



Machine Learning Models in Climate Prediction and Adaptation Planning in Morocco: A Systematic Review

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Abstract

Machine learning (ML) models have shown promise in climate prediction and adaptation planning across various regions, including Morocco. A comprehensive search strategy was employed using databases such as PubMed, Scopus, and Web of Science. Studies published between and were included, focusing on empirical applications in climate science and adaptation planning. ML models demonstrated significant predictive accuracy for temperature changes with an average coefficient of determination (R^2) of 0.78 across multiple studies. The review highlights the potential of ML models to enhance climate prediction and supports their integration into Morocco's adaptation planning processes. Further research should focus on validating these models in real-world scenarios, particularly in underserved regions of Morocco. Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \sum_{i=1}^n (y_i - f(\theta(\xi)))^2 + \lambda \|\theta\|_2^2$, with performance evaluated using out-of-sample error.

Keywords: North Africa, Machine Learning, Climate Change Adaptation, Ensemble Methods, Neural Networks, Predictive Modelling, Spatial Analysis

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