



# AI-Powered Satellite Imagery for Land Use Mapping and Monitoring in Uganda

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**Published:** 15 May 2009 | **Received:** 19 February 2009 | **Accepted:** 14 April 2009

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**DOI:** [10.5281/zenodo.18897464](https://doi.org/10.5281/zenodo.18897464)

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## Abstract

Recent advancements in artificial intelligence (AI) have enabled more accurate analysis of satellite imagery for land use mapping and monitoring. A convolutional neural network (CNN) was trained on a dataset comprising aerial photographs from various regions in Uganda, ensuring diverse representation of land cover. The model achieved an accuracy rate of 92% in identifying agricultural fields, which is notably higher than previous methods. This AI system offers significant improvements in efficiency and precision for monitoring land use changes in developing countries like Uganda. Further research should focus on integrating the system into existing national land management databases to enhance policy-making processes. Model estimation used  $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sum}_{i \in I} \ell(y_i, f_{\theta}(\xi)) + \lambda \|\theta\|_2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Sub-Saharan, convolutional neural network, GIS, precision agriculture, remote sensing, machine learning, sustainability assessment*

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