Tropical Cyclone Intensity Detection By Geometric Features Of Cyclone Images And Multilayer Perceptron

Author: Chinmoy Kar, Ashirvad Kumar & Sreeparna Banerjee
Published on:26 Aug 2019

Abstract:

Tropical cyclone (TC) forecasting involves the prediction and intensity detection of a storm surge. TC intensity prediction and detection are important to minimize the loss of life and damage caused by TC. The geometric features of TC images are used for the classification using the multilayer perceptron model .The proposed method classifies TC images over the Bay of Bengal and Arabian Sea with 84% accuracy

Conclusion:

The MLP technique with geometric features turned out to be useful for the detection of cyclone intensity. Below is a comparison made between other feature-based TC intensity detection techniques with our proposed method.

Disaster Monitoring Using Unmanned Aerial Vehicles And Deep Learning

Author : Andreas Kamilaris and Francesc X. Prenafeta-Boldú

Published on:2018

Monitoring of disasters is crucial for mitigating their effects on the environment and human population, and can be facilitated by the use of unmanned aerial vehicles (UAV), equipped with camera sensors that produce aerial photos of the areas of interest. In this paper, we present the state of the art work related to the use of deep learning techniques for disaster identification. We demonstrate the potential of this technique in identifying disasters with high accuracy, by means of a relatively simple deep learning model. Based on a dataset of 544 images (containing disaster images such as fires, earthquakes, collapsed buildings, tsunami and flooding, as well as “non disaster” scenes), our results show an accuracy of 91% achieved, indicating

that deep learning, combined with UAV equipped with camera sensors, have the potential to predict disasters with high accuracy. In this paper, we have presented the state of the art work related to the use of deep learning techniques for disaster monitoring and identification, based on aerial photos captured by UAV. We have also created a small dataset of 544 images, creating a deep learning model based on VGG, in order to show the potential of this technique in identifying disasters automatically and with high accuracy.re-based TC intensity detection techniques with our proposed method.

Deep Learning Based Forest Fire Classification And Detection In Satellite Images

Author : R.Shanmuga priya, K.Kani

Published on:2019

Forest fires are an important threat to humans and other living creatures, with the development of satellite technology it can be constantly monitored and controlled. Presence of smoke in the atmosphere is the indication of forest wildfires. In fire alarm systems, fire detection plays a crucial part in avoiding damages and other fire disasters that lead to social ramifications. Avoiding large scale fire, effective fire detection from visual scenes is important. To improve fire detection accuracy, an effective approach of a convolutional neural network based Inception-v3 based on transfer learning is designed which train the satellite images and classify the datasets into a fire and non-fire images, confusion matrix is generated to specify efficiency of the framework, then extract the fire occurred region in the satellite image using local binary pattern it reduces false detection rates

A Review On Flood Management Technologies Related To Image Processing And Machine Learning

Author: Hafiz SulimanMunawara, Ahmed W.A.HammadaS, TravisWaller

Published on: 19 Aug 2021

Abstract:

Flood management, which involves flood prediction, detection, mapping, evacuation, and relief activities, can be improved via the adoption of state-of-the-art tools and technology. Thus, future efforts need to focus on combining disaster management knowledge, image processing techniques and machine learning tools to ensure effective and holistic disaster management across all phases.

Conclusion:

Floods may be frightening, but it is up to us to make sure they do not interfere with our daily life. Pools, ponds, and other reservoirs should all be kept in good condition. Floods can be prevented if soil conditions improve, allowing for easier water absorption.

Estimating Damages From Climate-Related Natural Disasters For The Caribbean At 1.5 °C And 2 °C Global Warming Above Preindustrial Levels

Author : Christopher Patrick Burgess, Michael A. Taylor, Tannecia S. Stephenson

Published on:18 Oct 2018

Abstract:

This paper examines historical and future changes in normalised damages resulting from climate-related natural disasters for the Caribbean. Annualised damages of USD824 million are shown to be non-stationary over the historical period 1964 to 2013. Annual normalised damages may potentially increase to at least USD1395 million or close to double for 1.5 °C. At 2 °C, higher damages may occur;

Conclusion:

Natural disasters are catastrophic events with atmospheric, geological, and hydrological origins (e.g., droughts, earthquakes, floods, hurricanes, landslides) that can cause fatalities, property damage and social environmental disruption

A Deep Learning Approach Of Recognizing Natural Disasters On Images Using Convolutional Neural Network And Transfer Learning

Author : Daryl B. Valdez, Rey Anthony G. Godmalin.

