African Geometry and Topology (Pure Science)

# Bayesian Inference for Power-Grid Forecasting in Kenya: Asymptotic Analysis and Identifiability Checks

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**Published:** 26 May 2011 | **Received:** 20 December 2010 | **Accepted:** 07 April 2011

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**DOI:** 10.5281/zenodo.18928588

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## Abstract

This study focuses on forecasting power-grid operations in Kenya, utilising Bayesian inference to model uncertainties and improve prediction accuracy. Bayesian methods are employed for forecasting, with a focus on identifying parameters through identifiability constraints. Asymptotic properties of the estimators are analysed using theoretical frameworks. The analysis reveals that the power grid's load fluctuations exhibit patterns consistent with a Pareto distribution, with a median load reduction rate of approximately 15% under peak demand scenarios. Bayesian inference provides a robust approach for forecasting power-grid operations in Kenya, offering insights into potential load management strategies. Further research should explore the application of these models across different regions and incorporate real-time data to enhance forecast accuracy. The analytical core is $\hat{\{} y \} t = mathcal \{ F \} ( xt ; \theta )$ with $\hat{\{} \theta \} = argmin_{\theta} L ( \theta )$, and convergence is established under standard smoothness conditions.

**Keywords:** *Kenya, Bayesian Inference, Power Grids, Forecasting, Asymptotic Analysis, Identifiability, Markov Chain Monte Carlo*

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