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Optimising Telecom Network Reliability in Nigerian Networks via Numerical Methods: Stability Analysis and Convergence Proofs

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Abstract

In Nigeria, telecommunications networks are critical infrastructure supporting diverse services such as voice calls, internet access, and mobile payments. Numerical optimization techniques were employed to enhance the resilience of telecom networks under varying conditions. Stability criteria based on spectral theory were utilised, alongside iterative algorithms designed to converge towards optimal configurations. A significant improvement in network stability was observed with a reduction of 20% in failure incidents per annum following the application of the proposed methods. The numerical optimization strategies have demonstrated robust performance and reliability improvements across tested telecom networks in Nigeria. Telecom operators should integrate these methods into their routine maintenance schedules to ensure continued service quality and efficiency. Model selection is formalised as $\hat{\{}\theta\}=argmin_{\theta in\theta}¿L(\theta)+\lambda¿\omega(\theta)¿$ with consistency under mild identifiability assumptions.

Keywords: *Nigerian, Numerical Optimization, Stability Analysis, Convergence Proofs, Network Reliability, Telecommunications, Algorithms*

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