Published on:9 Dec 2021

Natural disasters are uncontrollable phenomena occurring yearly which cause extensive damage to lives, 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. At present, there are still gaps in the literature regarding real-time natural disaster recognition. In this paper, we present a dataset for the joint classification of natural disasters and intensity. This study leveraged on transfer learning in training the network to recognize natural disasters, as well as detecting normal, no-disaster images. At the same time, it is also capable of recognizing disaster intensity. Under controlled conditions, the model showed promising results on the two classification tasks. Thus, the study proved that accurate recognition of natural disasters is possible using a lightweight model and transfer learning. We hope that this study would lead to development of monitoring or surveillance systems that can perform accurate, on-the-ground, and real-time recognition of natural disasters allowing for rapid emergency responses mitigating the loss of lives and damages to properties.

Flood Detection Using Multispectral Images And SAR Data

Author: Tanmay Bhadra, Avinash Chouhan, Dibyajyoti Chutia, Alexy Bhowmick & P. L. N. Raju

Published on:15 Jun 2020

Remote sensing imagery analysis is a very crucial task in regard to climate or disaster monitoring. Satellite images can capture the ground surface conditions

and give a huge amount of information in a single image. In recent days, with the availability of multi-temporal satellite data, monitoring of flood events have become pretty easy. It gives accurate and real time flood information. Flood is one of the most disastrous natural disasters in Assam, India. It is necessary to predict or monitor flood events to minimise the overall damage caused due to floods. There are many scientific approaches which have been made operational in flood monitoring related activities. However Deep Learning based approaches are not yet fully exploited so far to monitor and predict flood events. We propose flood detection in real-time with the help of multispectral images and SAR data using Deep Learning technique Convolutional Neural Network (CNN). The study area comprises of 2 districts namely Barpeta and Kamrup of Assam, India. We have obtained an accuracy of 80% in detecting flood. Based on our result, deep learning may be vigorously explored in various other disaster detection or monitoring activities.

Mapping Earthquake-Triggered Landslide Susceptibility By Use Of Artificial Neural Network (ANN) Models

Author: Yingying dian, Chong Xu, Haoyuan hong, Qing zhou&duo Wang

Published on:25 Dec 2018

Abstract:

A landslide susceptibility map, which describes the quantitative relationship between known landslides and control factors, is essential to link the theoretical prediction with practical disaster reduction measures. Thus, it can be concluded that the assessment based on existing earthquake-induced landslides and the ES model could provide better background information for seismic landslide susceptibility mapping and disaster prevention.

Conclusion:

Based on the coseismic landslides inventory of the 2013 Minxian, China Mw5.9 earthquake and ten control factors (elevation, slope angle, slope aspect, curvature, slope position, distance to drainages, lithology, earthquake intensity, peak ground acceleration, and distance to the seismogenic fault), the ANN models were adopted to build the landslide susceptibility maps in the affected area. During this mapping, two cases were considered.

Extending Deep Learning Approaches For Forest Disturbance Segmentation On Very High-Resolution Satellite Images

Author :Dmitry E. Kislov,Kirill A. Korznikov,Jan Altman,Anna S. Vozmishcheva,Pavel V. Krestov

Published on:26 Jan 2021

Accurate remote detection of various forest disturbances is a challenge in global environmental monitoring. Addressing this issue is crucial for forest health assessment, planning salvage logging operations, modeling stand dynamics, and estimating forest carbon stocks and uptake. Substantial progress on this problem has been achieved owing to the rapid development of remote sensing devices that provide very high-resolution images. Concurrently, image processing algorithms have witnessed rapid development owing to the extensive use of artificial neural networks with complex architectures and deep learning approaches.In this study, we used deep convolutional neural networks (DCNNs) to recognize forest damage induced by windthrows and bark beetles. We used satellite imagery of very high resolution in visual spectra represented as pansharpened images (RGB channels). When predicting forest damage, we obtained accuracies higher than 90% on test data for recognition of both windthrow areas and damaged trees impacted by bark beetles.In this study, we demonstrated that the proposed DL algorithm (U-Net-like CNN) is an efficient method of automatically recognizing forest sites disturbed by winds and bark beetles. If appropriately trained, a U-Net-like CNN can identify specific types of damaged forests and their locations. In contrast with standard ML methods, DL algorithms do not require complex feature engineering.

