Adaptive Image Compression Method Using GAN based Semantic-Perceptual Residual Compensation

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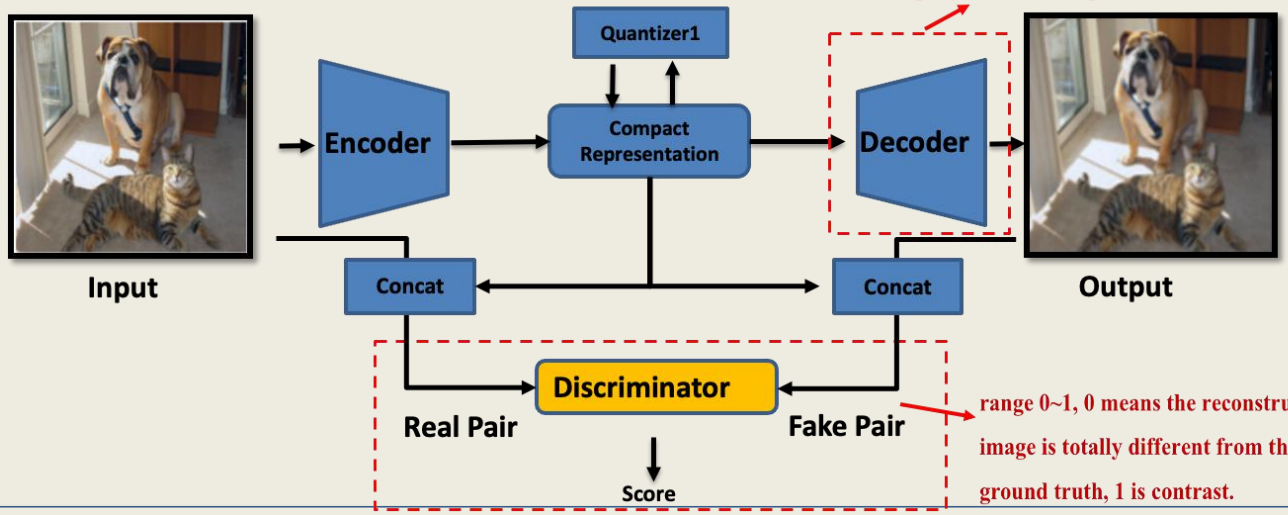
Key words: Semantic Perception, Deep learning, Image Compression

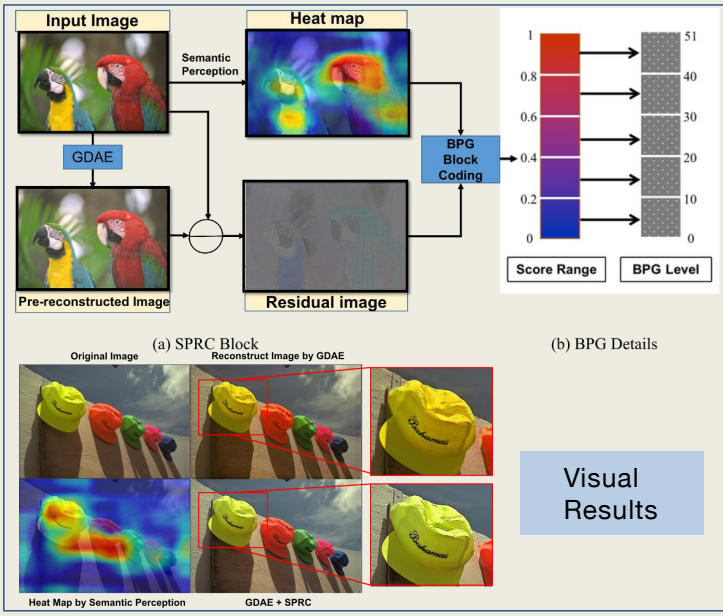
Motivation

- Situation in Image compression: Although existing methods based on a fully convolutional network have greatly improved the performance, the reconstructed results still do not show satisfactory on the structural similarity and statistical distribution similarity of the whole image.
- CNN's Shortcoming: Overdownsampling thus losing details
- Proposal: In this work, we propose an GAN based dense Auto-encoder (GDAE) and Semantic-perceptual residual compensation method (SPRC) to improve the coarse results generated by front CNN and compensate the details of reconstructed image.

Overview



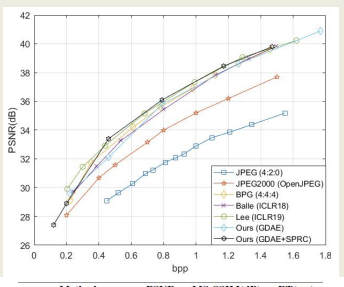
GDAE & SPRC

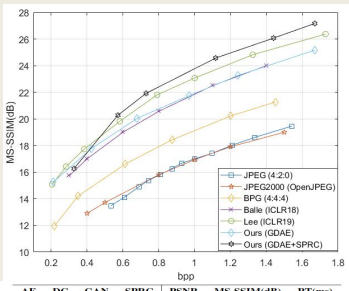


Visual Results

Competition result

- Dataset: ImageNet and Kodak PhotoCD
- Evaluate metric: PSNR and MS-SSIM
- Result comparison





Method	PSNR	MS-SSIM(dB)	RT(ms)
JPEG [2]	29.3	13.7	**290**
JPEG2000 [3]	31.7	13.9	590
BPG [5]	32.9	15.2	750
Lee's [18]	33.2	19.3	6200
Our's(GDAE)	33.1	18.6	607
Our's(GDAE+SPRC)	**33.8**	**20.1**	912

AE	DC	GAN	SPRC	PSNR	MS-SSIM(dB)	RT(ms)
✓				27.37	16.91	426
✓	✓			29.24	17.07	532
✓	✓	✓		32.65	17.96	532
✓	✓		✓	32.47	18.66	863
✓		✓		30.77	18.21	426
✓			✓	30.92	18.28	752
✓		✓	✓	31.27	18.94	752
✓	✓	✓	✓	33.77	19.24	863

The two graphs are the Rate-distortion results.
The rest two table are the Ablation analysis.

Conclusion

- Firstly develop a GAN based dense autoencoder to make full use of the feature information extracted from the input image(GDAE).
- Next, add a semantic-perceptual residual compensation block to GDAE architecture, lead to an improving compression performance(SPRC).
- Finally, optimize the quantization process to further reduce the distortion.