ByteDance



Introduction

- Residual local feature block (RLFB), faster and effective.
- Warm-start training strategy to boost the SR performance.
- Winner of NTIRE 2022 efficient super-resolution challenge.

Inference Time AND Parameters



Average PSNR/SSIM Results

SRCNN [11] 24 6.92 36.66 / 0.9542 32.42 / 0.9063 31.36 / 0.8879 FSRCNN [12] 12 9.02 36.98 / 0.9556 32.62 / 0.9087 31.50 / 0.8904 VDSR [22] 666 35.37 37.53 / 0.9587 33.05 / 0.9127 31.90 / 0.8960 DRCN [23] 1774 716.45 37.63 / 0.9588 33.04 / 0.9118 31.85 / 0.8942 LapSRN [25] 251 53.98 37.52 / 0.9591 32.99 / 0.9124 31.80 / 0.8952 × 2 CARN [2] 1592 159.10 37.76 / 0.9590 33.63 / 0.9177 32.19 / 0.8996 RFDN [31] 534 74.51 38.05 / 0.9606 33.68 / 0.9184 32.16 / 0.8994 MAFFSRN [37] 402 152.91 37.97 / 0.9603 33.49 / 0.9170 32.14 / 0.8994 ECBSR [48] 596 39.96 37.90 / 0.9615 33.34 / 0.9178 32.10 / 0.9018 FDIWN-M [14] - - -/- -/- -/- RLFN (ours) 527 60.39 38.07 / 0.9607 33.68 / 0.9172 32.19 / 0.8997 RLFN (ours) 527 60.39 38.07 / 0.9607 33.72 / 0.	l PSN
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	26.
RLFN-S (ours) 470 15.16 32.23 / 0.8961 28.61 / 0.7818 27.58 / 0.7359	26.
RLFN (ours) 543 16.41 32.24 / 0.8952 28.62 / 0.7813 27.60 / 0.7364	26.

Residual Local Feature Network for Efficient Super-Resolution Fangyuan Kong*, Mingxi Li*, Songwei Liu*, Ding Liu, Jingwen He, Yang Bai, Fangmin Chen, Lean Fu

* Indicates equal contribution



4	BSD100	Urban100
SSIM	PSNR / SSIM	PSNR / SSIM
.7824	27.58 / 0.7361	26.09 / 0.7859
.7806	27.54 / 0.7351	26.00 / 0.7832
.7817	27.57 / 0.7358	26.11/0.7861
.7817	27.58 / 0.7359	26.11 / 0.7865

14	BSD100	Urban100
' SSIM	PSNR / SSIM	PSNR / SSIM
0.7818	27.57 / 0.7363	26.12 / 0.7869
0.7817	27.58 / 0.7359	26.11 / 0.7865

Feature Extractor of Contrastive Loss



Shallow features preserve more accurate details and textures



Warm-start training strategy

- In the first stage, the model is trained from scratch.
- with same settings.
- Train a model in multiple stages to get better results.

Model	Set5 PSNR / SSIM	Set14 PSNR / SSIM	BSD100 PSNR / SSIM	Urban100 PSNR / SSIM	
RLFN-S_e2000	32.17 / 0.8953	28.58 / 0.7815	27.57 / 0.7354	26.08 / 0.7849	
RFLN-S_clr	32.20 / 0.8959	28.59 / 0.7818	27.56 / 0.7359	26.12 / 0.7865	
RLFN-S_ws_1	32.21 / 0.8959	28.60 / 0.7818	27.57 / 0.7360	26.12 / 0.7864	

RLFN for NTIRE 2022 challenge

Team name	PSNR [val]	PSNR [test]	Ave Time [ms]	Parameters [M]	FLOPs [G]	Activations [M]	Memery [M]	Conv
ByteESR(ours)	29.00	28.72	27.11	0.317	19.7	80.05	377.91	39
NJU_Jet	29.00	28.69	28.07	0.341	22.28	72.09	204.6	34
NEESR	29.01	28.71	29.97	0.272	16.86	79.59	575.99	59
Super	29.00	28.71	32.09	0.326	20.06	93.82	663.07	59
MegSR	29.00	28.68	32.59	0.29	17.7	91.72	640.63	64
RFDN(Winner AIM20)	29.04	28.75	41.97	0.433	27.1	112.03	788.13	64
IMDN(Baseline)	29.13	28.78	50.86	0.894	58.53	154.14	471.76	43

Main Track - runtime track results of challenge



Tanh has stronger response than relu. We use two conv + tanh as feature extractor.

Model	Set5	Set14	BSD100	Urban100
	PSNR / SSIM	PSNR / SSIM	PSNR / SSIM	PSNR / SSIM
RLFN-S_ws_2	32.22 / 0.8960	28.60 / 0.7818	27.57 / 0.7359	26.13 / 0.7865
RLFN-S_ws_2 + CL	32.23 / 0.8961	28.61 / 0.7818	27.58 / 0.7359	26.15 / 0.7866

In the next stage, load the weights from previous stage and train model



scan this to get our code link !