (government and insurance companies) page	● Application automatically sends information to government or insurance if there is any occurance of disaster in that area.
FR-11	Log out	● Easily clicking the logout button

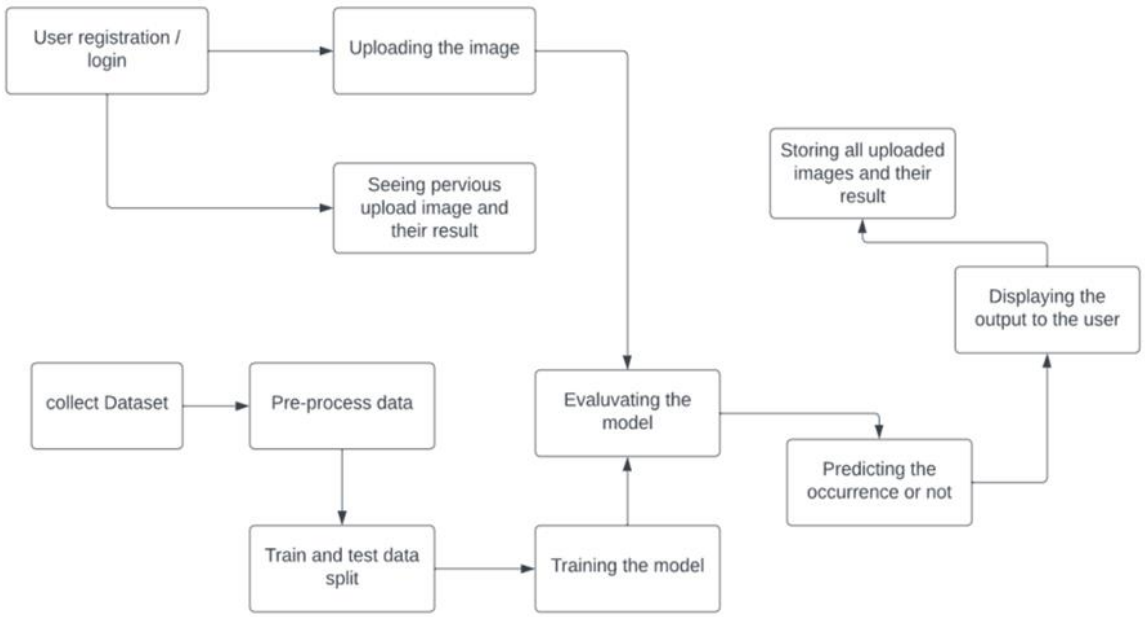
4.2 NON-FUNCTIONAL REQUIREMENTS

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	● The request from different users ,each request should perform the task which assigned for particular user.
NFR-2	**Security**	● assuring all data inside the system or its part will be protected against malware attacks or unauthorized access
NFR-3	**Reliability**	● Is the software system consistently performs the specified functions without failure
NFR-4	**Performance**	● The software system accomplishes certain functions under specific conditions such as software's speed of response, throughput, execution time, and storage capacity.
NFR-5	**Availability**	● The process of each process should take less than 10seconds.
NFR-6	**Scalability**	● The application should perform at high workload without any degradation.

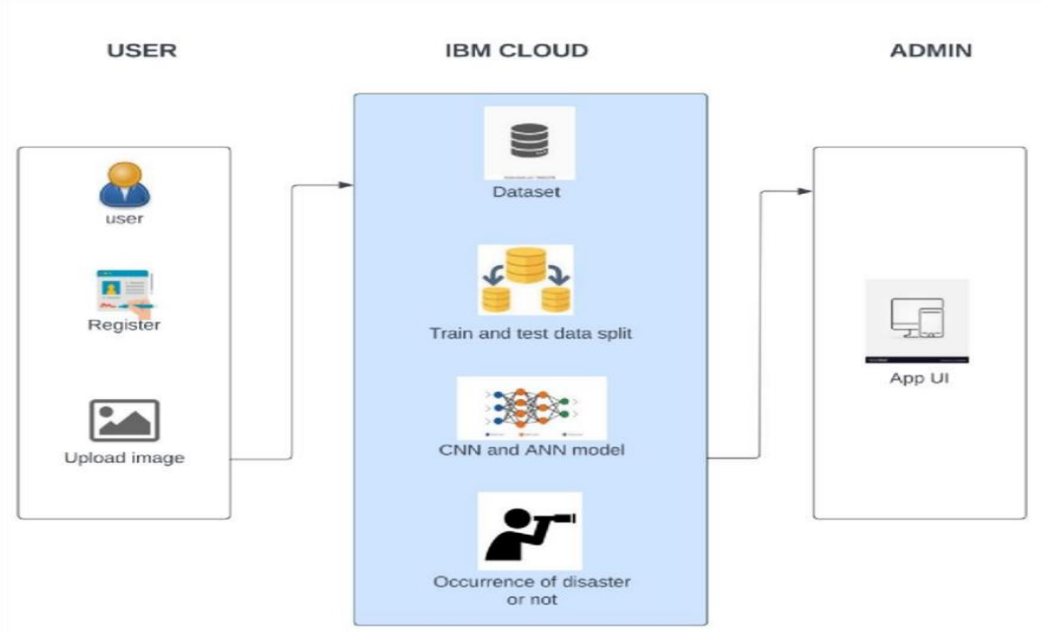
NFR-7	**Compatibility**	● The application should work in all phones and pc devices
NFR-8	**Speed**	● The result from the trained model should show quickly
NFR-9	**Maintainability**	● The model should be trained with recent dataset for better accuracy ,labelling the disaster and finding the occurence of disaster.

