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Natural Disasters Intensity Analysis and Classification using Artificial Intelligence

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ABSTRACT

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.

LITERATURE SURVEY

SURVEY-1

AUTHORS: Mignan A,Tonini M., D'Andrea M., Biondi G., Degli Esposti S., Trucchia A., Fiorucci P.

TITLE: Natural Disasters Intensity Analysis and Classification Based on Multispectral Images Using Multi-Layered Deep Convolutional Neural Network

METHODS: 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 propose a multilayered deep convolutional neural network. The proposed model works in two blocks: Block-I convolutional neural network (B-I CNN), for detection and occurrence of disasters, and Block-II convolutional neural network (B-II CNN), for classification of natural disaster intensity types with different filters and parameters. The model is tested on 4428 natural images and performance is calculated and expressed as different statistical values: sensitivity (SE), 97.54%; specificity (SP), 98.22%; accuracy rate (AR), 99.92%; precision (PRE), 97.79%; and F1-score (F1), 97.97%. The overall accuracy for the whole model is 99.92%, which is competitive and comparable with state-of-the-art algorithms.

SURVEY-2

AUTHORS: vinay chamola,vikas hassija,Sakshi gupta, Adit Goyal

TITLE: Disaster and Pandemic Management Using Machine Learning: A Survey

METHODS:

This article provides a literature review of state of-the-art machine learning (ML) algorithms for disaster and pandemic management. Most nations are concerned about disasters and pandemics, which, in general, are highly unlikely events. To date, various technologies, such as IoT, object sensing, UAV, 5G, and cellular networks, smartphone-based system, and satellite-based systems have been used for disaster and pandemic management. ML algorithms can handle multidimensional, large volumes of data that occur naturally in environments related to disaster and pandemic management and are particularly well suited for important related tasks, such as recognition and classification. ML algorithms are useful for predicting disasters and assisting in disaster management tasks, such as determining crowd evacuation routes, analyzing social media posts, and handling the post-disaster situation. ML algorithms also find great application in pandemic management scenarios, such as predicting pandemics, monitoring pandemic spread, disease diagnosis, etc. This article first presents a tutorial on ML algorithms. It then presents a detailed review of several ML algorithms and how we can combine these algorithms with other technologies to address disaster and pandemic management. It also discusses various challenges, open issues and, directions for future research.

SURVEY-3

AUTHORS:

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TITLE:

Storm intensity estimation using symbolic aggregate approximation and artificial neural network

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%.

SURVEY-4

AUTHORS: Vasileios Linardos, Maria Drakaki , Panagiotis Tzionas and Yannis L. Karnavas

TITLE: Machine Learning in Disaster Management: Recent Developments in Methods and Applications

METHODS: Disasters affect the lives of millions of people worldwide every year. The disaster has been classified into two categories. They are Natural disasters and man-made disasters. In this paper the datasets were collected by the Emergency Events Database. Disaster causes economic losses. This paper includes the aim to produce the overall research studies that are ML and DL methods for disaster management. Particularly In the areas of disaster and hazard prediction, disaster monitoring, early warning systems. Additionally the analysis of recently developed ML and DL applications for disaster management are discussed.Future research should be directed towards leveraging ML and DL for improving the performance of disaster recovery operations.

SURVEY-5

AUTHORS: Amir Mosavi,Pinar Ozturk and kwok-wing Chau

TITLE: Flood Prediction using machine learning models

METHODS: Floods are among the most destructive natural disasters. The research on this flood prediction models contributed to risk reduction, policy suggestion, minimization of the loss of human life, and reduction of the property damage associated with floods.To reduce the physical processes of floods, during the past two decades, machine learning (ML) methods are highly involved the advancement of prediction systems providing better performance and cost-effective solutions.The main contribution of this paper is to demonstrate the state of the art of ML models in flood prediction and to give insight into the most suitable models.In this paper, the literature where ML models were benchmarked through a qualitative analysis of robustness,accuracy, effectiveness, and speed are particularly investigated to provide an extensive overview on the various ML algorithms used in the

field. As a result, this paper introduces the most promising prediction methods for both long-term and short-term floods.Its based on hybridization, data decomposition, algorithm ensemble, and model optimization are reported as the most effective strategies for the improvement of ML methods.