

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.

Technical Architecture:

Project Objectives

By the end of this project you will:

know fundamental concepts and techniques of the Artificial Neural Network and Convolution Neural Networks

Gain a broad understanding of image data.

Work with Sequential type of modeling

Work with Keras capabilities

Work with image processing techniques

Work with Opencv

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The user interacts with the UI (User Interface) to open the integrated webcam.

The video frames are captured and analyzed by the model which is integrated with flask application.

Once model analyses the video frames, the prediction is showcased on the UI and OpenCV window

To accomplish this, we have to complete all the activities and tasks listed below

Data Collection.

Collect the dataset or Create the dataset

Data Preprocessing.

Import the ImageDataGenerator library

Configure ImageDataGenerator class

Apply ImageDataGenerator functionality to Trainset and Testset

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We are building a Flask Application that needs HTML pages stored in the templates folder and a python script app.py for serverside scripting

we need the model which is saved and the saved model in this content is a disaster.h5

templates folder contains home.html,intro.html,upload.html pages.

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To complete this project, you must require the following software's, concepts, and packages

Anaconda Navigator is a free and open-source distribution of the Python and R programming languages for data science and machine learning related applications. It can be installed on Windows, Linux, and macOS. Conda is an open-source, cross-platform, package management system. Anaconda comes with so very nice tools like JupyterLab, Jupyter Notebook, QtConsole, Spyder, Glueviz, Orange, Rstudio, Visual Studio Code. For this project, we will be using Jupyter notebook and Spyder

To install Anaconda navigator and to know how to use Jupyter Notebook & Spyder using Anaconda watch the video

Link: [Click here to watch the video](#)

To build Machine learning models you must require the following packages

Numpy:

It is an open-source numerical Python library. It contains a multidimensional array and matrix data structures and can be used to perform mathematical operations

Scikit-learn:

It is a free machine learning library for Python. It features various algorithms like support vector machine, random forests, and k-neighbors, and it also supports Python numerical and scientific libraries like NumPy and SciPy

OpenCV

OpenCV is a library of programming functions mainly aimed at real-time computer vision. Here, OpenCV is used to capture frames by accessing the webcam in real-time.

Open anaconda prompt and type command

“pip install opencv-contrib-python”

Flask:

Web framework used for building Web applications

Python packages:

open anaconda prompt as administrator

Type “pip install numpy” and click enter.

Type “pip install pandas” and click enter.

Type “pip install scikit-learn” and click enter.

Type “pip install opencv-contrib-python” and click enter.

Type “pip install tensorflow==2.3.0” and click enter.

Type “pip install keras==2.4.0” and click enter.

Type “pip install Flask” and click enter.

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Prior Knowledge

One should have knowledge on the following Concepts :

Supervised and unsupervised learning:

Watch the below video to know about the types of machine learnings

Regression Classification and Clustering :

Artificial Neural Networks:

Convolution Neural Networks :

Flask :

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This milestone lets you create the dataset or download the dataset

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Collect images of disaster-prone areas organized into subdirectories based on their respective names as shown in the project structure.

Create folders of types of disasters that need to be recognized.

In this project, we have collected images of 4 types of natural disasters Cyclone, Earthquake, Flood, and wildfire and they are saved in the respective subdirectories with their respective names.

You can download the dataset used in this project using the GitHub link which is posted in the pre-requisite section.

Note: For better accuracy train on more images

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<https://drive.google.com/file/d/11-FdbTaJVrpwQmaCLV5gYYDQIfTeD0uz/view?usp=sharing>

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Image Preprocessing

Image Pre-processing includes the following main tasks

Import ImageDataGenerator Library.

Configure ImageDataGenerator Class.

Applying ImageDataGenerator functionality to the trainset and test set.

Note: The ImageDataGenerator accepts the original data, randomly transforms it, and returns only the new, transformed data.

To know more about the data generator class [click on this link](#)

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Model Building
We are ready with the augmented and pre-processed image data, Lets begin our model building, this activity includes the following steps
Import the model building Libraries
Initializing the model
Adding CNN Layers
Adding Hidden Layer
Adding Output Layer
Configure the Learning Process
Training and testing the model
Saving the model
To know more about model building please click here
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