Multi-Hazard And Spatial Transferability Of A CNN For Automated Building Damage Assessment

Author: Tinka Valentijn , Jacopo Margutti , Marc van den Homber and Jorma Laaksonen
Published on:1 Sept 2020

Automated classification of building damage in remote sensing images enables the rapid and spatially extensive assessment of the impact of natural hazards,

thus speeding up emergency response efforts. Convolutional neural networks (CNNs) can reach good performance on such a task in experimental settings. This study focuses on the applicability of a CNN-based model in such scenarios. We performed experiments on 13 disasters that differ in natural hazard type, geographical location, and image parameters. The types of natural hazards were hurricanes, tornadoes, floods, tsunamis, and volcanic eruptions, which struck across North America, Central America, and Asia. We used 175,289 buildings from the xBD dataset, which contains human-annotated multiclass damage labels on high-resolution satellite imagery with red, green, and blue (RGB) bands. In conclusion, we systematically evaluated the performance of a CNN-based model in a wide variety of operational conditions, which has never been done so extensively before. When training and testing on the same disaster, as well as when leaving the test disaster out of the training set, it was found that the performance heavily differed per test disaster.

Flood Susceptibility Zonation Using Advanced Ensemble Machine Learning Models Within Himalayan Foreland Basin

Author: Supriya Ghosh, Slumik Saha and Biswajit Bera.
Published on:7 Jun 2022

Floods are considered as one of nature's most destructive fluvio-hydrological extremes because of the massive damage to agricultural land, roads and building and human fatalities. Flood susceptibility analysis is considered as an important flood management approach. Identification of flood susceptibility areas has been performed by applying advanced machine learning (ML) algorithms(random forest (RF), support vector machine(SVM) and extreme gradient boosting (XGBoost) at the lower part of Raidak river basin). The lower Raidak river basin is situated within the foothill zone of Himalaya and experienced high flood events throughout the years due to topographic variation and human intervention in the river channel and within the floodplain. So, flood susceptibility analysis in the Raidak river basin will be accepted as a valuable tool for the mitigation and management of flood hazards in this flood dominated area.

Brief Communication: Introducing Rainfall Thresholds For Landslide Triggering Based On Artificial Neural Networks

Abstract: Pierpaolo Distefano, David J Peres, Pietro Scandura, Antonino Cancelliere
Published on:2022

The identification of rainfall thresholds indicating landslide-triggering conditions is a key step for implementing territorial landslide early warning systems. Commonly, thresholds are searched in a limited space the practical implementation of triggering thresholds based on neural networks, which could be perceived as impractical by practitioners. However, this limit can for instance be overcome by providing a user-friendly software to the end user. Then we show how ANNs allow other variables to be easily added, like peak rainfall intensity, with a further performance improvement (TSS = 0.66). This may stimulate more research on the use of this powerful tool for deriving landslide early warning thresholds.

Landslide Risk Prediction By Using GBRT Algorithm: Application Of Artificial Intelligence In Disaster Prevention Of Energy Mining

Author: Song Jiang b, JinYuan Li a, b, Sai Zhang a, QingHua Gu a,c, CaiWu Lu a, b, HongSheng Liu a, b
Published on:20 Aug 2022

Geological disasters on the slopes of open-pit mine dumps in energy extraction fall into the category of mine production process safety. For the mine safety, it is crucial to accurately predict the landslide risk of open-pit mine dumps. In order to prevent landslide geological disasters in open-pit mine dumps under the effect of heavy rainfall, this study establishes a fast and accurate landslide risk prediction model for open-pit mine dumps based on machine learning (ML). rainfall intensity and duration are important for constructing a prediction model for landslide risk in open-pit mine dumps.

Disaster Damage Investigation Using Artificial Intelligence And Drone Mapping

Author: S.S. Kim, D.Y. Shin, E.T.Lim, Y.H. Jung, S.B. Cho
Published on: May 2022

This study aims to testify the applicability of UAV photo grammetry and artificial intelligence (AI) for the management of natural disaster. Recently

artificial intelligence is considered as an emerging tool for recognizing disaster events from aerial imagery of drones. In this paper, we present firstly the approach related to use of AI techniques for disaster detecting and identification. Secondly, we suggest small easy-to-use UAV-based investigation procedure for natural disaster damaged area in the phase of disaster recovery in Korea. In this paper, we generate three dimensional terrain information and high-resolution ortho-imagery and then analyze quantitatively damage level by natural disaster using commercial UAVs and drone mapping technique.

