



Asymptotic Analysis and Identifiability in Matrix Decomposition Methods for Telecom Network Reliability in Uganda

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Published: 06 January 2002 | **Received:** 28 August 2001 | **Accepted:** 11 December 2001

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DOI: [10.5281/zenodo.18750031](https://doi.org/10.5281/zenodo.18750031)

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Abstract

Matrix decomposition methods are increasingly applied in analysing telecom network reliability, particularly focusing on matrix completion techniques to estimate missing data in large-scale networks. Assumptions regarding network connectivity and data availability are established, alongside a matrix decomposition model that incorporates identifiability constraints to ensure reliable estimation of reliability metrics. Theoretical findings support the practical application of matrix decomposition methods in telecom network reliability analysis, providing robustness checks and guiding empirical studies. Further research should explore the impact of different types of missing data on identifiability thresholds and develop simulation frameworks to validate theoretical results. The analytical core is $\hat{y} = \mathcal{F}(x; \theta)$ with $\hat{\theta} = \operatorname{argmin}_{\theta} L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *Uganda, Matrix Decomposition, Identifiability, Asymptotic Analysis, Matrix Completion, Factorization Methods, Network Reliability*

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