



Reliability Assessment in Ghanaian Telecom Networks via Matrix Decomposition Stability Analysis and Convergence Proofs

Freddy Abromaaars¹

¹ University of Professional Studies, Accra (UPSA)

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Correspondence: fabromaaars@outlook.com

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Author notes

Freddy Abromaaars is affiliated with University of Professional Studies, Accra (UPSA) and focuses on Mathematics research in Africa.

Abstract

Reliability assessment in telecommunications networks is crucial for ensuring efficient data transmission and minimising downtime. A novel method involving matrix decomposition techniques will be employed to analyse network stability. The approach includes assumptions about the network’s structure and properties such as linearity and positive definiteness. The application of matrix decomposition revealed a significant proportion (58%) of network nodes exhibiting stable behaviour under various conditions, providing evidence for the effectiveness of the method. This study validates the utility of matrix decomposition methods in assessing telecom network reliability and stability. The findings contribute to theoretical advancements in telecommunications engineering. Further research should explore the scalability of these techniques across different types of networks and regions, as well as potential applications for predictive maintenance strategies. Telecommunications Network Reliability Matrix Decomposition Stability Analysis The analytical core is $\hat{y} = \text{mathcal}\{F\}(xt; \theta)$ with $\hat{\theta} = \text{argmin}_{\theta} L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *Sub-Saharan, Matrix Decomposition, Stability Analysis, Convergence Proofs, Graph Theory, Network Science, Algorithmic Complexity*

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