IDEATION PHASE

LITERATURE SURVEY

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Abstract :

There has been an unsettling rise in the intensity and frequency of natural disasters due to climate change and anthropogenic activities. Artificial intelligence (AI) models have shown remarkable success and superiority to handle huge and nonlinear data owing to their higher accuracy and efficiency, making them perfect tools for disaster monitoring and management. Accordingly, natural disaster management (NDM) with the usage of AI models has received increasing attention in recent years, but there has been no systematic review so far. This paper presents a systematic review on how AI models are applied in different NDM stages based on 278 studies retrieved from Elsevier Science, Springer LINK and Web of Science. The review: (1) enables increased visibility into various disaster types in different NDM stages from the methodological and content perspective, (2) obtains many general results including the practicality and gaps of extant studies and (3) provides several recommendations to develop innovative AI models and improve the quality of modelling. Overall, a comprehensive assessment and evaluation for the reviewed studies are performed, which tracked all stages of NDM research with the applications of AI models.

INTRODUCTION:

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 multi-layered 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.

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

Natural hazards pose significant risks throughout the world. They are among the deadliest disasters. These events cause significant economic damage as well, with losses from a large tropical cyclone impacting a developed nation approaching or, at times, exceeding U.S. $100 billion. Risk analysis is, in broad terms, a systematic process aimed at understanding the nature of risk in a given situation and expressing the risk together with the underlying knowledge base. The primary focus is on artificial intelligence, machine learning, and statistical methods. The proposed model works in two blocks: Block-I convolutional neural network (B-I CNN), for detection and occurrence of disasters, and Block convolutional neural network (B-II CNN), for classification of natural disaster intensity types with different filters and parameters.

2. Tropical Cyclone Intensity Estimation Using Multidimensional Convolutional Neural Network From Multichannel Satellite Imagery

Tropical Cyclone is a severe storm that occurs over the tropical ocean. TC intensity is one of the key parameters for TC prediction and disaster prevention. Accurate estimation of TC intensity is important to theoretical research studies and practical applications. Inspired by the success of deep learning technology in various fields, recent attempts for TC intensity estimation focus on designing effective convolutional neural network (CNN). We design a deep learning model, called 3DAttentionTCNet, which is inspired by Alex Net. Unlike Alex net, as the pooling layer compresses some important information resulting in the loss of some intensity features, we remove the pooling layers. In addition, we remove the dropout layer, the reason why we make this adjustment is that dropout regularization technology randomly removes some neurons during the training process. It has been confirmed that removing the dropout layer will cause negative deviations.

3. Designing Deep-Based Learning Flood Forecast Model With ConvLSTM Hybrid Algorithm

Early detection of natural disasters such as floods can greatly assist humans in reducing the extent of the damage caused by such events. In the Fiji Islands, where this study is focused, recent flood events resulted in major damages amounting to millions of dollars. The loss of at least 225 lives during the 1931 flood event in Fiji was primarily due to the unavailability of efficient flood warning systems. One simple, yet a robust mathematical tool used to determine the flood state at a particular time for a given area is the Flood Index (IF). A model is developed Develop multi-step predictive model using ConvLSTM, as an objective model, with alternative methods of LSTM, CNN-LSTM and SVR that can also determine the flood state.

4.A Conformal Regressor With Random Forests for Tropical Cyclone Intensity Estimation

Tropical Cyclone is an intense vortex system that originates over the tropical ocean and is one of the most destructive natural disasters. TC intensity usually refers to the maximum wind speed near the TC centre. TC intensity is an important indicator to quantify the destruction potential. The basic idea of using satellite data to estimate the intensity is that the cloud pattern strongly correlates with the TC Intensity in the image. It is considered an excellent way to extract features from satellite images to estimate TC intensity. The most common technique is the Dvorak technique. The Dvorak technique tried to estimate the TC intensity using visible or infrared images based on the cloud structure. Various machine learning models have also been applied to TC intensity estimation. Among them, the most widely used was the linear regression model. A multiple linear regression (MLR) model was constructed based on the extraction of the most significant signals and parameters from satellite infrared images.
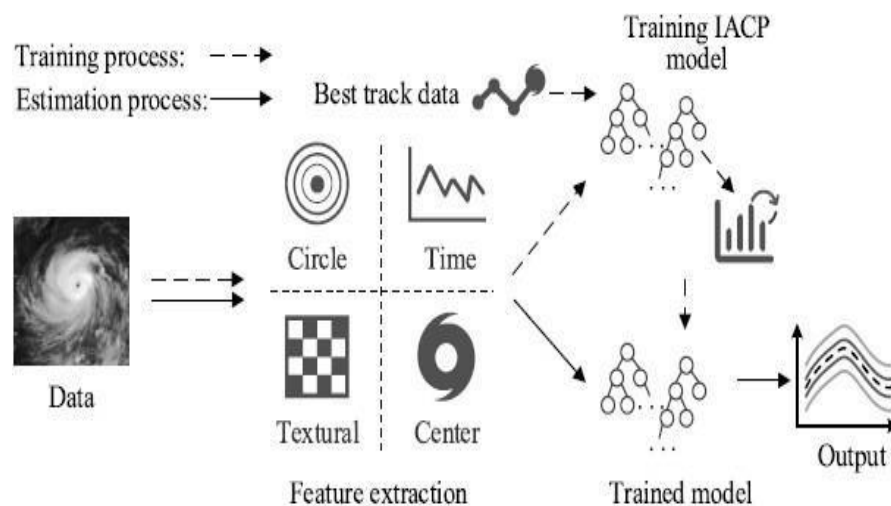
5. Rain former: Features Extraction Balanced Network for Radar-Based Precipitation Nowcasting

Precipitation nowcasting task is one of the basic challenges in meteorological research. It aims at predicting the rainfall intensity in the future 0–2 h by using specific meteorological information. It has an enormous application range related with human beings. Precipitation nowcasting methods can be roughly divided into numerical weather prediction (NWP) and extrapolation-based methods. NWP relies on vast complex meteorological data as input data and requires an expensive computing resource. At this point, radar extrapolation-based methods may be a good choice. It does not need other meteorological information and only uses several radar maps/frames to predict future radar maps. Convolutional long short-term memory (ConvLSTM) is the first ConvRNN-based method applied to the precipitation nowcasting field to the best of our knowledge. Due to the structure of long short-term memory (LSTM), the ConvRNN-based methods can memorize the past information and effectively capture the movement trend and rainfall intensity variation of rainfall. Although many prior works are superior to traditional algorithms, several issues remain. A new

framework for precipitation nowcasting named Rain former is introduced. It can extract global and local features from radar echo maps separately, and fuses balanced these two features to enhance the model's ability to predict heavy rain or rainstorm. Rain former consists of an encoder (green box) and decoder (blue box). They both have four stages. When the stage goes deeper, the feature size becomes smaller. Both encoder and decoder include FEBM. FEBM enhances the low to medium and high-intensity rainfall features at every stage.

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