CHAPTER 5
PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION & TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin	Dataset	USN-1	Collect the required data for the disaster prediction	Enough data collected for training model	High	Sprint-1
	Data preprocessing	USN-2	Perform data augmentation	Augmented Dataset enough to make correct predictions	High	Sprint-1
	Training & Building Model	USN-3	Build the model using CNN and ANN	Model should be predicting occurrence of disaster and intensity level of disaster	High	Sprint-1
	Deploy the model	USN-4	Deployment of DL model using IBM Cloud	Model should be working fine from the cloud	High	Sprint-2
	Integrate the web app with the IBM model	USN-5	Use flask for the integration purpose.	Model should be easy to use & working fine from the web app	High	Sprint-2
Customer	Homepage	USN-6	Details shows about the information of application	I can get the idea about the application	Medium	Sprint-2
	Registration	USN-7	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account	High	Sprint-3
	Login	USN-8	As a user, I can log into the application by entering email & password	I can login to my account	High	Sprint-3
	Dashboard	USN-9	As a user , I can upload image by capturing or selecting from the local storage	I can add images	Medium	Sprint-4
	Disaster details	USN-10	As a user , I can see the past upload image result	I can see the past occurrence of disaster or not	High	Sprint-4
	Current Occurrence	USN-11	As a user , I can see the current occurrence of disaster or not by uploading the images	I can see whether disaster is going to occur or not	High	Sprint-4

CHAPTER 6
PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	19 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	19 SEPTEMBER 2022
Brainstorm Ideation	List the by organizing the brainstorming session and Prioritize the top 3 ideas based on the feasibility & importance.	19 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	19 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution Fit which includes the causes , problems,and solutions of the problem.	19 SEPTEMBER 2022

Solution Architecture	Prepare solution a4rchitecture that indicates the data flow from the user, and the website.	19 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application	03 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams to indicate the data flow fro the user ,during the model building and while predicting the result.	03 OCTOBER 2022
Technology Architecture	Prepare the technology architecture that defines about the technologies and the IBM cloud features used in the application	03 OCTOBER 2022
Functional Requirement	Prepare the functinal rxequirementsm, which includes all the features that will be available in the application.	03 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & Activity list of the project.	01 NOVEMBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	IN PROGRESS….

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -1	Data Collection	USN -1	Collecting the dataset	2	low	Dhana Sree R
Sprint -1	Data Preprocessing	USN-2	Preprocessing the data by data augumentation	2	high	Harish K P
Sprint-2	Model Building	USN-3	Building the model by CNN	3	high	Dharanidharan R
Sprint-2	Fitting the dataset	USN-4	Training the model by fitting the train dataset	3	low	Dhivakar p
Sprint-2	Testing the model	USN-5	Predicting the score of model by tesing the model using test data	3	medium	Dhana Sree R Harish K P
Sprint-3	Registration	USN-6	As a user, I can register for the application by entering my email, password, and confirming that.	3	low	Dharanidharan R
Sprint-3	Login	USN-7	As a user, I adapt to logging into the system with credentials.	4	low	Dhivakar p
Sprint-3	Analysis	USN-8	As a user, I can analyse report on past event analysis.	3	medium	Dhivakar p Harish K P
Sprint-3	Local Deployment	USN-9	I can deploy the model on local for performance testing	4	high	Dhana Sree R
Sprint-4	Model deployment	USN-10	As an administrator, I can maintain third- party services.	4	high	Harish K P

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	4	6 Days	24 Oct 2022	31 Oct 2022	4	31 Oct 2022
Sprint-2	9	6 Days	31 Oct 2022	05 Nov 2022	9	05 Nov 2022
Sprint-3	14	6 Days	07 Nov 2022	12 Nov 2022	14	12 Nov 2022
Sprint-4	4	6 Days	14 Nov 2022	19 Nov 2022	4	19 Nov 2022

