

Title: Enhancing Video Quality in Multimedia-IoT (M-IoT) Applications: A WSE-DCNN Approach

Abstract:

This report addresses the challenges in multimedia data processing within the context of Multimedia-IoT (M-IoT) applications. The focus is on improving Quality of Experience (QoE) through a novel in-loop filtering approach named Wide-Activated Squeeze-and-Excitation Deep Convolutional Neural Network (WSE-DCNN). The proposed methodology aims to mitigate compression artifacts in Versatile Video Coding (VVC) standards, ensuring higher video quality in smart city scenarios. The report presents an evaluation of the WSE-DCNN approach, emphasizing its coding gains and impact on video quality.

Introduction:

The evolution of multimedia technologies, including big data processing, cloud computing, and the Internet of Things (IoT), has reshaped our lifestyles. Multimedia-IoT (M-IoT) plays a pivotal role in connecting humans, health centers, industries, and various objects. However, challenges like interoperability, security, and data processing must be addressed to fully leverage M-IoT. Quality of Experience (QoE) becomes paramount in M-IoT, demanding enhanced video quality and efficient data delivery.

Literature Review:

The report delves into the challenges of multimedia data in M-IoT, emphasizing the need for efficient feature extraction, encoding/decoding, and improved QoE. The adoption of Versatile Video Coding (VVC) brings its own set of challenges, including compression artifacts like blocking, blurring, and ringing artifacts. In-loop filtering techniques, such as deblocking filter (DBF), sample adaptive offset (SAO), and adaptive loop filter (ALF), address these artifacts to a certain extent. However, traditional methods have limitations, prompting the exploration of innovative solutions.

Proposed Methodology:

The proposed Wide-Activated Squeeze-and-Excitation Deep Convolutional Neural Network (WSE-DCNN) aims to overcome the limitations of traditional in-loop filtering methods. WSE-DCNN focuses on effectively removing compression artifacts, ensuring high-quality compressed videos in M-IoT applications. The methodology is designed to provide robust quality improvement, particularly in smart city scenarios.

Dataset Development:

To evaluate the effectiveness of the WSE-DCNN approach, a comprehensive dataset representative of M-IoT scenarios, with a focus on smart cities, is developed. The dataset encompasses diverse video content to validate the proposed methodology's performance across various use cases.

Key Contributions:

The main contributions of this report include:

- i) Introduction of the WSE-DCNN framework for M-IoT, emphasizing video quality awareness in smart city contexts.
- ii) Implementation of the WSE-DCNN approach into the VVC standard, showcasing coding gains for random access configurations.
- iii) Adaptation of the M-IoT scenario-based smart city context to improve QoE in video quality.

Conclusion:

In conclusion, this report addresses the challenges posed by multimedia data in M-IoT applications and emphasizes the significance of QoE. The WSE-DCNN approach offers a promising solution to enhance video quality in smart city scenarios, demonstrating potential coding gains. Future work may involve further optimization, exploring broader M-IoT domains, and addressing scalability concerns, keeping pace with ongoing advancements in multimedia technologies.