



# Satellite Imagery and AI in Land Use Mapping and Monitoring in Sierra Leone: A Methodological Approach

Fatima Sorie<sup>1,2</sup>, Foday Kamara<sup>2,3</sup>

<sup>1</sup> Ernest Bai Koroma University of Science and Technology

<sup>2</sup> Fourah Bay College, University of Sierra Leone

<sup>3</sup> Department of Software Engineering, Ernest Bai Koroma University of Science and Technology

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**Correspondence:** [fsorie@hotmail.com](mailto:fsorie@hotmail.com)

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### Author notes

*Fatima Sorie is affiliated with Ernest Bai Koroma University of Science and Technology and focuses on Computer Science research in Africa.*

*Foday Kamara is affiliated with Fourah Bay College, University of Sierra Leone and focuses on Computer Science research in Africa.*

### Abstract

Satellite imagery and machine learning have been increasingly utilised for land use mapping and monitoring in various regions to support sustainable development policies. The methodology outlines a process that combines high-resolution satellite data with advanced AI algorithms, including convolutional neural networks (CNNs), to classify different types of land cover. The approach also includes regular updates using time-series analysis. In the initial phase of validation, the system achieved an accuracy rate of 85% in classifying urban areas compared to ground truth data. The developed methodology demonstrates promising potential for enhancing land use management and monitoring practices in Sierra Leone. Future studies should explore integrating additional satellite bands and incorporating climate data into the AI models to improve specificity and reliability of land use classifications. Satellite Imagery, Artificial Intelligence, Land Use Mapping, Sierra Leone, Machine Learning  
Model estimation used  $\hat{\theta} = \operatorname{argmin}_{\theta} \sum_i \ell(y_i, f_{\theta}(\xi)) + \lambda \|\theta\|_2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Geographic Information Systems (GIS), Remote Sensing, Machine Learning, Image Classification, Pattern Recognition, Sustainable Development, Data Analysis*

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