PROJECT REPORT

Natural Disasters Intensity Analysis and Classification using Artificial Intelligence

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1. INTRODUCTION

1.1 Project overview

Natural disasters are inevitable, and the occurrence of disasters drastically affects the economy, ecosystem and human life. 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 [1].Many machine learning approaches have been used for wildfire predictions since the 1990s.A recent study used a machine learning approach in Italy. This study used the randomforest technique for susceptibility mapping of wildfire[2]. Floods are the most devastating natural disaster, damaging properties, human lives and infrastructures. To map flood susceptibility, an assembled machine learning technique based on random forest (RF), random subspace (RS) and support vector machine (SVM) was used [3].

1.2 Purpose

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.

2. LITERATURE SURVEY

2.1 Existing 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

Flood:

Floods are one of the most common hazards in the United States. They occur when land that is normally dry experiences an overflow of water. Several events cause floods, including hurricanes and tropical storms, failed dams or levees, and flash floods that occur within a few minutes or hours of excessive rainfall.

Wildfires:

Wildfires are usually triggered by lightning or accidents and often go unnoticed at first. They can spread quickly and are especially destructive if they occur near forests, rural areas, remote mountain sites, and other woodland settings where people live. While not reported as often as floods or tornadoes and severe storms, they, too, can cause emotional distress in people living in affected areas.

Drought:

Drought is a slow-moving hazardous event, so the psychological effects of living through this type of disaster are more subtle and last longer than with other natural disasters. Low water availability creates shortages in water supplies that impact various activities and the environment. The impact is even greater as humans place demands on water supplies. Additionally, drought conditions increase the risk of other natural disasters, such as wildfires, and landslides.

Earthquakes:

An earthquake is the shifting of the Earth's plates, which results in a sudden shaking of the ground that can last for a few seconds to a few minutes. Within seconds, mild initial shaking can strengthen and become violent. Earthquakes happen without warning and can happen at any time of year. Certain states are more prone to higher frequency of earthquakes, particularly California, Hawaii, Nevada, and Washington.

2.2 Reference

Establishing effective communications in disaster

affected areas and artificial intelligence based

detection using social media platform

Author: Mohsin Raza, Muhammad Awais, Kamran Ali, Nauman Aslam, Vishnu Vardhan

Paranthaman, Muhammad Imran, Farman Ali

Year: 2020

Artificial neural network for predicting

earthquake casualties and damages in Indonesia

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

Year: 2022

A Deep Cascade of Convolutional Neural

Networks for Dynamic MR Image Reconstruction

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

Year: 2017

2.3 Problem Statement Definition

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.

3. IDEATION &PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation & Bra

Priyatharshini

It evaluates how severe the impending tragedy will be

Without any direct physical human intervention, disaster intensity can be forecast.

It'll be a benefcial invention for this society

It takes information from the built-in webcam to record video and an image frame.

Priyanka

It can easily predict and take actions without any human intervention

Early and accurate predictions ensures safety of people and other livestocks included

Livestock can be saved giving hope for their future even after the disaster occurs

Rescue team can work faster than ever with the accurate forecasting of AI, thus reducing damages and casualties

Annapoorani

It helps to reduce the property damage

Causalties can be reduced with the AI's prediction.

Rescue team can tend to the needs of victims without any human intervention with the help of AI

AI is the future technology that can help to protect both people and environment before or after the occurence of disaster.

Ranjani

safegaurd and make available vital materials,supplies and equipment to ensure the safety and recovery of records from predictable disasters.

aims to reduce,or avoid,the potential losses from hazards,assure prompt and appropriate assistance to victims of disasters,achieve rapid and effective recovery.

