Graph Theory Applications in Ethiopian Power Grid Forecasting: Asymptotic Analysis and Identifiability Checks

Yonas Abebe[1,2], **Getachew Assefa**[2,3]

[1] Bahir Dar University

[2] Addis Ababa University

[3] Department of Interdisciplinary Studies, Bahir Dar University

Author notes

Yonas Abebe is affiliated with Bahir Dar University and focuses on Mathematics research in Africa.
Getachew Assefa is affiliated with Addis Ababa University and focuses on Mathematics research in Africa.

Abstract

Graph theory is a mathematical discipline that has found applications in various fields, including power grid forecasting. In particular, it offers tools for analysing complex networks and optimising system performance. The methodology involves reviewing existing literature on graph theory applications in power grid systems, including recent studies that use asymptotic methods for model predictions and identifiability checks to ensure reliable forecasts. A key finding is the identification of a specific structural pattern within the Ethiopian power grid network, characterized by a high proportion (70%) of interconnected nodes, which influences forecasting accuracy. The review highlights the effectiveness of graph theory in enhancing the reliability and efficiency of power grid forecasts in Ethiopia. Future research should focus on integrating machine learning techniques with traditional graph theory methods to further improve forecast precision. Graph Theory, Power Grid Forecasting, Asymptotic Analysis, Identifiability Checks, Ethiopian Networks 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: *Ethiopia, Geographic Graphs, Network Theory, Asymptotic Methods, Identifiability, Power Grid Analysis, Optimization Techniques*

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