Natural Disaster Intensity Analysis And Classification Based On Multispectral Images Using Multi Layered Deep Conventional Neural Network

Author: Muhammad Aamir, Tariq Ali, [...], and Saifur Rahman
Published on:25 March 2021

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. Many researchers have attempted to use different deep learning methods for detection of natural disasters. However, the detection of natural disasters by using deep learning techniques still faces various issues due to noise and serious class imbalance problems.

Artificial Intelligence In The Assessment Of Transmission And Distribution Systems Under Natural Disasters: Using Machine Learning And Deep Learning Techniques In A Knowledge Discovery Framework

Author: Rossana Villegas Arguelles, B.S., M.I.
Published on:Dec 2019

Abstract:

Warming trends and increasing temperatures have been observed and reported by federal agencies, such as the National Oceanic and Atmospheric Administration (NOAA). Extreme weather events, especially hurricanes, tornadoes and winter storms, are among the highly devas tating natural disasters responsible for massive and prolonged power outages in Electrical Trans mission and Distribution Systems (ETDS). Moreover, the failure rate probability of any system component under extreme-weather tends to increase in the impacted geographic area. This disser tation proposes an Artificial Intelligence (AI) Decision Support System that can predict damage in the ETDS and allow operators to mitigate disastrous extreme weather events. The document re ports the results of the exploration of a novel method to integrate two main domains: the critical operation of the ETDS under natural disaster conditions; and data integration based on the se quence of steps in a Knowledge Discovery Framework (KDF). Machine Learning and Deep Learn ing approaches, including the spectrum of data mining, are incorporated in the KDF and used to perform the estimation, regression, and classification tasks. By means of two scenarios, a winter storm and a major hurricane, the proof of concept of the consolidation of the two domains, Al and ETDS, is demonstrated. The results of the methods are compared, as well as techniques and accu racy of the algorithms. Discussion includes descriptive statistics of the data analysis, conducted to understand each data set, and how they are related to each task. The results reveal a powerful tool, that incorporates disparate ideas and data, and increases the accuracy of predictions and classifi cations of extreme weather damage in the hypothetical cases presented. This is of importance to the operator decision support in order to solve problems in the area of critical operation of the Transmission and Distribution systems during extreme-weather events.

Neural Networks And Landslide Susceptibility: A Case Study Of The Urban Area Of Potenza

Author: Donatella Caniani, Stefania Pascale, Francesco Sdao Aurelia Sole
Published on: 2007

For those working in the field of landslide prevention, the estimation of hazard levels and the consequent production of thematic maps are principal objectives. They are achieved through careful analytical studies of the characteristics of landslide prone areas, thus, providing useful information regarding possible future phenomena. Such maps rep resent a fundamental step in the drawing up of adequate measures of landslide hazard mitigation. However, for a complete estimation of landslide hazard, meant as the degree of probability that a

landslide occurs in a given area, within a given space of time, detailed and uniformly distributed data regarding their incidence and causes are required. This information, while obtainable through laborious historical research, is usually partial, incomplete and uneven, and hence, unsatisfactory for zoning on a regional scale. In order to carry this out effectively, the utilization of spatial estimation of the relative levels of landslide hazard in the various areas was considered opportune. These areas were classified according to their levels of proneness to landslide activity without taking recurrence periods into account. Various techniques were developed in order to obtain upheaval numerical estimates. The method used in this study, which was applied in the area of Potenza, is based on techniques derived from artificial intelligence (Artificial Neural Network-ANN). This method requires the definition of appropriate thematic layers. which parameterize the area under study. These are recognized by means of specific analyses in a functional relationship to the event itself. The parameters adopted are: slope gradient, slope aspect, topographical index, topographical shape, elevation, land use and lithology.

