Super-Resolution With Local Implicit Image Function and SIREN

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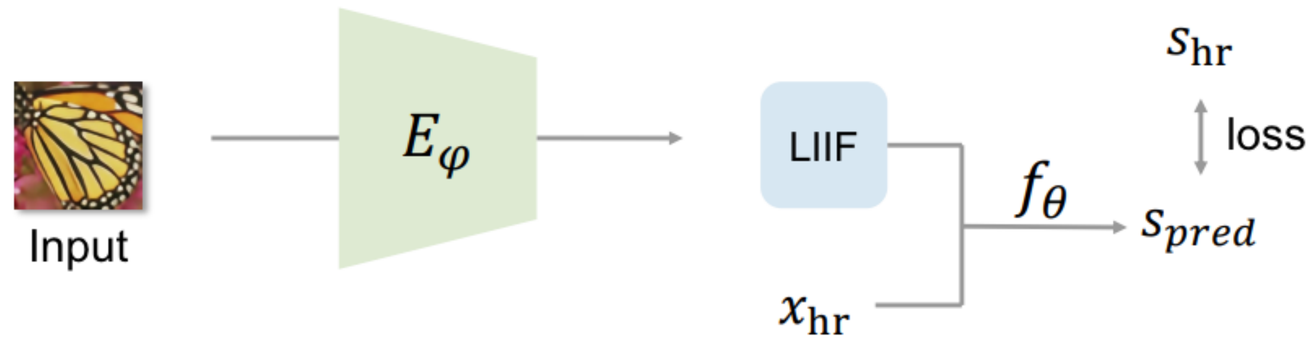
Motivation

- The goal of super-resolution is to convert a low resolution (LR) picture into a high resolution(HR) picture.
- Upscale the LR image by an arbitrary scale.
- Various applications: medical imaging, data augmentation and GPU rendering.

Neural Network Architecture



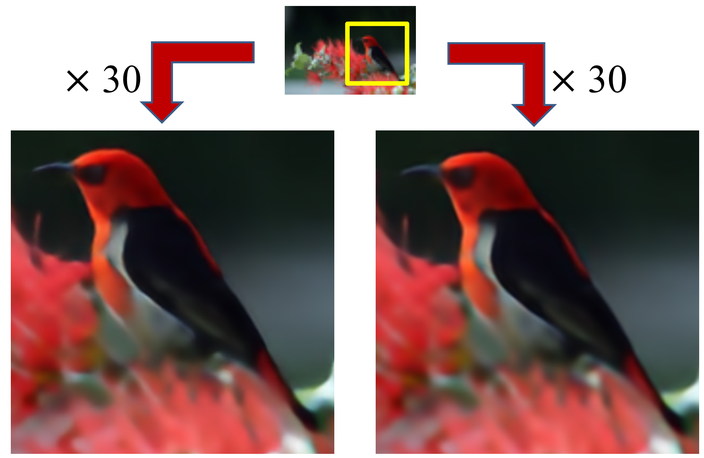
Related Work

Methods	CNN Feature Encoder	Fixed Upscaling Module	Generalized MLP
EDSR [1]	✓	✓	✗
LIIF [2]	✓	✗	✓ (ReLU)
LIIF + SIREN [3] (ours)	✓	✗	✓ (Sine)

References

[1] Lim, Bee, et al. "Enhanced deep residual networks for single image super-resolution." Proceedings of the IEEE conference on computer vision and pattern recognition workshops. 2017.
[2] Chen, Yinbo, Sifei Liu, and Xiaolong Wang. "Learning Continuous Image Representation with Local Implicit Image Function." arXiv preprint arXiv:2012.09161 (2020).
[3] Sitzmann, Vincent, et al. "Implicit neural representations with periodic activation functions." NeurIPS (Oral), 2020.

Experimental Results

Table 1. Performance comparisons on the benchmark datasets (PSNR / dB).

Datasets	Methods	In-domain			Out-of-domain	
		×2	×3	×4	×6	×8
Set5	EDSR-LIIF (baseline)	37.96	34.40	32.11	28.85	26.95
	EDSR-LIIF-SIREN-30	37.96	34.33	32.11	28.88	26.94
	EDSR-LIIF-SIREN-15	37.96	34.36	32.13	28.85	26.93
Set14	EDSR-LIIF (baseline)	33.60	30.32	28.59	26.45	24.93
	EDSR-LIIF-SIREN-30	33.62	30.31	28.56	26.41	24.91
	EDSR-LIIF-SIREN-15	33.61	30.32	28.59	26.44	24.90
B100	EDSR-LIIF (baseline)	32.14	29.09	27.59	25.84	24.78
	EDSR-LIIF-SIREN-30	32.15	29.08	27.57	25.83	24.78
	EDSR-LIIF-SIREN-15	32.15	29.09	27.58	25.83	24.78
Urban100	EDSR-LIIF (baseline)	32.02	28.15	26.08	23.76	22.43
	EDSR-LIIF-SIREN-30	32.04	28.13	26.04	23.71	22.41
	EDSR-LIIF-SIREN-15	32.01	28.15	26.07	23.74	22.43