Literature Survey

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

Studies analyzing the intensity of natural disasters have gained significant attention in the current decade. A. Ashiquzzaman et al. Utilized a video source for fire detection; processing video sources is a feasible task due to convolutional neural networks (CNNs), which require high performance computational resources including graphics hardware, and thus a smart and cost-effective fire detection network is proposed based on architecture of convolutional neural networks.

In convolutional neural networks, a model to detect wildfire smoke named wildfire smoke dilated dense net was proposed by Li et al., consisting of a candidate smoke region segmentation strategy using an advanced network architecture. Mangalathu et al. performed an evaluation of building clusters affected by earthquakes by exploring the deep learning method, which uses long short-term memory.

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Topic:Domain knowledge integration into deep learning for typhoon intensity classification

In this report, we propose a deep learning technique for high-accuracy estimation of the intensity class of a typhoon from a single satellite image, by incorporating meteorological domain knowledge. By using the Visual Geometric Group's model, VGG-16, with images preprocessed with fisheye distortion, which enhances a typhoon's eye, eyewall, and cloud distribution, we achieved much higher classification accuracy than that of a previous study, even with sequential-split validation. Through comparison of t-distributed stochastic neighbor embedding (t-SNE) plots for the feature maps of VGG with the original satellite images, we also verified that the fisheye preprocessing facilitated cluster formation, suggesting that our model could successfully extract image features related to the typhoon intensity class. Moreover, gradient-weighted class activation mapping (Grad-CAM) was applied to highlight the eye and the cloud distributions surrounding the eye, which are important regions for intensity classification; the results suggest that our model qualitatively gained a viewpoint similar to that of domain experts. A series of analyses revealed that the data-driven approach using only deep learning has limitations, and the integration of domain knowledge could bring new breakthroughs.

Topic : An Empirical Analysis of AI Contributions to Sustainable Cities

Cities are complex structures, growing worldwide at a fast pace (Batty, 2009). Commuter movement, capital flow, resources, and commodities lead to the emergence of city regions (Axinte et al., 2019). Due to increasing population size, density, and location, cities are also prone to adverse effects such as soil, air, and water pollution and impacts of climate change, affecting surrounding rural areas. Prompt action is required in the form of new and innovative infrastructures and services for addressing the increasing demands coupled with environmental and climate change impacts (Solecki et al., 2018). Urban areas are increasingly digitalized over the last few decades due to significant advancements in digital technologies (Ismagilova et al., 2019). Cities are considered as the drivers for change and innovation (Fitjar and Rodríguez-Pose, 2020). Several innovative approaches are being developed to gather detailed insights and opportunities for the planning and management of cities (Sharda et al., 2021; Rogers et al., 2020). Notions such as Smart cities touched upon several dimensions or application domains where technological infrastructure, system integration, and data analysis can help us optimize resources in cities (Ismagilova et al., 2019). At the same time, cities are also trying to reconfigure themselves for a sustainable future, with the aim to improve the quality of life for all citizens (Barlacchi et al., 2015; Bibri, 2021). The importance of cities is well recognized by the internationally agreed Agenda 2030 Sustainable Development and the Paris Agreement to reduce the impact of climate change (Aust, 2019). In fact, two-thirds of all Sustainable Development Goals (SDGs) can only be achieved in and with the help of cities (Acuto, 2016). Emphasizing the opportunities offered by digital technologies at a city scale can significantly contribute towards the progress of sustainable development in line with the 2030 Agenda.