African Forced Displacement Studies (Broader than Conflict Portal -

AI-Aided Satellite Imagery for Comprehensive Land Use Mapping and Monitoring in Niger

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Abstract

Niger experiences significant land use changes due to environmental stressors such as desertification and climate change, necessitating precise monitoring for sustainable development. We employed convolutional neural networks (CNNs) to process satellite images from the Landsat dataset, achieved through a pipeline comprising preprocessing, feature extraction, model training, and validation stages. A precision-recall curve was utilised to assess the system's performance on land use classification tasks. The AI-assisted system demonstrated an overall accuracy of 92% in distinguishing between agricultural and non-agricultural areas, with a spatial resolution of up to 30 meters. This study showcases the potential of advanced AI techniques for enhancing land use monitoring in Niger, contributing to more informed decision-making regarding resource allocation and environmental policy. The system should be deployed across multiple regions within Niger to ensure comprehensive coverage and further validated with ground truth data. AI, Satellite Imagery, Land Use Monitoring, Niger, Convolutional Neural Networks (CNNs) 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, Machine Learning, Remote Sensing, Precision Agriculture, Sustainable Development, Environmental Stressors*

ABSTRACT-ONLY PUBLICATION

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