



Machine Learning Models in Climate Prediction and Adaptation Planning in Tanzania

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Abstract

Machine Learning models have shown promise in climate prediction and adaptation planning across various regions. A comprehensive search strategy was employed using academic databases such as PubMed, Web of Science, and Google Scholar. Studies were included if they utilised Machine Learning methods to predict climate variables or develop adaptation strategies for Tanzanian contexts. The analysis identified a trend towards the use of Random Forest models in predicting rainfall patterns with an average accuracy rate of 72%, indicating their effectiveness in climate prediction within Tanzania's diverse geographical regions. Machine Learning models, particularly Random Forest, offer promising tools for enhancing climate prediction and supporting adaptive planning in Tanzanian ecosystems. However, further research is needed to validate these findings across different time periods and climate scenarios. Future studies should focus on expanding the model's application to cover a broader range of climate variables, including temperature and humidity, and integrating them with socioeconomic data for comprehensive adaptation strategies. Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \sum_{i=1}^n \ell(y_i, f_{\theta}(\xi)) + \lambda \|\theta\|_2^2$, with performance evaluated using out-of-sample error.

Keywords: Tanzania, Geographic Information Systems, Machine Learning, Climate Change Adaptation, Predictive Analytics, Data Mining, Spatial Analysis

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