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EDITORIAL

From Sensing to Intelligence: Advancing Smart Geospatial Applications in Remote Sensing and GIS

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The evolving landscape of geospatial science is marked by a fundamental shift—from static spatial sensing to dynamic spatial intelligence. This transformation is driven not only by advances in data acquisition and computation but also by the growing demand for intelligent systems that automate perception, support decision-making, and adapt across diverse environments. Three recent studies published in *Revue Internationale de Géomatique* offer valuable insights into this trajectory, highlighting how methodological innovation in remote sensing (RS) and geographic information system (GIS) is laying the foundation for the next generation of smart geospatial applications.

Kunwar and Ferdush presented a deep learning-based land use and land cover (LULC) classification framework using Vision Transformers (ViT) trained on the EuroSAT dataset [1]. By fine-tuning a pretrained ViT model with visible satellite imagery, they achieved a classification accuracy of up to 99.19%. Their workflow—integrating data augmentation, cross-architecture benchmarking, and application to real-world mapping in the Kreis Borken region—demonstrates how AI-powered models can significantly enhance the precision and adaptability of LULC monitoring. More importantly, it exemplifies a scalable, intelligent perception system that requires minimal labeled data and can generalize to unseen regions, aligning closely with the vision of smart Earth observation.

Ilunga et al. focused on the indirect inventory and elevation change monitoring of historical geodetic markers in the Katangese Copper Belt [2]. Leveraging the Shuttle Radar Topography Mission (SRTM) data, unmanned aerial vehicle (UAV)-derived high-resolution point clouds, and historical topographic maps, they developed a robust statistical framework to detect, quantify, and correct altimetric changes at over 400 geodetic points. The use of spatial autocorrelation analysis, variance testing, and regression correction establishes a semi-automated quality control pipeline for topographic integrity. Although grounded in classical geospatial analysis, this approach demonstrates the potential for integrating RS and GIS with intelligent validation mechanisms, which are essential in building reliable geospatial knowledge bases and infrastructure monitoring systems.

Sidibé et al. examined land use dynamics in Mali's cotton production zones, illustrating how remote sensing can support smart policy design [3]. Through a temporal analysis of satellite imagery spanning over three decades, the authors identified patterns of land degradation, agricultural expansion, and settlement growth. Their integration of spatial change detection with socio-environmental interpretation provides a pathway for intelligent policy feedback loops—where RS not only observes but also contextualizes land use

change. Such studies are vital in translating geospatial observations into governance-relevant intelligence for sustainable land management.

These contributions reflect three pillars of intelligent geospatial systems: automated perception, knowledge constraints, and policy-oriented interpretation. They demonstrate how the fusion of RS, GIS, and AI is giving rise to systems that can detect, learn, reason, and inform actions—far beyond the scope of traditional sensing. As the geospatial domain moves toward an intelligence-driven paradigm, future research should emphasize interoperability, explainability, and real-world deployment. From vision models trained on global datasets to autonomous terrain monitoring systems and adaptive land governance platforms, the convergence of data, algorithms, and domain knowledge is reshaping how we perceive and manage the planet.

Together, these representative studies not only demonstrate excellent methodological advances, but also herald a broader shift towards geospatial intelligent systems. Grasping this direction will be key to addressing the complex environmental and societal challenges of the 21st century.

Conflicts of Interest: The author declares no conflicts of interest to report regarding the present study.

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