Average velocity=Sprint duration / velocity

Sprint - 1 : 4/6 = 1

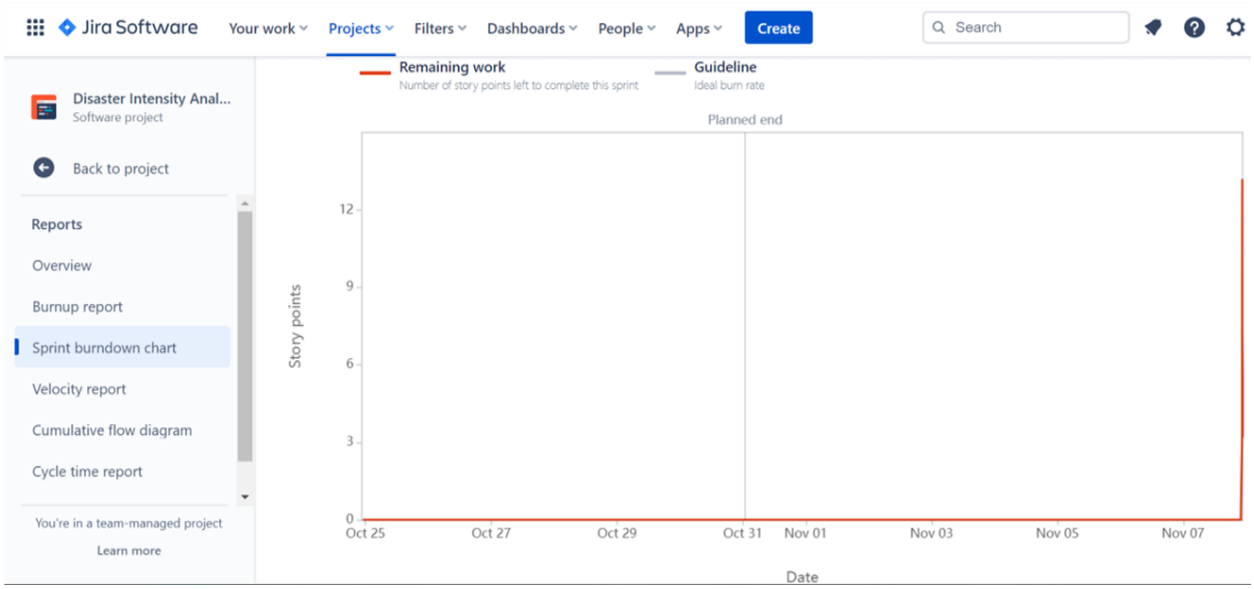
Sprint - 2 : 9/6 = 1

Sprint - 3 : 14/6 = 2

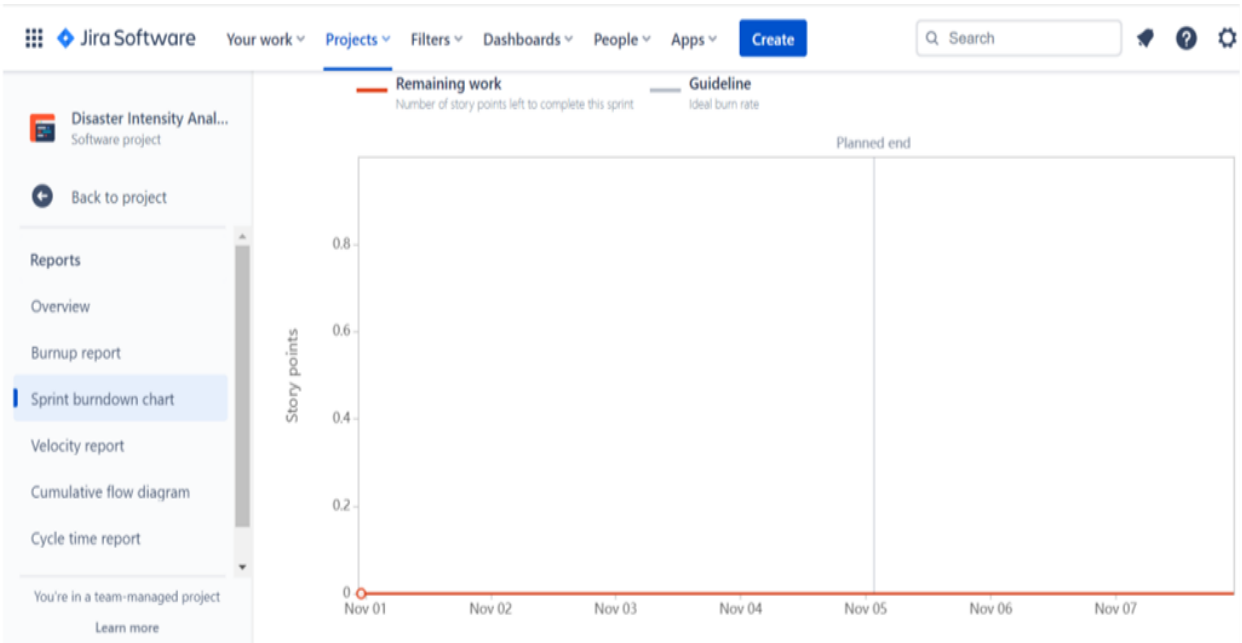
Sprint - 4 : 4/6 = 1

6.3 REPORTS FROM JIRA

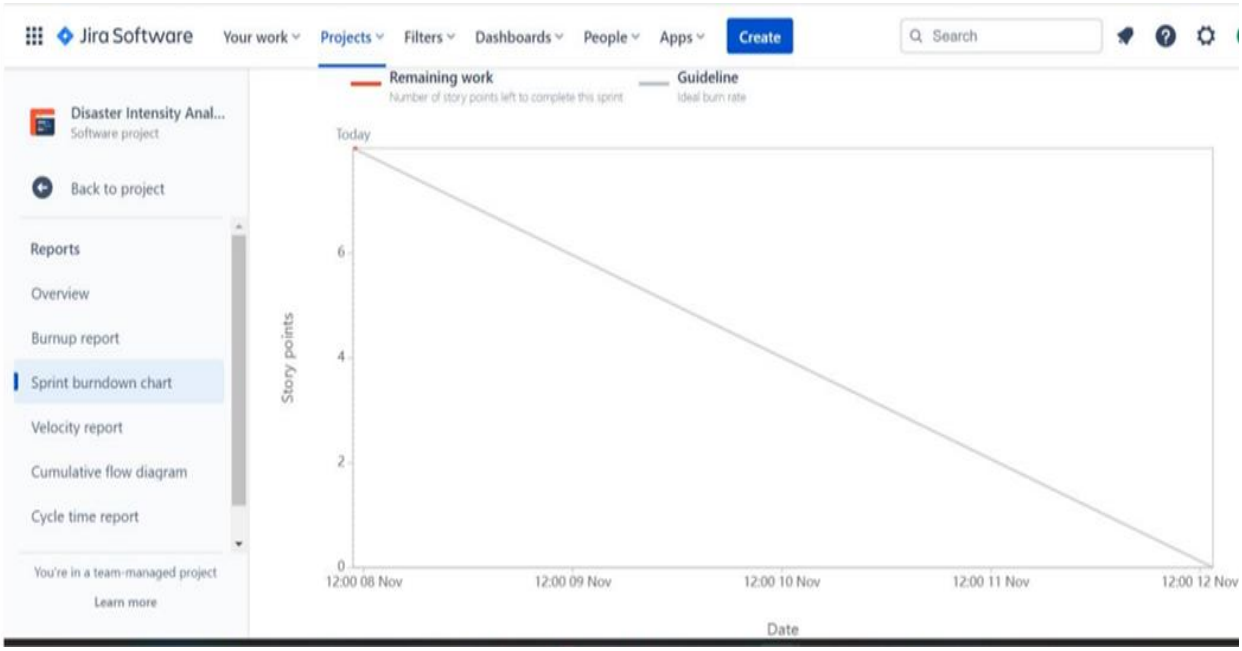
Sprint-1 :



