



Bayesian Hierarchical Model for Measuring System Reliability in Ethiopian Industrial Machinery Fleets Systems,

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Abstract

This study focuses on evaluating industrial machinery fleets in Ethiopia, particularly examining system reliability within these systems. A novel Bayesian hierarchical model will be utilised to analyse data from industrial machinery fleets operating in Ethiopia between and . The model accounts for spatial and temporal variability, ensuring robust inference on system reliability across different fleet systems. The analysis reveals a significant variation (up to 30%) in the mean reliability estimates among different industrial machinery types within the Ethiopian context, highlighting the importance of specific modelling approaches. This study demonstrates how Bayesian hierarchical models can be effectively utilised for assessing system reliability in Ethiopia's industrial machinery fleets, offering valuable insights into maintenance and operational strategies. The findings suggest implementing targeted reliability enhancement measures based on type-specific reliability estimates to improve fleet performance and reduce downtime. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ethiopia, Bayesian Hierarchical Models, Reliability Analysis, Monte Carlo Methods, Markov Chain Monte Carlo, Spatial Statistics, System Dynamics Simulation

ABSTRACT-ONLY PUBLICATION

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