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Editorial: Advancements in land cover classification and machine learning techniques for Urban areas using remote sensing big data

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Editorial on the Research Topic
Advancements in land cover classification and machine learning techniques for Urban areas using remote sensing big data

The application of machine learning techniques and remote sensing imagery has significantly improved land cover classification and urban monitoring, especially in the context of urban planning, environmental management, and resource conservation. Recent studies have advanced these methodologies, leading to more efficient and precise systems. This editorial aims to showcase the valuable contributions to this field, highlighting the progress made through the four featured articles in this Research Topic.

The first article by Jin et al. focuses on a building extraction method from high-resolution remote sensing images using a multi-attention Location-Channel Attention Feature Serial Fusion Module (L-CAFSFM) and a meticulous feature fusion module (MFFM). This innovative approach improves building feature extraction by enhancing the model's ability to detect structures at various scales and levels. The method demonstrates a high level of precision (95.17%) and an Intersection over Union (IoU) of 90.18%, proving its effectiveness for urban planning and land resource management. The second article by Wang et al. introduces DeepGDLE, a lightweight land cover classification model designed with deep learning techniques. The model optimizes the DeeplabV3+ network by integrating the GhostNet network as the backbone, thus reducing computational costs while maintaining high accuracy. The inclusion of the FRSID dataset plays a crucial role in improving segmentation performance, offering insights into the influence of various factors on the model's results. The study exemplifies the importance of optimizing deep learning networks for large-scale applications without compromising their efficiency.

In the third article by Nigar et al., machine learning and deep learning models are compared for land classification tasks using satellite-derived indices such as NDVI, MNDWI, and NDBI. The study shows that deep learning models, especially CNN, significantly outperform machine learning models in classifying land cover types. The CNN model achieved an impressive overall accuracy of 97.3%, particularly excelling in the classification of water bodies. This work highlights the potential of deep learning for achieving high spatial resolution and accurate land cover classification in complex environments. Lastly, the fourth article by Gelete et al. explores the integration of machine learning and geospatial analysis for predicting gully erosion susceptibility in the Erer watershed of Ethiopia. Using models such as XGBoost, Random Forest, Support Vector Machine (SVM), and Artificial Neural Networks (ANN), the study identifies key geo-environmental factors contributing to gully erosion. The results reveal that XGBoost is the most robust model, offering a comprehensive approach for erosion susceptibility mapping. This work underscores the value of machine learning in addressing critical land degradation issues and supports more sustainable land management practices.

Together, these studies represent significant advancements in the integration of machine learning with remote sensing data, contributing to improved land cover classification, environmental monitoring, and natural resource management. The methodologies discussed here are not only enhancing our ability to process vast amounts of remote sensing data but also enabling more accurate and actionable insights for urban planning and sustainable development. As remote sensing and machine learning technologies continue to evolve, we can anticipate even greater progress in the ability to monitor and manage land cover changes, offering powerful tools for conservation and urban management in the future.

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