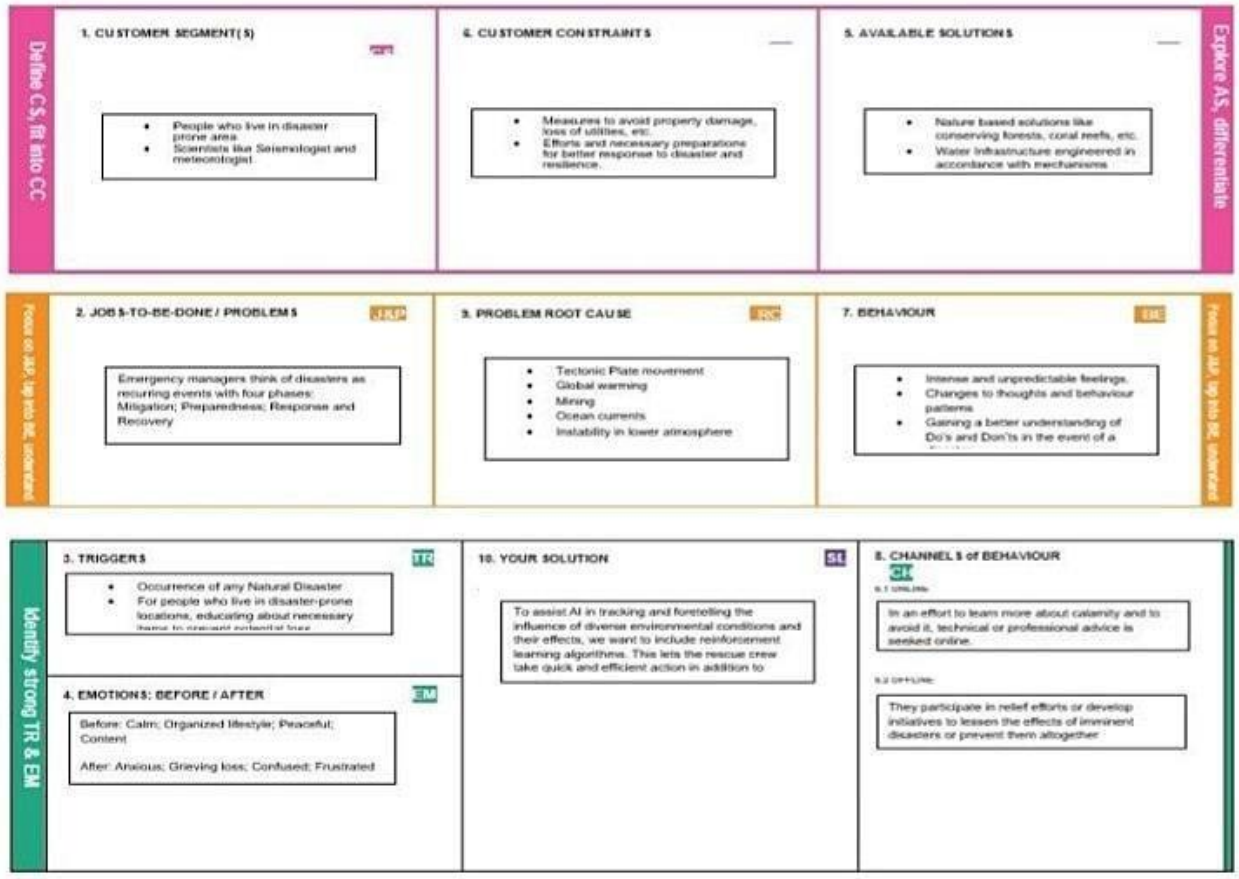
the goal of disaster prediction is to maximize citizens awarness of the importance of proactive planning,and encourage participation in disaster preparedness activities.

disaster prediction is very important to avoid the enormous number of deaths caused by the hazardeous disasters.

3.3 .Proposed Solution

Sl.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To identify natural disaster intensity level and classification based on the webcam image given as input using Artificial Intelligence (AI).
2.	Idea / Solution description	The classification is done by Machine Learning and Deep Learning techniques such as Convolutional Neural Network (CNN) and Artificial Neural Network (ANN).
3.	Novelty / Uniqueness	It is based on the satellite and multi-spectral image and the classification using Multi-layered Deep Convolutional Neural Networks.
4.	Social Impact / Customer Satisfaction	The people can easily identify the type of natural disasters and its effect on the environment that leads to the earlier identification and reduced damages in the environment as well as economy.
5.	Business Model (Revenue Model)	We build a system that classifies the natural disaster and its intensity level and it is believed that the model is available for all people, also the model provides long term reliability.
6.	Scalability of the Solution	The model will be created for all the people who needs to classify the type of natural disasters. The Machine Learning and Deep Learning techniques were used for the classification and intensity analysis.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Funtional requirement

