African Remote Sensing Applications
(Environmental/Earth Science Methodology)

Bayesian Hierarchical Model for Measuring Adoption Rates in Ghanaian Manufacturing Plants Systems

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Abstract

Manufacturing systems in Ghanaian plants face varying degrees of adoption of advanced technologies such as automation and digitalization. A Bayesian hierarchical model was developed to analyse data from multiple manufacturing sites, accounting for both site-specific variability and common trends. The analysis revealed a significant difference ($p < 0.05$) in the rate of automation adoption among small-scale and large-scale plants, emphasising the need for tailored strategies. Bayesian hierarchical models provide robust insights into technology adoption patterns but require further validation through field studies and larger datasets. Further research should focus on validating these findings across a broader range of Ghanaian manufacturing sectors and industries. manufacturing, Bayesian hierarchical model, adoption rates, automation, Ghana 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: *Ghana, Bayesian Hierarchical Models, Adoption Rates, Manufacturing Systems, Methodological Evaluation, Quantitative Analysis, Geographic Information Systems*

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