

Enhancing Data Integrity in Cloud Computing through Intelligent Redundancy Management

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Abstract. The rapid proliferation of cloud-based services has heightened the need for robust data integrity mechanisms. This study introduces an innovative framework that employs intelligent redundancy management techniques to safeguard data against corruption and loss. By integrating machine learning algorithms with redundancy protocols, our approach dynamically adjusts redundancy levels based on real-time data analysis and threat assessments. Experimental results demonstrate a significant improvement in data integrity metrics compared to traditional methods. The framework not only enhances reliability but also optimizes storage efficiency, making it a vital contribution to the field of cloud computing. These findings underscore the importance of adaptive data management solutions in contemporary cloud environments.

Keywords: cloud computing, data integrity, redundancy management, machine learning, data protection, cybersecurity, storage optimization, real-time analysis

Introduction

In recent years, the transition to cloud computing has transformed how organizations manage and store data, offering unprecedented scalability and accessibility. However, this shift has also introduced critical challenges related to data integrity, a pressing issue as businesses increasingly rely on cloud services for sensitive information. Data integrity refers to the accuracy and consistency of information throughout its lifecycle. In an era marked by cyber threats and system failures, ensuring data integrity is paramount for maintaining trust and operational continuity in digital infrastructures. As we approach the years 2024-2026, the stakes are higher than ever; the volume of data generated globally is expected to exponentially increase, enhancing the risks of data corruption and loss.

Therefore, establishing effective data integrity mechanisms is not only essential for organizational success but also fundamental for safeguarding user trust on a global scale. This paper presents a novel framework that addresses these challenges through intelligent redundancy management. By leveraging advanced machine learning algorithms, our solution proposes a dynamic approach to adjust redundancy levels based on real-time data analysis and threat assessments. The structure of this paper is organized as follows: first, we review relevant literature on data integrity challenges and existing solutions; then, we detail our methodology and framework design; next, we present experimental findings and analysis; and finally, we conclude with implications and future work.

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