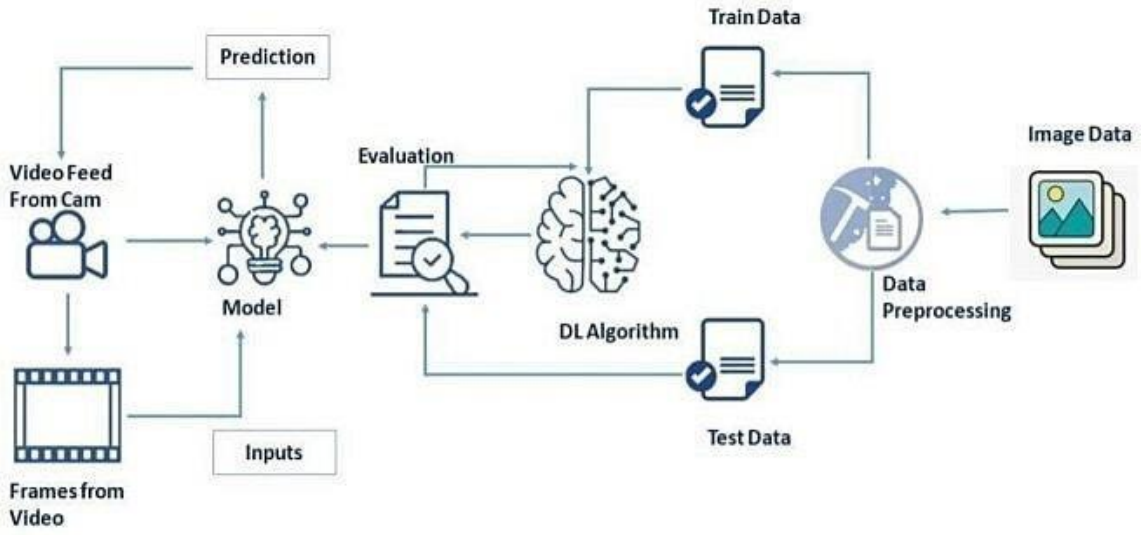
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Request permission	Access permission from Web camera
FR-2	Disaster prediction	Based on the webcam image, natural disaster is classified.
FR-3	Accuracy	Since the training and testing images are huge, the accuracy is higher.
FR-4	Speed	The generation of results from the input images are faster.
FR-5	Resolution	The resolution of the integrated web camera should be high enough to capture the video frames.
FR-6	User Interface	Maximizing the interaction in web designing service.

4.2 Non Funtional requirements

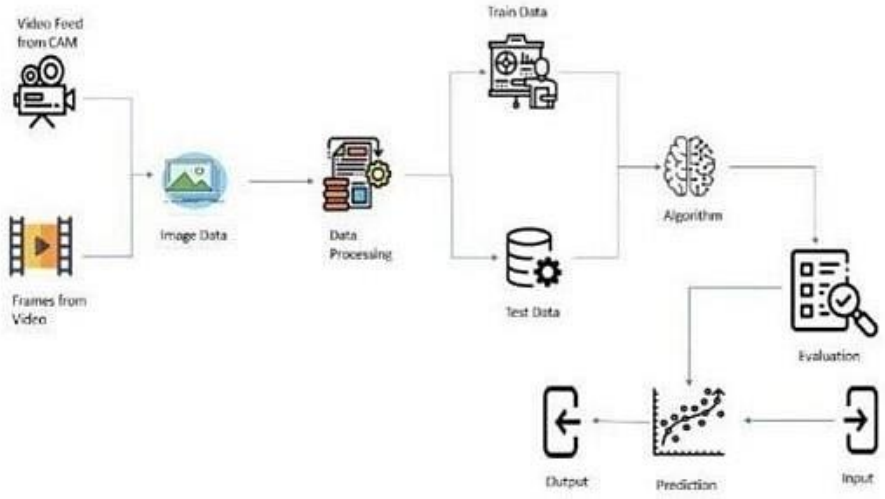
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User friendly and classify the disaster easily.
NFR-2	**Security**	The model is secure due to the cloud deployment models and also there is no login issue.
NFR-3	**Reliability**	Accurate prediction of the natural disaster and the website can also be fault tolerant.
NFR-4	**Performance**	It is shown that the model gives almost 90 percent accuracy after continuous training.
NFR-5	**Availability**	The website will be made available for 24 hours.
NFR-6	**Scalability**	The website can run on web browsers like Google Chrome, Microsoft edge and also it can be extended to the NDRF and customers

