

# Securing Parallel Data: An Experimental Study of Hindmarsh-Rose Model-Based Confidentiality

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**Abstract:** *This paper presents a novel parallel computing confidentiality scheme based on the Hindmarsh-Rose model; a mathematical model commonly used to describe neuronal activity. In an era where data security is paramount, especially in parallel computing environments, this scheme offers a promising solution to enhance data privacy. We explore the Hindmarsh-Rose model's unique chaotic behavior to develop an encryption and decryption framework tailored to parallel computing. Empirical results demonstrate the scheme's efficiency and effectiveness in maintaining data confidentiality while ensuring timely access. The scalability and resource utilization aspects of the scheme are also discussed. This research contributes to the ongoing efforts to bolster data security in parallel computing and opens up new possibilities for utilizing mathematical models in cryptography.*

**Keywords:** Parallel computing, data confidentiality, Hindmarsh-Rose model, encryption, decryption, data security, scalability, resource utilization, chaos-based cryptography