Project Design Phase-I

Solution Architecture

Date	23 October 2022
Team ID	PNT2022TMID51308
Project Name	Natural Disasters Intensity Analysis and Classification using Artificial Intelligence
Maximum Marks	4 Marks

Solution Architecture:

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.

Disaster Risk Knowledge

An event becomes a disaster when it abruptly affects a community's daily activities and involves human and material losses and has economic or environmental impacts . It would also be considered as a disaster when damage exceeds the community's ability to respond with their own resources . When there is a greater knowledge of the risk to which a population is exposed, this leads to the improvement of the processes of risk management, reduction and

adaptation . The knowledge contains information that can be used to make decisions an actions that allow the community to improve their capacity to react to disaster risk in a timely manner .

To reduce the risk of flooding in urban areas, the data collected should be relevant and concise, qualitative or quantitative, and should be obtained through official sources. The following areas should be covered:

- Historical background
- Geographical aspects
- Economic aspects.

1. Methodology

This section defines the overall method for natural disaster intensity analysis and classification based on multispectral images using a multilayered deep convolutional neural network. Moreover, this method consists of two blocks of a convolutional neural network. The first block detects a natural disaster occurring and the second one defines the intensity type of the natural disaster. Additionally, the first block consists of three miniconvolutional blocks with four layers each, including an image input and fully connected layers. On the other hand, the second block also consists of three miniconvolutional blocks with two layers each and includes an image input layer and fully connected layer.

Solution Architectural Diagram

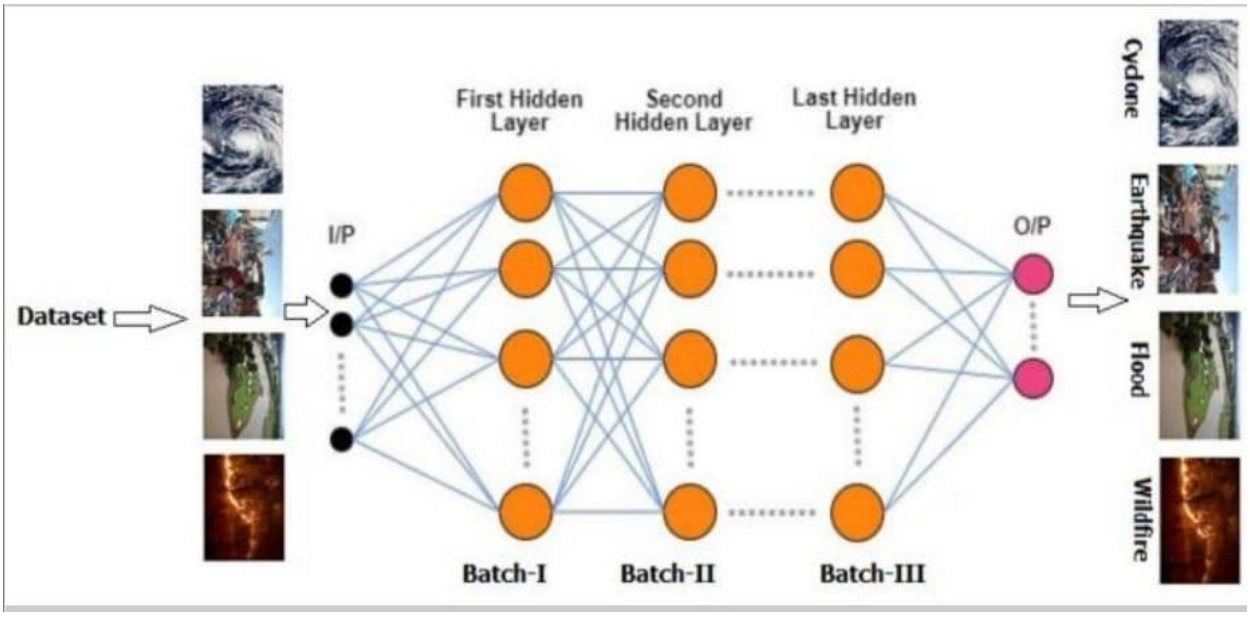


Figure 1: Proposed architecture of multilayered deep convolutional neural network.

