African Applied Mathematics (Pure Science)

Graph Theory underpinnings for Power-Grid Forecasting in Kenya: Spectral Methods and Condition Number Analysis

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Abstract

This study addresses a current research gap in Mathematics concerning Graph Theory for power-grid forecasting in Kenya: spectral methods and condition-number analysis in Kenya. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A theorem-driven mathematical framework was developed under explicit regularity assumptions, with stability and convergence analysis of the proposed estimator. The main results show stability of the proposed functional under bounded perturbations and convergence of the estimator to a well-defined limit, characterised by $R(x)=argmin_{\theta} L(\theta;x)$. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Graph Theory for power-grid forecasting in Kenya: spectral methods and condition-number analysis, Kenya, Africa, Mathematics, theoretical This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims.

Keywords: *Kenya, Graph Theory, Power Grids, Spectral Methods, Condition Number Analysis, Network Analysis, Linear Algebra*

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