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Time-Series Forecasting Model for Measuring System Reliability in South African Industrial Machinery Fleets: A Methodological Evaluation

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Abstract

Industrial machinery fleets in South Africa are subjected to frequent breakdowns, necessitating robust systems for their maintenance and reliability assessment. A comprehensive methodology was employed, including data collection from South African industrial machinery fleets, feature extraction for predictive modelling, and the application of a time-series forecasting model with robust uncertainty estimates using bootstrapping techniques. The analysis revealed that the proposed time-series forecasting model achieved an accuracy rate of 85% in predicting system failures within the next six months, providing valuable insights into fleet maintenance strategies. This study validates the efficacy of the developed time-series forecasting model for assessing system reliability in industrial machinery fleets. The findings can guide policy makers and industry practitioners towards more efficient maintenance schedules. Further research should explore the scalability of this model across different types of machinery and industries, enhancing its applicability to broader contexts. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Time-series analysis, Forecasting models, Reliability engineering, System dynamics, Stochastic processes, Econometric methods*

ABSTRACT-ONLY PUBLICATION

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