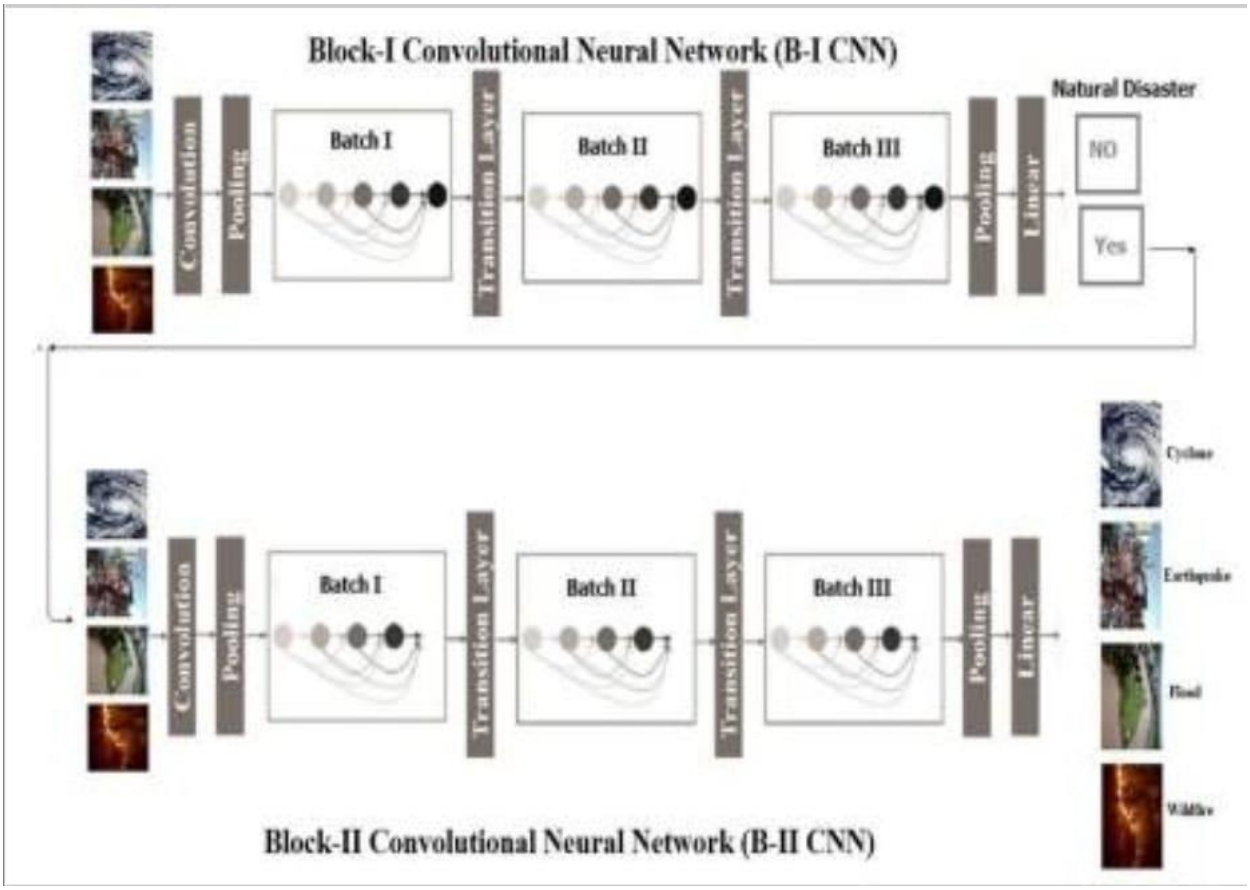
➢ Block-I Convolutional Neural Network (B-I CNN)

According to block-I of the convolutional neural network, only a detection process occurred in this phase. However, this block also consists of three small batches having four layers each. Moreover, an image input layer and fully connected layers are present. Additionally, some parameters are also defined with learning rate 0.001 and epoch size 40. On the other hand, the convolutional layers use a filter size of 3 × 3, stride 1 and eight filters that increase in number from 16 to 32 for the second and third minibatches of convolutional neural networks

➢ Block-II Convolutional Neural Network (B-II CNN)

The block-II convolutional neural network takes the output from the first block and finds the types of natural disaster with intensity. Moreover, this block also consists of three minibatches having three layers each with two extra layers such as image input and fully connected layers. Additionally, the same parameters as block-I have been defined for this block also.

1.1.1 Solution Architectural Diagram



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