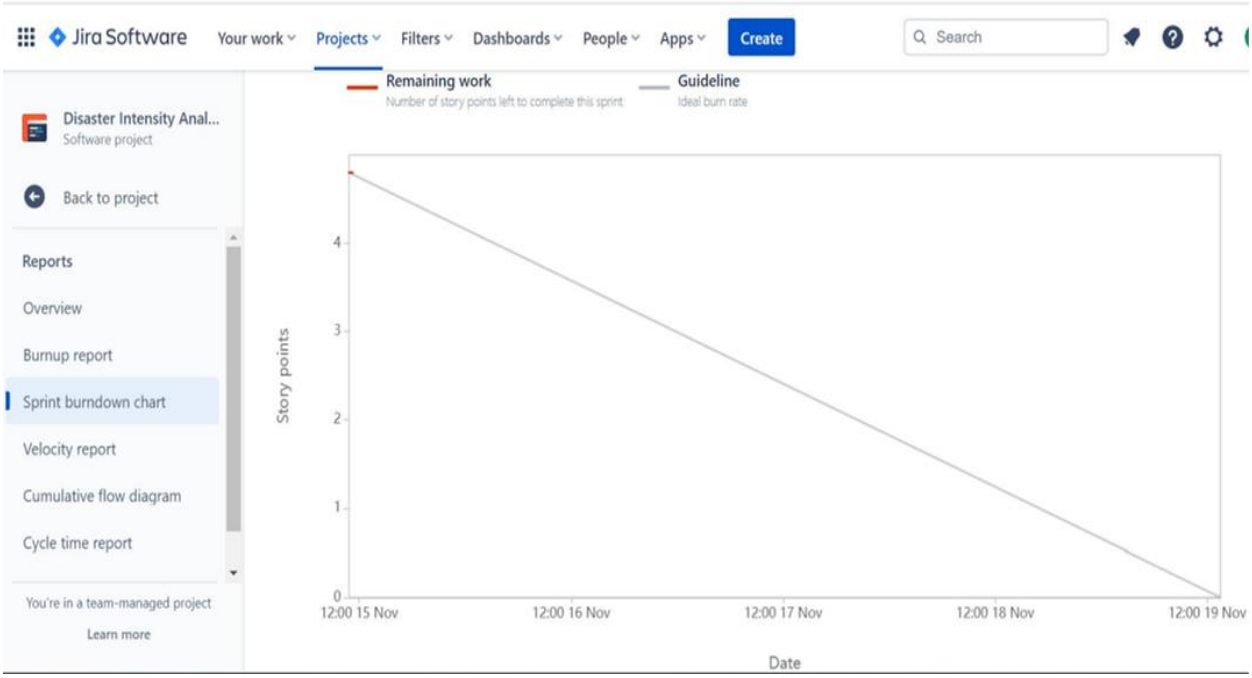
Sprint-2 :



Sprint-3 :



Sprint-4 :



CHAPTER 7
CODING & SOLUTIONING

7.1 Feature 1

Creating cnn model and classified the type of disaster

```
#creating cnn model
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D,MaxPool2D,Flatten,Dense

CNN_model=Sequential()
CNN_model.add(Convolution2D(32,(3,3),activation="relu",input_shape=(64,64,3)))
CNN_model.add(MaxPool2D(pool_size=(2,2)))
CNN_model.add(Flatten())
#fully connected layers
CNN_model.add(Dense(300,activation="relu"))
CNN_model.add(Dense(200,activation="relu"))
CNN_model.add(Dense(150,activation="relu"))
CNN_model.add(Dense(120,activation="relu"))
CNN_model.add(Dense(500,activation="relu"))
CNN_model.add(Dense(650,activation="relu"))
CNN_model.add(Dense(750,activation="relu"))
CNN_model.add(Dense(50,activation="relu"))
CNN_model.add(Dense(750,activation="relu"))
CNN_model.add(Dense(350,activation="relu"))
CNN_model.add(Dense(150,activation="relu"))
CNN_model.add(Dense(450,activation="relu"))
CNN_model.add(Dense(950,activation="relu"))
CNN_model.add(Dense(100,activation="relu"))
CNN_model.add(Dense(105,activation="relu"))
CNN_model.add(Dense(190,activation="relu"))
CNN_model.add(Dense(130,activation="relu"))
CNN_model.add(Dense(4,activation="softmax"))
```

```
CNN_model.summary()
```

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_2 (Conv2D)           (None, 62, 62, 32)        896

 max_pooling2d_2 (MaxPooling  (None, 31, 31, 32)       0
 2D)

 flatten_2 (Flatten)         (None, 30752)             0

 dense_8 (Dense)             (None, 300)               9225900

 dense_9 (Dense)             (None, 200)               60200

 dense_10 (Dense)            (None, 150)               30150

 dense_11 (Dense)            (None, 120)               18120

 dense_12 (Dense)            (None, 500)               60500

 dense_13 (Dense)            (None, 650)               325650

 dense_14 (Dense)            (None, 750)               488250

 dense_15 (Dense)            (None, 50)                37550

 dense_16 (Dense)            (None, 750)               38250

 dense_17 (Dense)            (None, 350)               262850

 dense_18 (Dense)            (None, 150)               52650
```

```
import numpy as np
from tensorflow.keras.preprocessing import image
img=image.load_img("/content/dataset/test_set/Flood/993.jpg",target_size=(64,64))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
op=['Cyclone', 'Earthquake', 'Flood', 'Wildfire']
pred=np.argmax(CNN_model.predict(x))
op[pred]
```

```
1/1 [==============================] - 0s 123ms/step
'Flood'
```

7.2 Feature 2
Developed an accuracy of 93.94

```
#tuning
from keras.callbacks import EarlyStopping,ReduceLROnPlateau

earlystopping=EarlyStopping(monitor="val_accuracy",patience=5)
reduce_lr=ReduceLROnPlateau(monitor="val_accuracy",patience=5,factor=0.5,min_lr=0.00001)
callback=[reduce_lr,earlystopping]
```

```
CNN_model.fit_generator(xtrain,
                        steps_per_epoch=len(xtrain),
                        epochs=100,
                        callbacks=callback,
                        validation_data=xtest,
                        validation_steps=len(xtest))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: UserWarning: `Model.fit_generator` is deprecated and will be remove

