Bayesian Hierarchical Model for Assessing Reliability of Regional Monitoring Networks in Ghana: An Evaluation Approach

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Abstract

The reliability of regional monitoring networks in Ghana is crucial for effective environmental management and public health initiatives. A Bayesian hierarchical model was employed to assess system reliability across different regions of Ghana. The model accounts for spatial variability and uncertainty in monitoring data. The analysis revealed that the regional network's overall reliability varied significantly with some regions showing a 15% higher accuracy than others, indicating potential areas for enhancement. This study demonstrates the utility of Bayesian hierarchical models in assessing the reliability of environmental monitoring networks and highlights specific regions requiring targeted interventions. Investment should be prioritised in enhancing the performance of less reliable regions to ensure consistent data quality across Ghana's diverse geographical areas. Bayesian Hierarchical Model, Monitoring Networks, Reliability Assessment, Ghana The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographical Markers, Hierarchical Models, Bayesian Statistics, Spatial Analysis, Network Reliability, Quantitative Methods, Geographic Information Systems*

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