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AI-Powered Satellite Imagery for Land Use Mapping and Monitoring in Gambia: A Methodological Approach

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Abstract

Satellite imagery has become an essential tool for monitoring land use changes on a global scale. However, accurate and timely land use mapping remains challenging in developing countries like Gambia due to limited data availability and high costs. The research employs a convolutional neural network (CNN) model for supervised learning, leveraging Sentinel-2 satellite data. A random forest classifier is integrated for feature selection, enhancing the accuracy of land use mapping. The CNN achieved an overall classification accuracy of 85% in identifying different land cover types within Gambia's agricultural landscapes. This AI-driven methodology represents a significant advancement in automated land use monitoring, potentially reducing costs and improving timeliness compared to traditional manual methods. Future research should explore the scalability and robustness of this approach across diverse geographical regions and different types of satellite imagery. AI, Convolutional Neural Networks (CNN), Random Forest Classifier, Land Use Monitoring, Sentinel-2 Satellite Imagery 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, Remote Sensing, Machine Learning, Pattern Recognition, Data Analytics, Spatial Databases*

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