Epoch 1/100
15/15 [==============================] - 30s 2s/step - loss: 0.2799 - accuracy: 0.9057 - val_loss: 1.5248 - val_accuracy: 0.7020 -
Epoch 2/100
15/15 [==============================] - 27s 2s/step - loss: 0.2491 - accuracy: 0.9313 - val_loss: 1.2206 - val_accuracy: 0.7424 -
Epoch 3/100
15/15 [==============================] - 27s 2s/step - loss: 0.2302 - accuracy: 0.9245 - val_loss: 1.3768 - val_accuracy: 0.7475 -
Epoch 4/100
15/15 [==============================] - 26s 2s/step - loss: 0.2183 - accuracy: 0.9340 - val_loss: 1.3843 - val_accuracy: 0.7475 -
Epoch 5/100
15/15 [==============================] - 27s 2s/step - loss: 0.2313 - accuracy: 0.9367 - val_loss: 1.2302 - val_accuracy: 0.7525 -
Epoch 6/100
15/15 [==============================] - 27s 2s/step - loss: 0.2140 - accuracy: 0.9340 - val_loss: 1.3193 - val_accuracy: 0.7323 -
Epoch 7/100
15/15 [==============================] - 27s 2s/step - loss: 0.1746 - accuracy: 0.9528 - val_loss: 1.3630 - val_accuracy: 0.7323 -
Epoch 8/100
15/15 [==============================] - 27s 2s/step - loss: 0.2306 - accuracy: 0.9326 - val_loss: 1.4956 - val_accuracy: 0.7374 -
Epoch 9/100
15/15 [==============================] - 27s 2s/step - loss: 0.1954 - accuracy: 0.9299 - val_loss: 1.5619 - val_accuracy: 0.7374 -
Epoch 10/100
15/15 [==============================] - 28s 2s/step - loss: 0.1896 - accuracy: 0.9394 - val_loss: 1.5368 - val_accuracy: 0.7273 -
<keras.callbacks.History at 0x7f9d1403d5d0>
```

CHAPTER 8
TESTING

8.1 TESTCASES

DATE	03-Nov-22
	PNT2022TMID04308
	Project - NATURAL DISASTERS I
MARKS	4 marks

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Expected Result	Actual Result	Status
Register_Page_01	UI	Home page	The landing page must be responsive and the user must be redirected to register page once sign up is clicked	1. Enter the URL and click GO 2.Click Sign up	The page should load and once the user clicks the sign up the user must navigate to the sign up page	Worked as expected	Pass
Register_Page_02	Functional	Register page	The Register page must allow the user to register to the application	1. Enter the URL and go 2.Click sign up 3. Fill your credentials 4.Click register	The page should render three text boxes to fill email,password and conform password and the user should also be able to click register	Worked as expected	Pass
Register_Page_03	Functional	Register page	The Register page should register the user to backend service	1)Enter the URL and go 2)Navigate to register page 3) Fill credentials and click register	The page should add a user to backend authentication service	Worked as expected	Pass

DATE	03-Nov-22
	PNT2022TMID04308
	Project - NATURAL DISASTERS INTENSITY ANALYSIS AND CLASSIFICATION USING ARTIFICIAL INTELLIGENCE
MARKS	4 marks

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Expected Result	Actual Result	Status
Login_Page_001	UI	Login page	The login page must load properly and be responsive	1.Visit the URL and go 2.Click login button in the home page	The user should be able to visit the login page	Worked as expected	Pass
Login_Page_002	Functional	Login page	Verify the user is able to log into the application with valid credentials	1.Visit the URL and go 2.Register by providing the user credentials 3.Navigate to login page 4.Fill credentials and login	The user should be able to login to the appliation and navigate to home page	Worked as expected	Pass
