Advanced Data Compression Techniques (CSI3019)

Smart Compression Framework for IoT Sensor Healthcare Data using Adaptive Modelling

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Abstract - With the age of the Internet of Things (IoT), enormous amounts of data generated by sensors create critical challenges with respect to transmission bandwidth, energy costs, and storage efficiency. As IoT applications increasingly expand into healthcare, continuous streams of vital parameters such as heart rate, blood pressure, temperature, and oxygen saturation further intensify these challenges due to their real-time monitoring and analysis requirements. To address these issues, this work presents a Smart Compression Framework for IoT Sensor Data designed to intelligently reduce data volume while preserving the integrity of critical health information. Using the Human Vital Sign Dataset from Kaggle as a representative healthcare IoT source, the framework adaptively integrates multiple lossless compression techniques, including the LZW algorithm as the existing methodology and the Zstandard (zstd) algorithm as the proposed methodology. The system evaluates compression performance based on key metrics such as Compression Ratio, Space Saving, and Processing Time. By providing an adaptive and efficient approach for handling continuous sensor streams, the proposed framework supports optimized storage, faster transmission, and improved scalability for IoT-based healthcare monitoring environments.