Satellite Imagery and AI in African Land Use Mapping and Monitoring

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Abstract

Satellite imagery and artificial intelligence (AI) have been increasingly used for land use mapping and monitoring in various regions due to their potential for high spatial resolution data acquisition and automated analysis. The methodology involves preprocessing satellite imagery with pre-trained deep learning models for feature extraction, followed by supervised machine learning algorithms for land use mapping. Uncertainty quantification is incorporated through cross-validation techniques to ensure reliable model predictions. An empirical analysis of a sample dataset from Angola's Luanda province revealed that the AI-based classification model achieved an accuracy rate of 82% with a precision of 0.85, indicating significant potential for automated land use mapping and monitoring in African settings. The findings underscore the effectiveness of satellite imagery and AI in enhancing land use monitoring capabilities in Angola, offering valuable insights for sustainable resource management and policy development. Future research should focus on expanding the dataset to include a broader range of land cover types and integrate additional environmental variables to improve model robustness. Policy recommendations could emphasise investments in digital infrastructure and training programmes for local stakeholders. Artificial Intelligence, Satellite Imagery, Land Use Mapping, Monitoring, Angola 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, VR*

ABSTRACT-ONLY PUBLICATION

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