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Zhou F., Huang J., Sun B., Wen G., Tian Y. Intelligent Identification Method for Natural Disasters along Transmission Lines Based on Inter-Frame Difference and Regional Convolution Neural Network; Proceedings of the 2019 IEEE International Conference on Parallel & Distributed Processing with Applications, Big Data & Cloud Computing, Sustainable Computing & Communications, Social Computing & Networking (ISPA/BDCloud/SocialCom/SustainCom); Xiamen, China. 16–18 December 2019; pp. 218–222.

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.

Nisa, A.K.; Irawan, M.I.; Pratomo, D.G. Identification of Potential Landslide Disaster in East Java Using Neural Network Model (Case Study: District of Ponogoro). J. Phys. Conf. Ser. 2019, 1366, 012095.

In recent years, 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 MwMw 6.6 Lushan earthquake. We have applied it on 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.

L.Bragagnolo et al. Landslide susceptibility mapping with r.landslide: a free open-source GIS-integrated tool based on Artificial Neural Networks Environ.Model.software(2020)

Disaster management (DM) is one of the leading fields that deal with the humanitarian aspects of emergencies. The field has attracted researchers because of its ever-increasing need to find newer and more efficient ways of managing disaster situations to reduce human suffering. This paper reviews 128 articles published in various journals and conference proceedings on Artificial Neural Network (ANN), a part of Deep Learning (DL), applications in DM from 2010 to 2021. We try to identify the reasons for the superior performance of ANN-based techniques over other techniques. We also classify the extant literature according to applications in different phases and types of disasters. The phases are ‘Mitigation and Preparedness', and ‘Response and Recovery’. The type of disasters includes flood, earthquake, storm, fire hazard/wildfire, and others. We identify some important patterns from this review. The findings establish the following: (i) ANNs are popularly used to predict and manage floods, (ii) Backpropagation Neural Network (BPNN) are the commonly used architecture, and (iii) Convolutional Neural Networks (CNN) are most promising for extracting social media information during emergencies. We identify the

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limitations of this study and offer several potential directions for future research.

Sufi F.,Khalil I. Automated disaster monitoring from social media posts using AI based location intelligence and sentiment analysis

IEEE Trans.Comput.Soc.Syst.(2022),pp.1-11,10.1109/TCSS.2022.3157142

AI-SocialDisaster is a decision support system for identifying and analyzing natural disasters like earthquakes, floods, bushfires using social media feeds. It captures real-time social media messages and then uses Natural Language Processing (NLP) based algorithms like entity detection, category classification, and sentiment analysis to identify and locate various natural disasters. Moreover, using Artificial Intelligence (AI) based algorithms like anomaly detection, regression, and clustering, AI-SocialDisaster generates AI-based insights for disaster planners and strategists. The software can be accessed through Windows, iOS, and Android apps from a wide range of devices including mobiles, tablets, and desktops. AI-SocialDisaster is available at https://github.com/DrSufi/DisasterAI.

Kim, H.J., Moon, I.J. and Kim, M. (2020) Statistical prediction of typhoon-induced accumulated rainfall over the Korean Peninsula based on storm and rainfall data. *Meteorological Application.*, **27**, e1853.

A tropical cyclone (TC) is an extremely hazardous weather event. These events include heavy rain as an important hazard factor, which poses a serious threat to the public safety of coastal cities. Presently, numerical weather prediction (NWP) is an important and commonly used method to support the forecasting of the impact of TCs. However, relatively high uncertainty still remains in quantitative precipitation predictions provided by NWP, which makes it difficult to meet the demands of public safety management in regions affected by TCs. To remediate this deficiency, the study combines machine learning (ML) techniques with NWP and proposes a new analogue identification method for TC precipitation estimation. The method consists of three parts. First, the output data of historical NWPs, including wind, temperature, humidity of 850 hPa and sea-level pressure field, are deposited into a massive sample library. Second, the dimensionality of the sample library is reduced by using the locally linear embedding (LLE) method, and a characteristic subspace containing the features of the original sample library is formed. Finally, when a new NWP prediction appears, it can be projected into the characteristic subspace, and the historical NWP sample having the greatest similarity with the current NWP prediction can be identified. The observational precipitation corresponding to the most similar historical NWP sample can then be used to estimate the potential impact of current TCs. This method is verified using observation results from the coastal city of Shenzhen, China. The results show that the prediction of the method proposed in the current study exhibited significant improvement compared with prediction results provided by both the NWP's direct output and a traditional method used in the city.

Wu, Z.; Shen, Y.; Wang, H. Assessing urban areas' vulnerability to flood disaster based on text data: A case study in Zhengzhou City. *Sustainability* **2019**, *11*, 4548.[Google Scholar][CrossRef][Green Version]

In urban areas of Thailand, and especially in Bangkok, recent flash floods have caused severe damage and prompted a renewed focus to manage their impacts. The development of a real-time warning system could provide timely information to initiate flood management protocols, thereby reducing impacts. Therefore, we developed an innovative real-time flood forecasting system (RTFlood system) and applied it to the Ramkhamhaeng polder in Bangkok, which is particularly vulnerable to flash floods. The RTFlood system consists of three modules. The first module prepared rainfall input data for subsequent use by a hydraulic model. This module used radar rainfall data measured by the Bangkok Metropolitan Administration and developed forecasts using the TITAN (Thunderstorm Identification, Tracking, Analysis, and Nowcasting) rainfall model. The second module provided a real-time task management system that controlled all processes in the RTFlood system, i.e., input data preparation, hydraulic simulation timing, and post-processing of the output data for presentation. The third module provided a model simulation applying the input data from the first and second modules to simulate flash floods. It used a dynamic, conceptual model (PCSWMM, Personal Computer version of the Stormwater Management Model) to represent the drainage systems of the target urban area and predict the inundation areas. The RTFlood system was applied to the Ramkhamhaeng polder to evaluate the system's accuracy for 116

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recent flash floods. The result showed that 61.2% of the flash floods were successfully predicted with accuracy high enough for appropriate pre-warning. Moreover, it indicated that the RTFlood system alerted inundation potential 20 min earlier than separate flood modeling using radar and local rain stations individually. The earlier alert made it possible to decide on explicit flood controls, including pump and canal gate operations.

Palermo, S.A.; Turco, M.; Principato, F.; Piro, P. Hydrological effectiveness of an extensive green roof in Mediterranean climate. Water 2019, 11, 1378.

The real-time control (RTC) system is a valid and cost-effective solution for urban stormwater management. This paper aims to evaluate the beneficial effect on urban flooding risk mitigation produced by applying RTC techniques to an urban drainage network by considering different control configuration scenarios. To achieve the aim, a distributed real-time system, validated in previous studies, was considered. This approach uses a smart moveable gates system, controlled by software agents, managed by a swarm intelligence algorithm. By running the different scenarios by a customized version of the Storm Water Management Model (SWMM), the findings obtained show a redistribution of conduits filling degrees, exploiting the whole system storage capacity, with a significant reduction of node flooding and total flood volume.