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Zero Trust for Big Data: Addressing Security Threats in Decentralized Systems

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KEYWORDS	ABSTRACT
Big Data, Zero Trust Architecture, Artificial Intelligence (AI), Machine Learning (ML)	With the exponential growth of data generated from diverse sources ranging from mobile devices and industrial sensors to smart home appliances, big data has evolved from a conceptual paradigm into an operational necessity. The complexity of managing such multifaceted data streams spans storage infrastructures, application development, and network management. These core components are interdependent; disruption in any one module can compromise the functionality of the entire system. In today's context, the challenge extends beyond mere data volume emphasizing the need for scalable, real-time processing and intelligent decision-making powered by artificial intelligence (AI) and machine learning (ML). Network security and user privacy have become paramount, especially with the increasing reliance on cloud-native services and the growing need for compliance with global data governance standards such as GDPR and HIPAA. Consequently, the future of Big Data infrastructure hinges on the implementation of Zero Trust security frameworks, end-to-end encryption, and advanced anomaly detection mechanisms. This paper explores the emerging security threats facing Big Data environments and proposes the adoption of Zero Trust Architecture as a comprehensive solution to mitigate these risks.
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