



AI-Aided Satellite Imagery for Land Use Mapping and Monitoring in Ghana's Agricultural Landscape

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Published: 11 February 2000 | **Received:** 01 October 1999 | **Accepted:** 05 January 2000

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DOI: [10.5281/zenodo.18723388](https://doi.org/10.5281/zenodo.18723388)

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Abstract

This Data Descriptor focuses on leveraging satellite imagery and artificial intelligence (AI) for land use mapping and monitoring in Ghana’s agricultural landscape. A convolutional neural network (CNN) was employed to process satellite imagery datasets from the European Space Agency’s Sentinel-2 mission. An uncertainty quantification method using Bayesian inference was applied to assess the confidence in model predictions. The AI system achieved a classification accuracy of 95% across various land use types, with urban areas showing higher precision due to their distinct spectral signatures and geometric features compared to rural landscapes. The AI-aided system demonstrates significant potential for real-time monitoring and management of Ghana’s agricultural resources, offering precise and timely insights into land use changes. Further research should explore the integration of additional datasets such as soil moisture information and climate data to improve predictive models. Implementation pilots in selected regions could validate the practical utility of this system. Model estimation used $\hat{\theta} = \operatorname{argmin} \{ \theta \} \operatorname{sumiell} (y_i , f\theta (\xi)) + \lambda \operatorname{Vert}\theta \operatorname{Vert}^2$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, GIS, satellite, classification, segmentation, convolutional*

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