

## ABSTRACT

The Internet of Things (IoT) has become a key enabler for real-time data collection and analysis in various sectors, including water quality monitoring. However, the constrained resources of IoT devices, such as limited memory, processing power, and energy capacity, pose significant challenges in ensuring data integrity and operational efficiency. This research focuses on developing a modified xxHash algorithm optimized for resource-constrained IoT devices, particularly in water quality monitoring applications. The proposed modifications aim to enhance hashing efficiency, reduce memory usage, and improve collision resistance.

Experimental results demonstrate that the modified xxHash achieves significantly higher throughput, reduced memory consumption, and improved Avalanche Effect compared to the original xxHash and other algorithms such as SHA256. The modified xxHash exhibits a throughput of 170,666.67 bps and a memory usage reduction of up to 20% on average. These improvements make the algorithm particularly suitable for real-time IoT applications where resource optimization and data integrity are critical. This study highlights the importance of lightweight and efficient hashing algorithms for advancing IoT technology in resource-constrained environments.

**Keywords:** Internet of Things (IoT), Hash Function Optimization, Data Integrity, Water Quality Monitoring