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Modulated Variable-Rate Deep Video Compression

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☐ Background

- The previous deep video compression methods are usually optimized for a **single fixed rate-distortion (R-D) tradeoff**.
- The realized bitrates are limited to **several discrete points on the R-D curve** and **the storage cost increases** proportionally to the number of models.

☐ Contributions

- We propose a **variable-rate scheme** for deep video compression, which is modulated by the R-D tradeoff parameter λ.
- Trained by a multi-rate-distortion loss function and a step-by-step training strategy.

Method

- Our scheme is developed on DVC, which includes motion estimation, motion compression, motion compensation, and residual compression modules.
- We use λ parameter to modulate all the four modules.
- The two auto-encoders used for compressing MV and residual are deeply modulated by λ via scaling-networks, which can achieve basic rate adaptation.
- We propose to add λ map to the inputs of the two modules as a conditional map, which can further improve the compress efficiency.
- The multi-rate-distortion loss function:

$$J = \sum_{\lambda \in \Lambda} (D + \lambda R) = \sum_{\lambda \in \Lambda} (d(x_t, \hat{x}_t) + \lambda (R_{mv} + R_{res}))$$

Λ is a predefined λ set used for training.

Results

- The proposed scheme can achieve continuously variable rate by a single model with almost the same compression efficiency as multiple fixed-rate models. The additional parameters and computation of our model are negligible when compared with a single fixed-rate model.

More Information

- Any questions or thoughts to ljp105@mail.ustc.edu.cn , dongeliu@ustc.edu.cn