African Geotechnical Engineering

Time-Series Forecasting Model for Adoption Rates in South Africa: A Replication Study of Process-Control Systems

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Abstract

This study aims to replicate a previous research that utilised time-series forecasting models to analyse the adoption rates of process-control systems in South Africa. The replication study employs a time-series forecasting model, specifically an autoregressive integrated moving average (ARIMA) method, to forecast adoption rates based on historical data from South Africa. The ARIMA(1,1,1) model was chosen for its ability to capture both short-term and long-term dependencies in the data. The findings revealed that the ARIMA(1,1,1) model accurately predicted the trend of adoption rates with a confidence interval of ±2% around the forecasted values. The replication study confirms the predictive accuracy of the ARIMA model for time-series forecasting in measuring process-control systems' adoption rates in South Africa. Recommendation is to extend this model's application to other sectors and regions, providing more robust insights into technology diffusion patterns globally. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *South Africa, Geographic Information Systems, Time-Series Analysis, Forecasting Models, Process Control, Adoption Rates, Methodological Evaluation*

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