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PROJECT TITLE: NATURAL DISASTERS INTENSITY ANALYSIS AND CLASSIFICATION USING AI

TEAM MEMBERS

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PROJECT DESCRIPTION

Natural disasters not only disturb the human ecological system but also destroy the properties and critical infrastructures of human societies and even lead to a permanent change in the ecosystem. Disasters can be caused by naturally occurring events such as earthquakes, cyclones, floods, and wildfires. Various researchers have applied many deep learning techniques to detect and classify natural disasters to overcome losses in ecosystems. However, the 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 the disaster. 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.

LITERATURE SURVEY

SURVEY: 1

Title:

“Neural Network Applications In Earthquake Prediction” Meta-Analytic And Statistical Insights On Their Limitations.Arnaud Mignan And Marco Broccardo neural Network Applications In Earthquake Prediction ; Meta-Analytic And Statistical Insights On Their Limitations Seismological Research Letters (May 2020).

Methods:

Deep learning has solved seemingly intractable problems, boosting the hope to find approximate solutions to problems that now are considered unsolvable. Earthquake prediction, the Grail of Seismology, is, in this context of continuous exciting discoveries, an obvious choice for deep learning exploration. We review the entire literature on artificial neural network (ANN) applications for earthquake prediction (77 articles, 1994-2019 period) and find two emerging trends: an increasing interest in this domain, and a complexification of ANN models over time, towards deep learning. Despite apparent positive results observed in this corpus, we demonstrate that simpler models seem to offer similar predictive powers, if not better ones. Due to the structured, tabulated nature of earthquake catalogs, and the limited number of features so far considered, simpler and more transparent machine learning models seem preferable at the present stage of research. Those baseline models follow first physical principles and are consistent with the known empirical laws of Statistical Seismology, which have minimal abilities to predict large earthquakes.

SURVEY: 2

Title:

“Simultaneous Earthquake Detection On Multiple Stations Via A Convolutional Neural Network” Shaobo Yang; Hu; Haijiang Zhang; Guiquan Liu, Seismological Research Letter(2021)

Methods:

As the amount of seismic data has grown rapidly, it is very important to develop a fast and reliable event detection and association algorithm. Generally, event detection is first performed on individual stations followed by event association through linking phase arrivals to a common event generating them. This study considers earthquake detection as the problem of image classification and convolutional neural networks (CNNs), as some of the widely used deep-learning tools in image processing, can be well used to solve this problem. In contrast to existing studies training the network using seismic data from individual stations, in this study, we train a CNN model jointly using records of multiple stations. Because the CNN automatically synthesizes information among multiple stations, the detector can more reliably detect seismic events and is less affected by spurious signals. The CNN is trained using aftershock data of the 2013 **Mw** 6.6 Lushan earthquake. We have applied it to two very different datasets of Gofar transform fault, East Pacific Rise and Changning shale gas field in southern Sichuan basin, China. The tests show that the trained CNN has strong generalization ability and is flexible with the number of available stations, different instrument types, and different data sampling rates. It can detect many more events than the conventional short-term average/long-term average detector and is more efficient than template-matching methods.

SURVEY: 3

Title :

“A Deep Learning Approach of Recognizing Natural Disasters on Images using Convolutional Neural Network and Transfer Learning” International Conference on Artificial Intelligence and its ApplicationsDaryl B. ValdezRey Anthony G. Godmalin December 2021.

Methods :

Natural disasters are uncontrollable phenomena occurring yearly which cause extensive damage to lives, and property and cause permanent damage to the environment. However, by using Deep Learning, real-time recognition of these disasters can help the victims and emergency response agencies during the onset of these destructive events.

Methods used include: Deep learning(DL),Convolutional Neural Network(CNN)

SURVEY: 4

Title :

“Storm intensity estimation using symbolic aggregate approximation and artificial neural network”, Arthit Buranasing, Akara Prayote, 06 December 2014, IEEE.

Methods :

A storm disaster is one of the most destructive natural hazards on earth and the main cause of death or injury to humans as well as damage or loss of valuable goods or properties, such as buildings, communication systems, agricultural land, etc. Storm intensity estimation is also important in evaluating the storm track prediction and risk area that will be affected by the storm. In this paper, proposed the storm intensity estimation model by using only 8 features to categorize major type of storm with symbolic aggregate approximation (SAX) and artificial neural network (ANN). The performance of the model is satisfactory, giving an average F-measure of 0.93 or 93%.