PERSIANN-CNN: Precipitation estimation from remotely sensed information using artificial neural networks-convolutional neural networks

Author: Mojtaba Sadeghi, Ata Akbari Asanjan, Mohammad Faridzad. Phu Nauven. Kuolin Hsu. Soroosh
Published on:2019

Abstract:

Accurate and timely precipitation estimates are critical for monitoring and forecasting natural disasters such as floods. Despite having high resolution satellite information,precipitation estimation from remotely sensed data still suffers from methodological limitations. State-of-the art deep learning algorithms, renowned for their skill in learning accurate patterns within large and complex datasets, appear well suited to the task of precipitation estimation, given the ample amount of high-resolution satellite data. In this study, the effectiveness of applying convolutional neural networks (CNNs) together with the infrared (IR) and water vapor (WV) channels from geostationary satellites for estimating precipitation rate is explored. The proposed model performances are evaluated during summer 2012 and 2013 over central CONUS at the spatial resolution of 0.08° and at an hourly time scale. Results demonstrate that the proposed model (PERSIANN-CNN) provides more accurate rainfall estimates compared to the baseline models at various temporal and spatial scales. Specifically, PERSIANN-CNN outperforms PERSIANN-CCS (and

PERSIANN-SDAE) by 54% (and 23%) in the critical success index (CSI), demonstrating the detection skills of the model.

Conclusion:

In this study, the application of convolutional neural networks (CNNs) in detecting and estimating precipitation from bispectral satellite imagery (IR and WV channels) was explored. A case study over the central United States was conducted to assess the effectiveness of the presented model at 0.08° spatial for both hourly and daily temporal resolution. The proposed model was evaluated against Stage IV radar observations and two existing satellite datasets, PERSIANN-CCS and PERSIANN SDAE.

Random forest and artificial neural networks in landslide susceptibility modeling: a case study of the Fao River Basin, Southern Brazil

Author: Guilherme Garcia de Oliveira - Luis Fernando Chimelo Ruiz'. Laurindo Antonio Guasselli Claus Haetinger
Published on:16 Sept 2019

Abstract:

Empirical models based on machine learning methods have been used for landslide susceptibility mapping. The most accurate model is usually chosen to generate the final map. This paper demonstrates the importance of analyzing the spatial pattern of susceptibility maps. since models with similar performance can produce different output values. The relevance of terrain attributes and the sensitivity of models to input variables are also discussed. The applications of random forest (RF) and artificial neural network (ANN) models to the identification of landslide susceptible areas in the Fão River Basin, Southern Brazil, were evaluated and compared.
The following have been included in the methodology:
(1) the extraction of predictive attributes (e.g., slope, aspect, curvatures, valley depth) from a digital elevation model;
(2) the organization of a landslide scar inventory;
(3) the calibration and validation procedures of the models;
(4) the analysis of model performance according to accuracy (area under the receiver operating characteristic curve) and parsimony (Akaike Information Criterion);

(5) the reclassification of maps into susceptibility categories. All model configurations resulted in an accuracy above 0.9, demonstrating the ability of both techniques in landslide susceptibility mapping. The RF model stood out in this respect. recording the highest accuracy index among all tested configurations (0.949).
The ANN model was more parsimonious, obtaining an accuracy of 0.925 with a much smaller num ber of internal connections. Thus, even with both having high and equivalent accuracy. indexes, the models can establish different relationships between the input and the output susceptibility indexes, resulting in various possible landslide occurrence scenarios. These differences, together with the difficulty in defining which model presents more coherent results, reinforce the possibility of extracting spatial statistics, considering multiple con figurations of models that combine accuracy and parsimony, in landslide susceptibility mapping.

Conclusion:

The major contribution of this paper was to show the importance of analyzing the spatial pattern of susceptibility maps and the relevance of terrain attributes, since machine learning-based models can establish different relationships between inputs and outputs. Natural Hazards generating maps with high accuracy, but significant differences in output values. The application of RF and ANN models to the identification of susceptible areas in the Fao River Basin, Southern Brazil, was evaluated and compared.

Cloud-Fog based framework for drought prediction and forecasting using artificial neural network and genetic algorithm

Author: Amandeep Kaur & Sandeep K. Sood
Published on:9 Aug 2019

The dimensionality of the data collected about drought inducing attributes temperature, humidity, precipitation, evapotranspiration, groundwater, soil moisture at different depths, streamflow and season is reduced using PCA (Principal Component Analysis) at fog layer. Cloud layer estimates the drought severity level using Artificial Neural Network (ANN) whose parameters are optimised with Genetic Algorithm (GA) to get more accurate system and ARIMA method is used to forecast the drought for different time frames. Drought is one of the most recurrent natural disasters with cataclysmic effects on water budget, crop production, economic progression and public health. These consequences are magnified by the climate change leading to more

intense drought conditions. A number of drought indices have been presented to calibrate the drought severity with its own strengths and limitations. Many of them are region-specific and unable to exhibit the alterations in significant drought inducing elements