



Time-Series Forecasting Model for Evaluating Emergency Care Units in Rwanda: A Methodological Assessment

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Abstract

Emergency care units (ECUs) in Rwanda face challenges related to resource allocation, staff training, and patient management. The study employed a hybrid ARIMA-GP (Autoregressive Integrated Moving Average - Generalized Pareto) model for forecasting emergency care utilization data from four selected ECUs in Rwanda. Uncertainty was quantified using robust standard errors to account for the variability in clinical outcomes and resource management. The time-series forecast indicated a significant reduction in median wait times by approximately 25% over a one-year period, with a 90% confidence interval of [18%, 34%]. This study demonstrated the effectiveness of the hybrid ARIMA-GP model for forecasting clinical outcomes in Rwanda's ECUs, providing actionable insights for improving patient care and resource management. ECU managers should leverage these findings to implement targeted interventions aimed at enhancing service delivery efficiency and staff training programmes. Emergency Care Units, Time-Series Forecasting, Clinical Outcomes, ARIMA-GP Model, Resource Management Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Rwandan, Geographic Information Systems, Time-series, Forecasting, Modelling, Methodology, Evaluation*

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