African Theoretical Physics (Pure Science)

Bayesian Hierarchical Model Replication for Adoption Rates in Off-Grid Communities of Senegal

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Abstract

This study focuses on evaluating the adoption rates of off-grid energy solutions in Senegal's communities by applying a Bayesian hierarchical model. A Bayesian hierarchical model was employed to analyse survey data collected from off-grid communities across Senegal. The model incorporated random effects at the community level to account for variability in adoption rates due to differing environmental conditions and socio-economic contexts. The analysis revealed a significant spatial variation in adoption rates, with some communities showing adoption levels up to three times higher than others, influenced primarily by access to alternative energy sources and local infrastructure availability. This replication study confirms the reliability of the Bayesian hierarchical model for assessing off-grid community dynamics. The identified patterns underscore the importance of targeted interventions based on specific community characteristics. Policy makers should prioritise investments in areas with lower adoption rates, considering factors such as improved access to alternative energy sources and enhanced local infrastructure connectivity. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Bayesian, Hierarchical, MCMC, Latent, Random, Variable*

ABSTRACT-ONLY PUBLICATION

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