

Peer Review

Review of: "Spatiotemporal Forecasting in Climate Data Using EOFs and Machine Learning Models: A Case Study in Chile"

Sanam Narejo¹

1. Department of Computer Systems Engineering, Mehran University of Engineering & Technology, Pakistan

This research presents a compelling and methodologically sophisticated approach to spatiotemporal forecasting in climate data, particularly for Chile's highly variable climate.

The integration of Empirical Orthogonal Functions (EOFs) with machine learning (Wavelet-ANN hybrid) is a novel and promising approach. EOFs effectively reduce dimensionality, while wavelet analysis captures multi-scale temporal variability—addressing a critical gap in climate forecasting. Transitioning from high-dimensional (6,355 time series) to low-dimensional (dozens of forecasts) problems is computationally efficient and practical for real-world applications.

1. The research employs an Artificial Neural Network (ANN) as part of a Wavelet-ANN hybrid model for forecasting EOF-derived temporal modes ($\phi_k(t)$). However, the abstract does not specify the ANN's architecture, which is crucial for reproducibility and performance evaluation. Below, I elaborate on key considerations and recommendations: Specify the type of ANN (e.g., LSTM, CNN) and why it was chosen. Was hyperparameter tuning performed?
2. Few equation numbers on Pg 5 and 6 are missing, and pg 10 as well
3. The authors may refer to and cite the following articles
 - a. [Multi-step rainfall forecasting using deep learning approach](#) S Narejo, MM Jawaid, S Talpur, R Baloch, EGA Pasero - PeerJ Computer Science, 2021
 - b. S. Juna, S. Narejo, and M. M. Jawaid, "Regional Heatwave Prediction Using deep learning based Recurrent Neural Network," 2022 *International Conference on Emerging Technologies in Electronics, Computing and Communication (ICETECC)*,

This is a high-quality, impactful study with a fusion of classical and ML techniques. With minor clarifications and expanded validation, it could be a standout contribution to climate informatics. The approach's scalability and interpretability make it valuable for both researchers and policymakers.

Declarations

Potential competing interests: No potential competing interests to declare.