African Public Sector Innovation (Public Admin/Business/ICT)

Machine Learning Models in Climate Prediction and Adaptation Planning for Ethiopia: A Technological Perspective

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Abstract

Climate change poses significant challenges to agriculture in Ethiopia, necessitating advanced prediction models for effective adaptation planning. A comparative analysis was conducted using historical weather data from five zones across Ethiopia, employing ML algorithms including Random Forest and Support Vector Machine (SVM) with robust uncertainty quantification techniques. The SVM model demonstrated superior performance in predicting temperature changes, achieving a mean absolute error reduction of 15% compared to traditional models. Machine learning models have proven valuable tools for climate prediction and adaptation planning in Ethiopia, offering precise forecasts that can guide agricultural policies. Further research should focus on integrating ML models into existing climate risk management frameworks to enhance their practical utility. 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: *Ethiopia, Geographic Information Systems, Machine Learning, Statistical Downscaling, Climate Change Adaptation, Ensemble Forecasting, Geospatial Analysis*

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