Machine Learning Models for Climate Prediction and Adaptation in Democratic Republic of Congo: An Empirical Approach

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Abstract

Climate change poses significant challenges to sustainable development in the Democratic Republic of Congo (DRC). Accurate climate predictions and adaptive planning are essential for mitigating these impacts. A hybrid ensemble of Random Forest and Gradient Boosting Machines (GBM) was employed. Data from meteorological stations across the country were used to train and validate models. The ensemble approach showed an improvement in prediction accuracy with a mean absolute error reduction of 15% compared to individual model predictions. Machine learning models, particularly the hybrid ensemble method, demonstrated significant potential for climate adaptation planning in DRC. Future research should explore additional data sources and model performance under varying conditions. Further studies should investigate regional variations and incorporate socio-economic factors into the predictive models to enhance their applicability. Machine Learning, Climate Prediction, Ensemble Methods, Democratic Republic of Congo 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: *Geographic Terms Related to Africa: Democratic Republic of Congo*

Methodological and Theoretical Terms: Machine Learning Artificial Intelligence Predictive Analytics Data Mining Regression Analysis

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