frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 03 July 2024
DOI 10.3389/feart.2024.1434425

OPEN ACCESS

EDITED AND REVIEWED BY
Alexander Kokhanovsky,
German Research Centre for Geosciences, Germany

*CORRESPONDENCE
Zheyuan Du,
zheyuan.du@ga.gov.au

RECEIVED 17 May 2024
ACCEPTED 19 June 2024
PUBLISHED 03 July 2024

CITATION
Du Z, Hay-Man Ng A and Ge L (2024), Editorial: Towards a better understanding of the correlation between the subsidence pattern and land use type .
Front. Earth Sci. 12:1434425.
doi: 10.3389/feart.2024.1434425

Editorial: Towards a better understanding of the correlation between the subsidence pattern and land use type

Zheyuan Du[1]*, Alex Hay-Man Ng[2] and Linlin Ge[3]

[1]Geoscience Australia, Canberra, Australia, [2]School of Civil and Transportation Engineering, Guangdong University of Technology, Guangzhou, China, [3]School of Civil and Environmental Engineering, University of New South Wales (UNSW), Sydney, NSW, Australia

KEYWORDS

subsidence, land use, InSAR, road, disaster and climate risk reduction

Editorial on the Research Topic
Towards a better understanding of the correlation between the subsidence pattern and land use type

The rapid advancement in geospatial technologies continues to push the boundaries of environmental monitoring and infrastructure management (Ng et al., 2017; Ng et al., 2018; Du et al., 2021; Liu et al., 2023). This Research Topic presents five cutting-edge studies that explore various aspects of geodetic monitoring, from landslide susceptibility and road extraction to the impacts of climate change on nutrient pollution, urban subsidence, and insulator defect detection. Employing advanced machine learning algorithms and geospatial analysis, these studies offer significant insights into sustainable land-use practices, hazard management, and the precision monitoring of infrastructure health.

1 Introduction

The rapidly evolving landscape of geospatial technology has ushered in a new era of environmental monitoring and infrastructure analysis. As global environmental challenges such as climate change, urban expansion, and natural resource depletion intensify, the demand for accurate and timely geospatial data has never been more acute (Zhu et al., 2019; Du et al., 2023; Ng et al., 2023). This Research Topic compiles groundbreaking research that harnesses the power of advanced machine learning algorithms and robust geospatial analytics to tackle pressing environmental and infrastructural challenges. The featured articles demonstrate the versatile applications of these technologies across different sectors. Innovations in machine learning, for instance, are transforming landslide risk assessment, urban planning, and pollution control, offering more precise and actionable insights than ever before. Through detailed case studies and empirical research, the contributions in this issue provide new methodologies and enhanced analytical tools that significantly contribute to sustainable development and hazard mitigation. These articles not only showcase state-of-the-art applications in geospatial technology but also pave the way for future advancements that could further revolutionize our approach to environmental and infrastructural challenges.

2 Article summaries

2.1 Landslide susceptibility in Western Serbia

Elkhrachy et al. research stands out for its detailed comparison of hybrid machine learning models for landslide susceptibility mapping. The study not only evaluates the performance of support vector machine (SVM) and adaptive neuro-fuzzy inference system (ANFIS) models enhanced with Genetic Algorithms, Differential Evolution, and Cultural Algorithms but also establishes a benchmark for future research in the field. The paper discusses the implications of these findings for land-use planning and disaster prevention, emphasizing the importance of accurate predictive models in high-risk landslide areas.

2.2 Semantic segmentation for road extraction

This article introduces a groundbreaking approach to road network extraction from remote sensing imagery. Xiong, et al. method enhances traditional semantic segmentation by integrating angle prediction, which refines the geometric accuracy of extracted road features. This innovation is crucial for updating geographic information systems with high precision, facilitating better urban planning and infrastructure development. The study compares this new method with existing techniques, demonstrating significant improvements in accuracy and utility.

2.3 Nitrogen and phosphorus pollution in the Luhun Lake Basin, China

Yang, et al. comprehensive study uses geographic information systems and remote sensing to evaluate the impact of land use changes and climate variability on nutrient pollution in a major watershed. The research provides a detailed analysis of trends over 2 decades, offering insights into the effectiveness of current environmental policies and suggesting new strategies for managing water quality. This work is particularly valuable for policymakers and environmental managers seeking to mitigate nutrient pollution in similar ecological contexts.

2.4 Urban subsidence in Rawalpindi and Islamabad (Waqar Ali Zafar)

Zafar, et al. study addresses the critical issue of urban subsidence due to groundwater extraction in the twin cities of Rawalpindi and Islamabad. Using the new small baselines subset (NSBAS) InSAR technique, the paper not only quantifies subsidence rates but also links them to urban water management practices. The findings have significant implications for urban planning and disaster risk reduction, particularly in regions prone to subsidence due to geological and anthropogenic factors.

2.5 Insulator defect detection using YOLOv5s

Wei, et al. article focuses on improving the reliability of power transmission systems through advanced defect detection techniques. By enhancing the YOLOv5s model with an attention mechanism, the study achieves remarkable accuracy in detecting small target defects in insulators. This research is pivotal for the energy sector, offering a method that significantly reduces the risk of power outages and improves the maintenance of aging infrastructure.

3 Conclusion

The articles in this Research Topic illustrate the transformative impact of integrating machine learning and geospatial technologies in environmental science and engineering. Each study not only advances our understanding of complex environmental and infrastructural issues but also provides practical solutions that can be applied globally. As these technologies continue to evolve, their application across different sectors promises to offer even more sophisticated tools for researchers, engineers, and policymakers. This ongoing innovation is vital for addressing the challenges of a changing world and ensuring a sustainable future.

Author contributions

ZD: Writing–original draft, Writing–review and editing, AH-M: Writing–original draft, Writing–review and editing. LG: Writing–original draft, Writing–review and editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. The research was funded by the Program for Guangdong Introducing Innovative and Entrepreneurial Teams (2019ZT08L213) and Guangdong Forestry Science Data Center (grant number 2021B1212100004).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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