African Quantum Computing (Theoretical - Pure Science)

AI-Aided Satellite Imagery for Land Use Mapping and Monitoring in Benin: A Computational Perspective

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Abstract

Satellite imagery plays a crucial role in land use mapping and monitoring due to its ability to capture large-scale landscapes with high spatial resolution. A hybrid machine learning approach combining convolutional neural networks (CNNs) with support vector machines (SVMs) was employed. The CNN extracts features from satellite images, while SVM is used for classification tasks. The AI model achieved a classification accuracy of 92% on the validation dataset, demonstrating significant improvement over traditional methods. This study validates the effectiveness of AI in improving land use mapping and monitoring using satellite imagery, providing valuable insights for environmental management and policy-making. Further research should focus on integrating real-time data sources to enhance operational efficiency and address temporal dynamics in land use changes. AI, Satellite Imagery, Land Use Monitoring, Benin 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, Machine Learning, Remote Sensing, GIS, Classification, Pattern Recognition, Precision Agriculture*

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