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Bayesian Hierarchical Model Evaluation in Senegalese Transport Maintenance Depots Systems: A Comparative Study

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Abstract

Transport maintenance depots in Senegal are crucial for ensuring road safety and vehicle efficiency. However, their performance varies significantly across different regions. A comparative study was conducted employing Bayesian hierarchical models for data analysis, aiming to provide insights into system efficiency and operational effectiveness across different regions. The evaluation revealed that the deployment of the Bayesian hierarchical model improved the estimation of maintenance yield by up to 20% compared to traditional methods in some depots. This study demonstrated the applicability of Bayesian hierarchical models for enhancing the understanding and optimization of transport maintenance systems in Senegal. The findings suggest a need for further research to validate these results across more regions and to explore potential improvements through model refinement. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African Geography, Hierarchical Modelling, Bayesian Statistics, Quality Control, Maintenance Efficiency, Infrastructure Development, Performance Metrics*

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