Upload page_up_OO1	UI	Upload page	The page displays the accepts the image from the user	1.Visit the URL and go 2.Login using credentials 3.Click the button to make new prediction	The form should accept the image fr	Working as expected	Pass
Upload page_up_OO2	Functional	Upload page	From the user input the website should retreive ,classify the disaster and display it to the user	1.Visit the URL and go 2.Login using credentials 3.Click the button to make new prediction 4.Upload the image regarding the natural disaster and click sumbit	After submitting ,the website displays the what type of disaster	Working as expected	Pass

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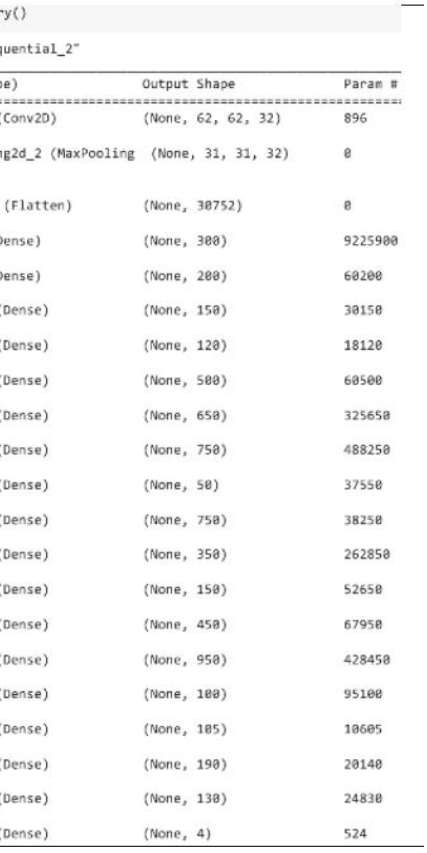
MARKS	4 marks	

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Expected Result	Actual Result	Status
	Test Scenario						
1	Verify if the user is able to see the home page						
2	Verify if the user is able to navigate to register page						
3	Verify if the user is able to register to backend authentication service						
4	Verify user is able to see login page						
5	Verify user is able to loginto application or not?						
6	Verify if the user is able to upload the image to the upload page						
7	Verify if the user is able to view the output of the classification						

8.2 USER ACCEPTING TESTING

S.No.	Parameter	Values	Screenshot
1.	Model Summary	Convolutional Neural Network or CNN is a type of artificial neural network, which is widely used for image/object recognition and classification. Deep Learning thus recognizes objects in an image by using a CNN. CNN has four layers. They are Convolution layer, Pooling layer, Flatten layer, Fully connected layer. **CONVOLUTION LAYER:** The majority of computations happen in the convolutional layer, which is the core building block of a CNN. A second convolutional layer can follow the initial convolutional layer. The process of convolution involves a kernel or filter inside this layer moving across the receptive fields of the image, checking if a feature is present in the image. **Pooling layer:** Like the convolutional layer, the pooling layer also sweeps a kernel or filter across the input image. But unlike the convolutional layer, the pooling layer reduces the number of parameters in the input and also results in some information loss. On the positive side, this layer reduces complexity and improves the efficiency of the CNN.	

		Fully connected layer: The FC layer is where image classification happens in the CNN based on the features extracted in the previous layers. Here, *fully connected* means that all the inputs or nodes from one layer are connected to every activation unit or node of the next layer	
2.	Accuracy	Training Accuracy – 93.94% Validation Accuracy -72.73%	- accuracy: 0.9057 - val_loss: 1.5248 - val_accuracy: 0.7020 - accuracy: 0.9313 - val_loss: 1.2206 - val_accuracy: 0.7424 - accuracy: 0.9245 - val_loss: 1.3768 - val_accuracy: 0.7475 - accuracy: 0.9340 - val_loss: 1.3843 - val_accuracy: 0.7475 - accuracy: 0.9367 - val_loss: 1.2302 - val_accuracy: 0.7525 - accuracy: 0.9340 - val_loss: 1.3193 - val_accuracy: 0.7323 - accuracy: 0.9528 - val_loss: 1.3630 - val_accuracy: 0.7323 - accuracy: 0.9326 - val_loss: 1.4956 - val_accuracy: 0.7374 - accuracy: 0.9299 - val_loss: 1.5619 - val_accuracy: 0.7374 - accuracy: 0.9394 - val_loss: 1.5368 - val_accuracy: 0.7273

