Satellite Imagery and AI in Land Use Mapping and Monitoring in Nigeria

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Abstract

Satellite imagery and artificial intelligence (AI) are increasingly being utilised for land use mapping and monitoring in Nigeria to address challenges related to urban sprawl, deforestation, and agricultural productivity. A combination of high-resolution satellite images from the Landsat programme and machine learning models was employed. Specifically, a Convolutional Neural Network (CNN) model was trained on a dataset comprising satellite imagery spanning multiple years to classify different land cover types with an accuracy rate above 90%. The analysis revealed significant variations in land use patterns across the northeastern region of Nigeria, with urban expansion accounting for approximately 35% of total land change from to . This pattern is consistent with economic development trends and infrastructure investments. This study demonstrates the efficacy of satellite imagery and AI in monitoring rapid changes in land use, providing valuable insights for policymakers and resource managers aiming to manage natural resources sustainably. Further research should focus on integrating remote sensing data from other sources such as ground surveys and socioeconomic indicators to enhance the model's predictive accuracy. Implementation strategies should be developed to leverage these findings for effective land management policies. AI, Convolutional Neural Network (CNN), satellite imagery, land use monitoring, Nigeria Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, GIS, DL, CNN, SVM, IoT, RS*

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