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution &Technical Architecture



6. PROJECT PLANNING &SCHEDULING

6.1 Sprint Planning &Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-1	Model Creation and Training (Fruits)		Create a model which can classify diseased fruit plants from given images. I also need to test the model and deploy it on IBM Cloud	8	High	Lalith Kishore Hari haran Durga Gomathy
	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images	2	High	Lalith Kishore Hari haran Durga Gomathy

[redacted]

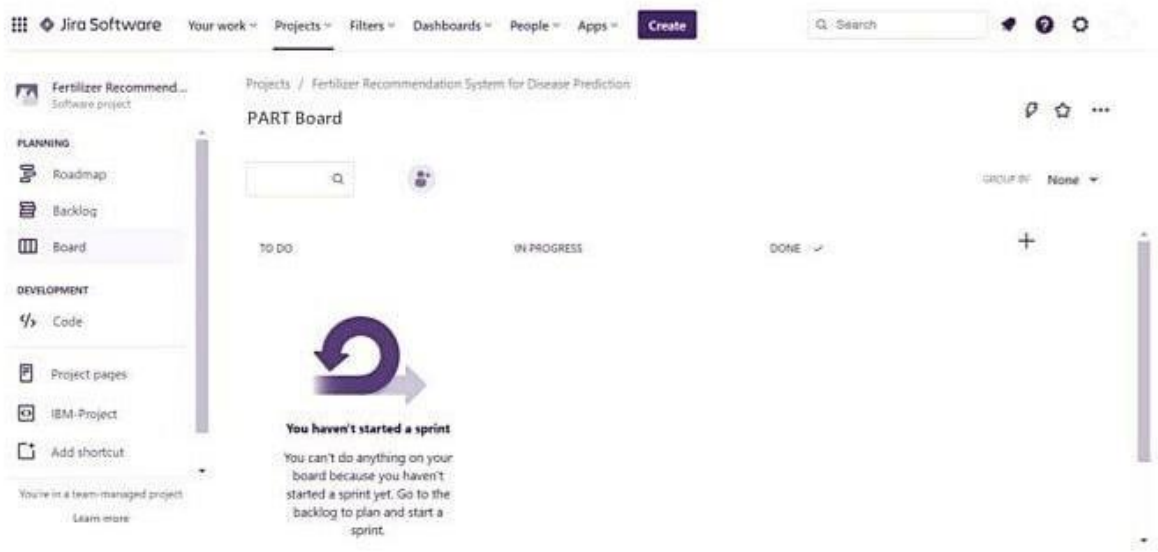
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-2	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images and train onIBM Cloud	6	High	Lalith Kishore Hari haran Durga Gomathy
	Registration	USN-1	As a user, I can register by entering my email, password, and confirming my password or via OAuth API	3	Medium	Lalith Kishore Hari haran Durga Gomathy
	Upload page	USN-2	As a user, I will be redirected to a page where Ican upload my pictures of crops	4	High	Lalith Kishore Hari haran Durga Gomathy
	Suggestion results	USN-3	As a user, I can view the results and then obtainthe suggestions provided by the ML model	4	High	Lalith Kishore Hari haran Durga Gomathy
	Base Flask App		A base Flask web app must be created as an interface for the ML model	2	High	Lalith Kishore Hari haran Durga Gomathy
Sprint-3	Login	USN-4	As a user/admin/shopkeeper, I can log into the application by entering email & password	2	High	Lalith Kishore Hari haran Durga Gomathy
	User Dashboard	USN-5	As a user, I can view the previous results and history	3	Medium	Lalith Kishore Hari haran Durga Gomathy
	Integration		Integrate Flask, CNN model with Cloudant DB	5	Medium	Lalith Kishore Hari haran Durga Gomathy