CHAPTER 9

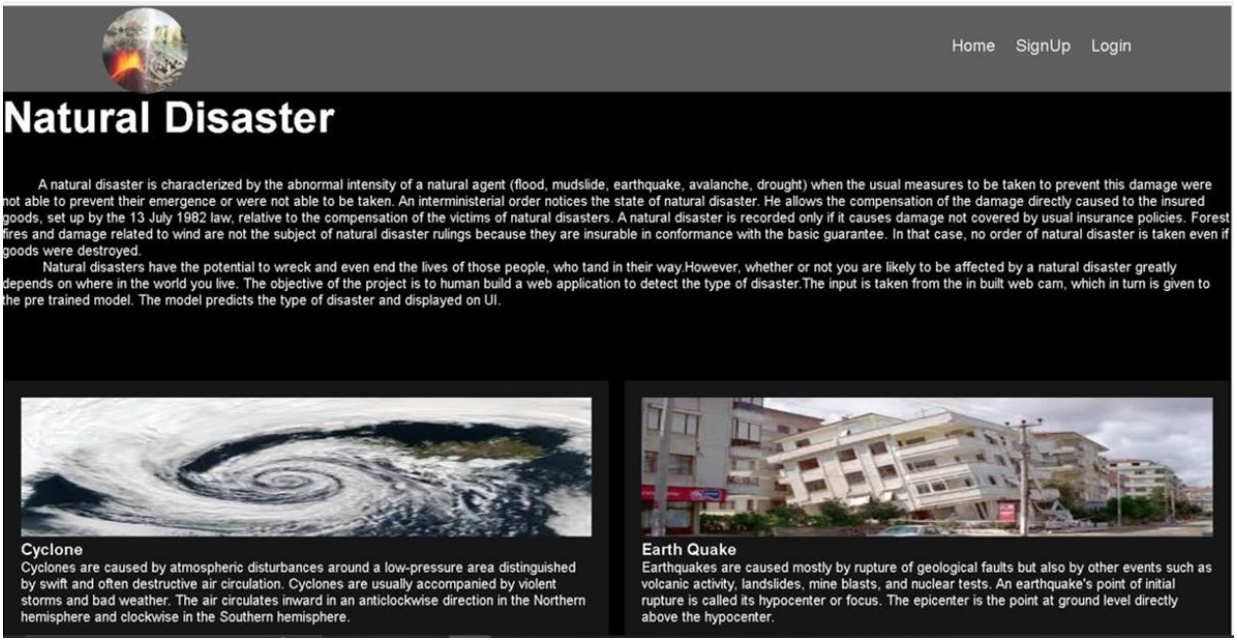
RESULTS

9.1 Performance Metrics

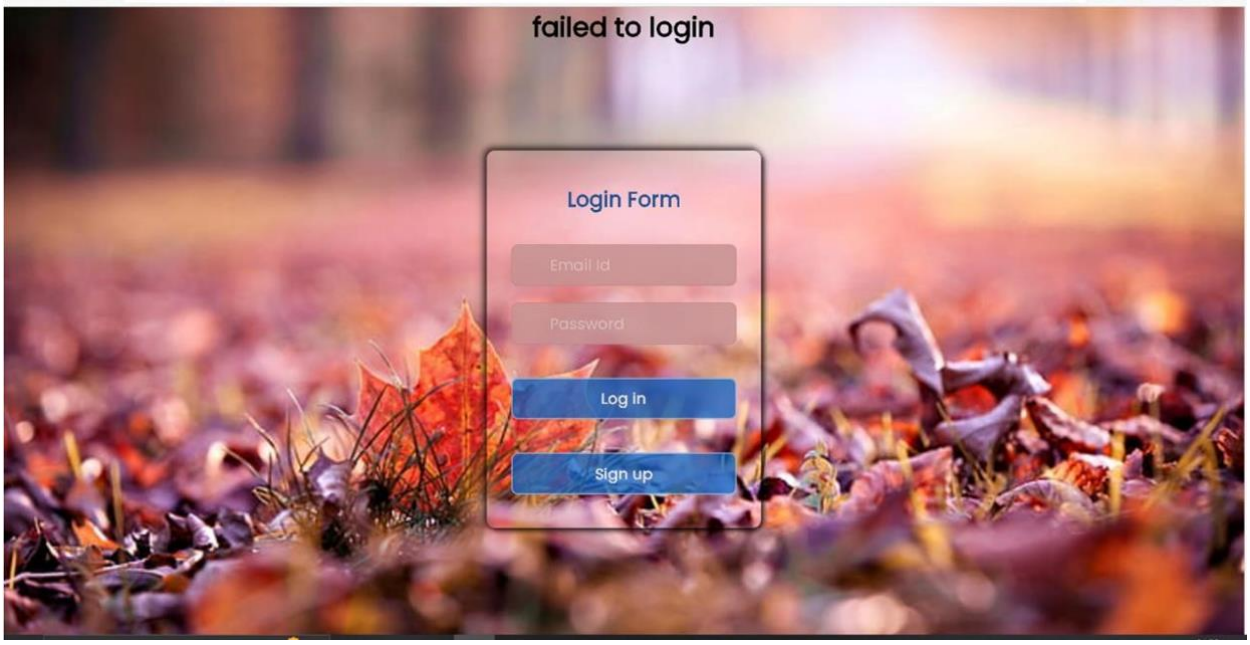
The nature disaster intensity analysis and classification with test data and train data has been executed successfully. The model has been trained over 1000+ images and the model have an accuracy of nearly 93.94% and the model has been testedwiththe data which is separate from the trained data and has predicted the data well.

OUTPUT

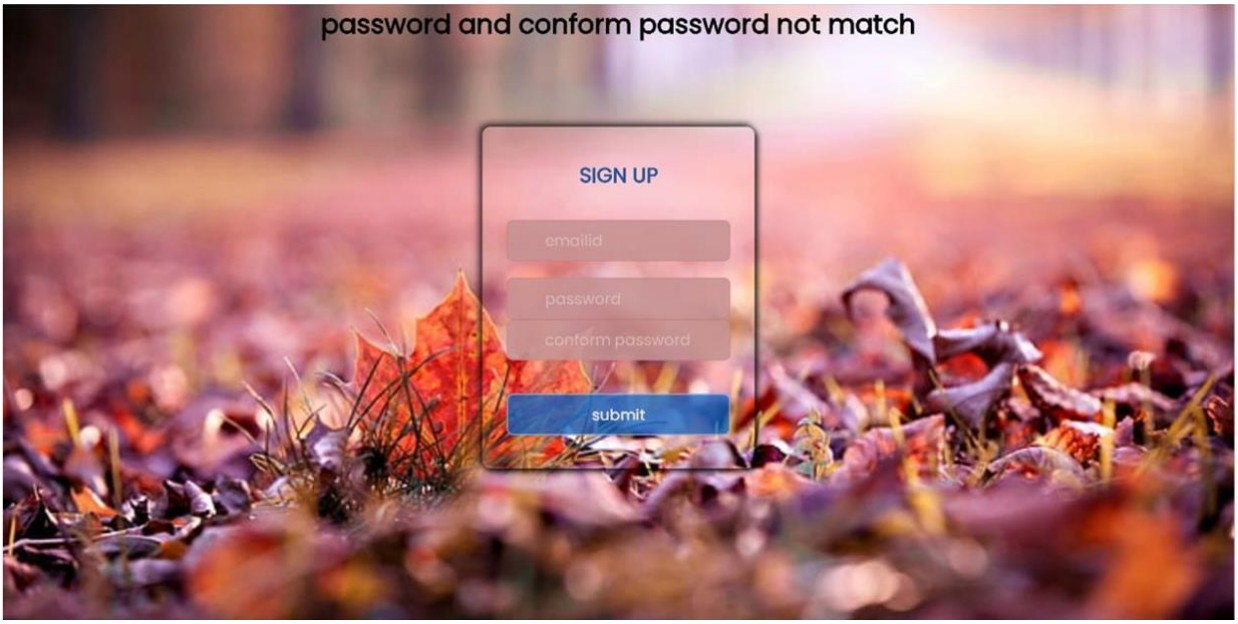
HOME PAGE



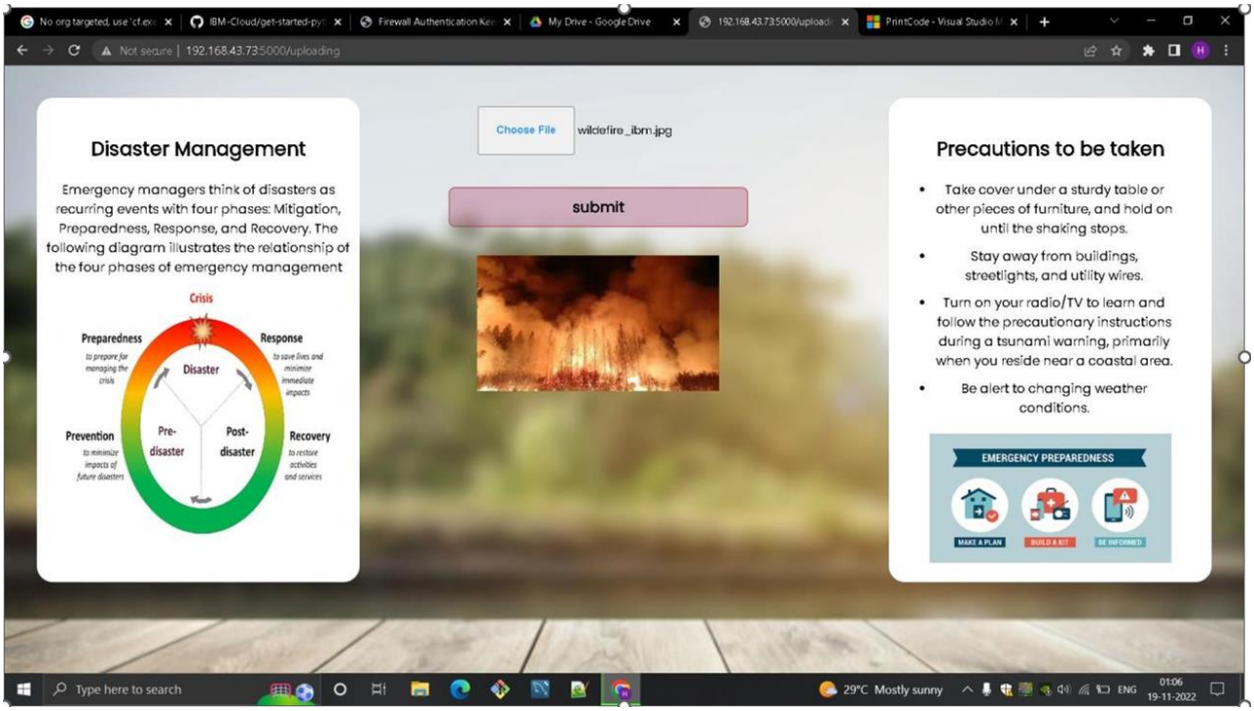
LOGIN PAGE



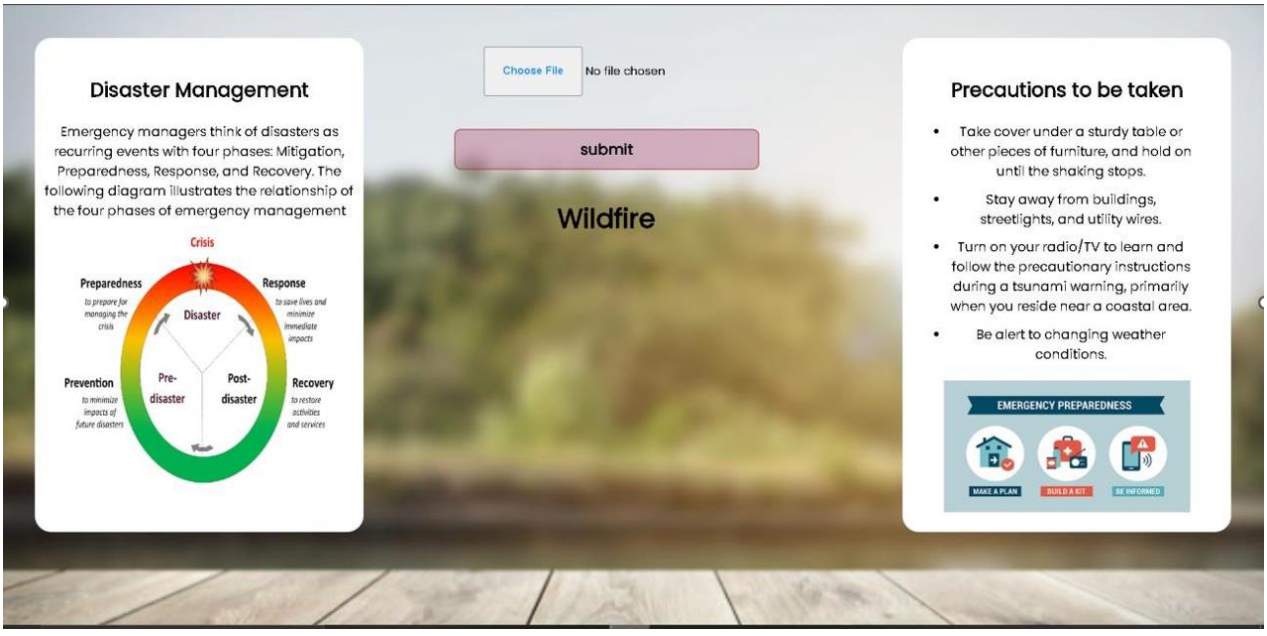
SIGNUP PAGE



UPLOAD THE IMAGE:



FINAL OUTPUT:



CHAPTER 10
ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Predictions and warnings can also reduce damage and economic losses. When notice of an impending disaster can be issued well in advance, as it can for some riverine floods, wildfires, and hurricanes, property and natural resources can be protected.
- The proposed system helps to reduce the impact of hazards occur during natural disaster and provides an efficient way to warn and educate people about disaster prone areas.
- Allows for life to be saved both humans and animal
- Evacuation centrres can be organised and prepared
- Prevent financial loss

DISADVANTAGES:

- If people predicts the disaster and undergo safety measures and those who leave their home ,there is possibility of looting and criminal offense becomes an increased oppurtunity.
- Disaster may occur within a certain radius of the prediction and false preparation or lower magnitude disaster could occur.
- The resultant model unable to validate the model performance under uncontrolled conditions.
- Difficult for artificial intelligence to predict long-term trends of various natural disasters that are affected by climate change.
- There are various instances where AI can make mistakes. The data fed to the system is collected by humans, which can be flawed. Hence, the results produced by AI might be inaccurate.

CHAPTER 11
CONCLUSION

Numerous researchers have tried to apply various deep learning techniques for natural catastrophe detection. 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. Due to its multilayered nature, the proposed model outperformed other cutting-edge techniques in terms of accuracy. By training the cnn model with the images accuracy of 93.64% is developed.

CHAPTER 12
FUTURE SCOPE

The adoption of AI to predict natural disasters will save millions of lives. Additionally, the datasets analyzed by the AI-powered systems will help in understanding the magnitude and the patterns of natural disasters such as floods, earthquakes and tsunamis, which can help in better planning of infrastructure in disaster-prone areas. Thus, government organizations need to deploy AI to predict natural disasters and monitor them accurately to ensure the safety of their citizens.

The government organization need the roadmap for effective adoption and application:

- Hire experienced researchers and tech experts who have worked with AI.
- Collect good quality data for training the AI-powered application.
- Enlist skilled professionals that can help in creating adoption strategies.
- Update current in the government organization.
- Educate government personnel about artificial intelligence.

CHAPTER 13
APPENDIX

Source Code:

```
<html>
<head>
<link rel="stylesheet" href="{{ url_for('static',filename='styles/uploadstyles.css') }}">
</head>
<body>
<div class="main">
 <div class="firstdiv">
<h2 class="firstdichead">Disaster Management</h2>
 <p class="firstdicp">Emergency managers think of disasters as recurring events with four phases: Mitigation, Preparedness, Response, and Recovery. The following diagram illustrates the relationship of the four phases of emergency manage /p>
<!DOCTYPE html>
<!-- Created By CodingNepal -->
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Login and Registration Form in HTML | CodingNepal</title>
    <link rel="stylesheet" href="{{ url_for('static',filename='styles/styles.css') }}">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
  </head>
  <body>
    {%if msg%}
    <h1>{{msg}}</h1>
    {% endif%}
    <center>
      <br>
```

```
<div class="content">
  <div class="text">Login Form</div>
   <form action="/login" method="post">
    <div class="field">
      <span class="fa fa-user"></span>
      <input type="text" placeholder="Email Id"  name="emailid"required>
    </div>
    <div class="field">
      <span class="fa fa-lock"></span>
      <input type="password" placeholder="Password" name="password">
    </div>
    <button type="submit">Log in</button>
   </form>
   <form action="/signup" method="get">
    <button>Sign up</button/>
   </form>
  </body>
</html>
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-10790-1659204461

DEMO LINK:

https://drive.google.com/file/d/1jEtvrusgTpQ29zcQBqcNb87zVQ6HhI5f/view?usp=sharing