Research on Image Compression Algorithms based on Deep Learning

Project Overview:

- **Project Name:** Research on Image Compression Algorithms based on Deep Learning
- **Duration:** Jan 2023 - Jun 2023

Abstract: In this research project, an innovative end-to-end image compression framework grounded in deep learning has been developed. The proposed framework not only enhances subjective image quality but also achieves superior objective compression results.

Key Contributions:

Quick Depth-Residual Attention Module (Q-DRAM):

- Introduced Q-DRAM, a novel module contributing to a remarkable improvement of 0.23dB (PSNR).
- Q-DRAM enhances the depth-residual attention mechanism, elevating the overall performance of the compression method.

Post-processing Module:

- Proposed a post-processing module resulting in a significant improvement of 0.13dB (PSNR).
- The post-processing module refines compressed images, contributing to enhanced perceptual quality.

Integration of Gaussian Mixture Model and Checkerboard Context Model:

- Implemented the Gaussian Mixture Model to augment the model's effectiveness.
- Introduced the Checkerboard Context Model for improved efficiency in the compression algorithm.

Methodology:

The research methodology involved a systematic approach to developing and refining image compression algorithms. Key steps included:

Model Architecture Design:

- Devised an end-to-end framework incorporating Q-DRAM and post-processing modules.
- Integrated Gaussian Mixture Model and Checkerboard Context Model to optimize compression outcomes.

Training and Evaluation:

- Trained the model on diverse datasets to ensure robust performance.
- Evaluated the model using both subjective and objective metrics, demonstrating superior compression results.

Results and Impact:

The proposed image compression framework, enriched by Q-DRAM, post-processing, and innovative context models, exhibited a marked enhancement in image quality. This research contributes to the advancement of deep learning-based image compression techniques, showcasing improved results over existing methods.

Future Directions:

Ongoing work involves further refining the proposed framework, exploring additional enhancements, and expanding its applicability to various domains. The research aims to make strides in the field of image compression, with potential applications in multimedia, telecommunications, and beyond.