Sprint-4	Dashboard (Admin)	USN-6	As an admin, I can view other user details and uploads for other purposes	2	Medium	Lalith Kishore Hari haran Durga Gomathy
	Dashboard (Shopkeeper)	USN-7	As a shopkeeper, I can enter fertilizer productsand then update the details if any	2	Low	Lalith Kishore Hari haran Durga Gomathy
	Containerization		Create and deploy Helm charts using Docker Image made before	2	Low	Lalith Kishore Hari haran Durga Gomathy

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	10	6 Days	24 Oct 2022	29 Oct 2022	10	30 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	06 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	13 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	10	20 Nov 2022

REPORTS FROM JIRA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Your work
Projects
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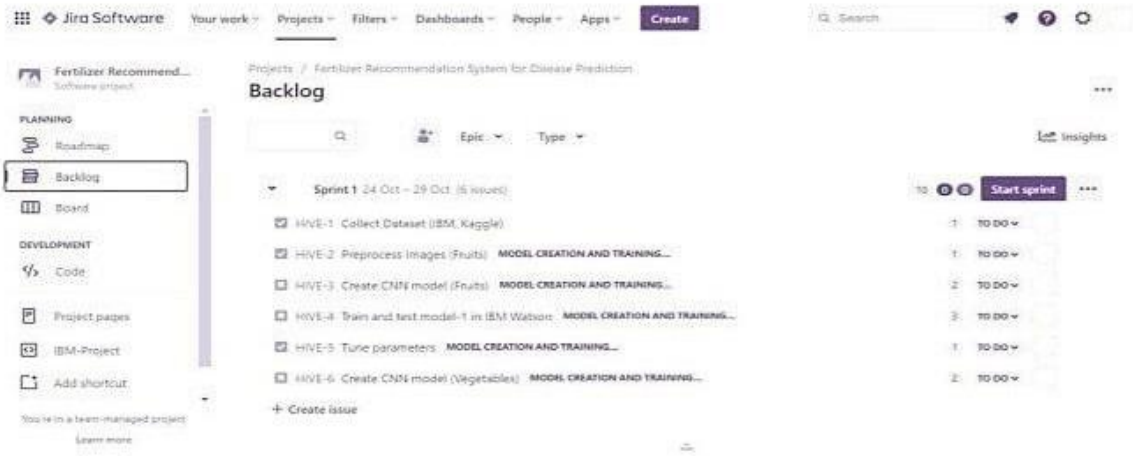
Dashboards
People
Apps
Create
Search
Fertilizer Recommend...
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
IBM-Project
Add shortcut
You're in a team-managed project
Learn more
Projects / Fertilizer Recommendation System for Disease Prediction
PART Board
GROUP BY None
TO DO
IN PROGRESS
DONE
You haven't started a sprint
You can't do anything on your board because you haven't started a sprint yet. Go to the backlog to plan and start a sprint.


Jira Software
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Projects
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Dashboards
People
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Create
Search
Fertilizer Recommend...
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
IBM-Project
Add shortcut
Projects / Fertilizer Recommendation System for Disease Prediction
Backlog
Epic
Type
Insights
Sprint 1 24 Oct – 29 Oct
Start sprint
HIVE-1 Collect Dataset (IBM, Kaggle)
HIVE-2 Preprocess Images (Fruits) MODEL CREATION AND TRAINING...
HIVE-3 Create CNN model (Fruits) MODEL CREATION AND TRAINING...
HIVE-4 Train and test model-1 in IBM Watson MODEL CREATION AND TRAINING...
HIVE-5 Tune parameters MODEL CREATION AND TRAINING...
HIVE-6 Create CNN model (Vegetables) MODEL CREATION AND TRAINING...
TO DO
+ Create issue

CONCLUSION

- **The core strategy of this project is to predict the crop based on the soil nutrient content and the location where the crop is growing. This system will help he farmers to choose the right crop for their land and to give the suitable amount of fertilizer to produce the maximum yield. The Support Vector Machine algorithm helps to predict the crop the precisely based on the pre-processed crop data. This system will also help the new comers to choose the crop which will grow in their area and produce them a good profit. A decent amount of profit will attract more people towards the agriculture.**

Github I'D : https://github.com/IBM-EPBL/IBM-Project-34016-1660230538