Quantization-free Lossy Image Compression Using Integer Matrix Factorization

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Abstract

one paragraph

1 Introduction

2 Related Work

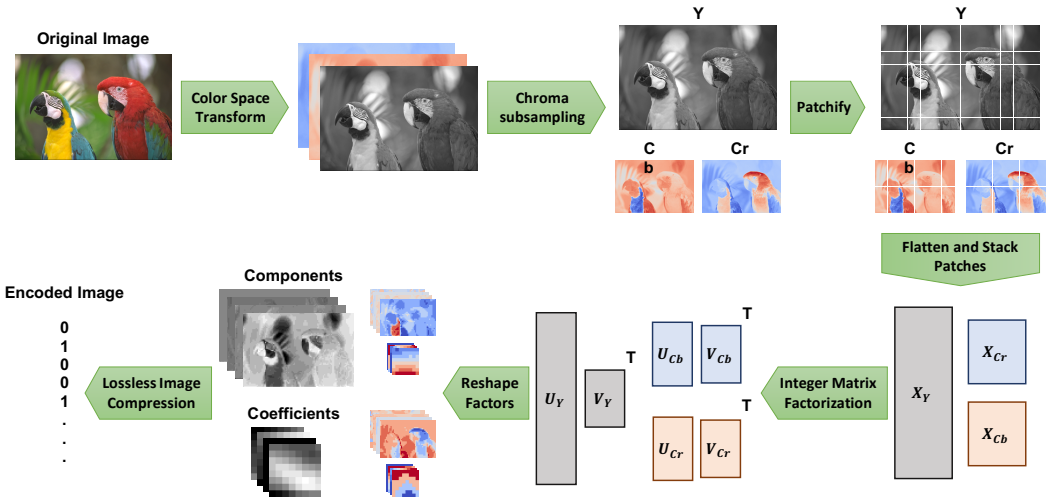

Figure 1 An illustration of our image compression method based on integer matrix factorization.

3 Method

3.1 Overall Framework

Encoder.

Decoder.

3.2 Integer Matrix Factorization (IMF)

3.3 Block Coordinate Descent Scheme for IMF

Theorem 1. *The IMF cost function,* $\|\boldsymbol{X} - \boldsymbol{U}\boldsymbol{V}^{\mathsf{T}}\|_F^2$*, is monotonically nonincreasing under each of the multiplicative update rules.*

Proof. See Appendix A for the proof. □

3.4 Implementation Details

(a) **(b)**

Figure 2 Rate-distortion performance on the Kodak dataset. In panels (a) and (b), the average PSNR and SSIM are plotted against bits per pixel (bpp), respectively.

(a) **(b)**

Figure 3 Rate-distortion performance on the CLIC dataset. In panels (a) and (b), the average PSNR and SSIM are plotted against bits per pixel (bpp), respectively.

4 Experiments

4.1 Rate-Distortion Performance

4.2 ImageNet Classification Performance

4.3 Ablation Studies

Patchification. without patchification, patch size 4, 8, 16, 32

Factor bounds.

BCD iteration.

Figure 4 Impact of different compression methods on ImageNet classification accuracy. Panels (a) and (b) show the validation top-1 and top-5 accuracy plotted against bits per pixel (bpp), respectively. A ResNet-50 model pretrained on the original ImageNet images was evaluated using validation images compressed by different methods.

5 Conclusion and Future Work

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References

[1] Justin Fu, Aviral Kumar, Ofir Nachum, George Tucker, and Sergey Levine. D4RL: Datasets for deep data-driven reinforcement learning. *arXiv preprint arXiv:2004.07219*, Apr 2020.

A Proof of Theorem 1

B Ablation Study on Color Space Transformation