huangzehao / **Super-Resolution.Benckmark**

Benchmark and resources for single super-resolution algorithms

super-resolution

README.md

Super-Resolution.Benckmark

A curated list of super-resolution resources and a benchmark for single image super-resolution algorithms.

See my implementated super-resolution algorithms:

- SRGAN

- VDSR
- CSCN

TODO

Build a benckmark like SelfExSR_Code

State-of-the-art algorithms

Classical Sparse Coding Method

- ScSR [Web]
- Image super-resolution as sparse representation of raw image patches (CVPR2008), Jianchao Yang et al.
- Image super-resolution via sparse representation (TIP2010), Jianchao Yang et al.
- Coupled dictionary training for image super-resolution (TIP2011), Jianchao Yang et al.

Anchored Neighborhood Regression Method

- ANR [Web]
- Anchored Neighborhood Regression for Fast Example-Based Super-Resolution (ICCV2013), Radu Timofte et al.
- A+ [Web]
- A+: Adjusted Anchored Neighborhood Regression for Fast Super-Resolution (ACCV2014), Radu Timofte et al.
- IA [Web]
- Seven ways to improve example-based single image super resolution (CVPR2016), Radu Timofte et al.

Self-Exemplars

- SelfExSR [Web]
- Single Image Super-Resolution from Transformed Self-Exemplars (CVPR2015), Jia-Bin Huang et al.

Bayes

- NBSRF [Web]
- Naive Bayes Super-Resolution Forest (ICCV2015), Jordi Salvador et al.

Deep Learning Method

- SRCNN [Web] [waifu2x by nagadomi]
- Image Super-Resolution Using Deep Convolutional Networks (ECCV2014), Chao Dong et al.
- Image Super-Resolution Using Deep Convolutional Networks (TPAMI2015), Chao Dong et al.
- CSCN [Web]
- Deep Networks for Image Super-Resolution with Sparse Prior (ICCV2015), Zhaowen Wang et al.
- Robust Single Image Super-Resolution via Deep Networks with Sparse Prior (TIP2016), Ding Liu et al.
- VDSR [Web] [Unofficial Implementation in Caffe]
- Accurate Image Super-Resolution Using Very Deep Convolutional Networks (CVPR2016), Jiwon Kim et al.
- DRCN [Web]
- Deeply-Recursive Convolutional Network for Image Super-Resolution (CVPR2016), Jiwon Kim et al.
- ESPCN [PDF]
- Real-Time Single Image and Video Super-Resolution Using an Efficient Sub-Pixel Convolutional Neural Network (CVPR2016), Wenzhe Shi et al.
- Is the deconvolution layer the same as a convolutional layer? [PDF]
- FSRCNN [Web]
- Acclerating the Super-Resolution Convolutional Neural Network (ECCV2016), Dong Chao et al.

Perceptual Loss and GAN

- Perceptual Loss [PDF]
- Perceptual Losses for Real-Time Style Transfer and Super-Resolution (ECCV2016), Justin Johnson et al.

- SRGAN [PDF]
- Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network, Christian Ledig et al.
- AffGAN [PDF]
- AMORTISED MAP INFERENCE FOR IMAGE SUPER-RESOLUTION, Casper Kaae Sønderby et al.
- EnhanceNet [PDF]
- EnhanceNet: Single Image Super-Resolution through Automated Texture Synthesis, Mehdi S. M. Sajjadi et al.
- neural-enchance [Github]

Video SR

- VESPCN [[PDF]](Real-Time Video Super-Resolution with Spatio-Temporal Networks and Motion Compensation)

Dicussion

Deconvolution and Sub-Pixel Convolution

- Deconvolution and Checkerboard Artifacts
- SubPixel

Datasets

| Test Dataset | Image source | |---- | ---|----| | **Set 5** | Bevilacqua et al. BMVC 2012 | | **Set 14** | Zeyde et al. LNCS 2010 | | **BSD 100** | Martin et al. ICCV 2001 | | **Urban 100** | Huang et al. CVPR 2015 |

| Train Dataset | Image source | |---- | ---|----| | **Yang 91** | Yang et al. CVPR 2008 | | **BSD 200** | Martin et al. ICCV 2001 | | **General 100** | Dong et al. ECCV 2016 | | **ImageNet** | Olga Russakovsky et al. IJCV 2015 | | **COCO**| Tsung-Yi Lin et al. ECCV 2014

Quantitative comparisons

Results from papers of VDSR, DRCN, CSCN and IA.

Note: IA use enchanced prediction trick to improve result.

Results on Set 5

Scale	Bicubic	A+	SRCNN	SelfExSR	CSCN	VDSR	D
2x - PSNR/SSIM	33.66/0.9929	36.54/0.9544	36.66/0.9542	36.49/0.9537	36.93/0.9552	37.53/0.9587	37.63
3x - PSNR/SSIM	30.39/0.8682	32.59/0.9088	32.75/0.9090	32.58/0.9093	33.10/0.9144	33.66/0.9213	33.82
4x - PSNR/SSIM	28.42/0.8104	30.28/0.8603	30.48/0.8628	30.31/0.8619	30.86/0.8732	31.35/0.8838	31.53

Results on Set 14

Scale	Bicubic	A+	SRCNN	SelfExSR	CSCN	VDSR	D
2x - PSNR/SSIM	30.24/0.8688	32.28/0.9056	32.42/0.9063	32.22/0.9034	32.56/0.9074	33.03/0.9124	33.04
3x - PSNR/SSIM	27.55/0.7742	29.13/0.8188	29.28/0.8209	29.16/0.8196	29.41/0.8238	29.77/0.8314	29.76
4x - PSNR/SSIM	26.00/0.7027	27.32/0.7491	27.49/0.7503	27.40/0.7518	27.64/0.7587	28.01/0.7674	28.02

Results on BSD 100

Scale	Bicubic	A+	SRCNN	SelfExSR	CSCN	VDSR	D
2x - PSNR/SSIM	29.56/0.8431	31.21/0.8863	31.36/0.8879	31.18/0.8855	31.40/0.8884	31.90/0.8960	31.85
3x - PSNR/SSIM	27.21/0.7385	28.29/0.7835	28.41/0.7863	28.29/0.7840	28.50/0.7885	28.82/0.7976	28.8(
4x - PSNR/SSIM	25.96/0.6675	26.82/0.7087	26.90/0.7101	26.84/0.7106	27.03/0.7161	27.29/0.7251	27.23