



Omnidirectional Image Super-resolution via Bi-projection Fusion

Jiangang Wang¹, Yuning Cui², Yawen Li³, Wenqi Ren^{1*}, Xiaochun Cao¹

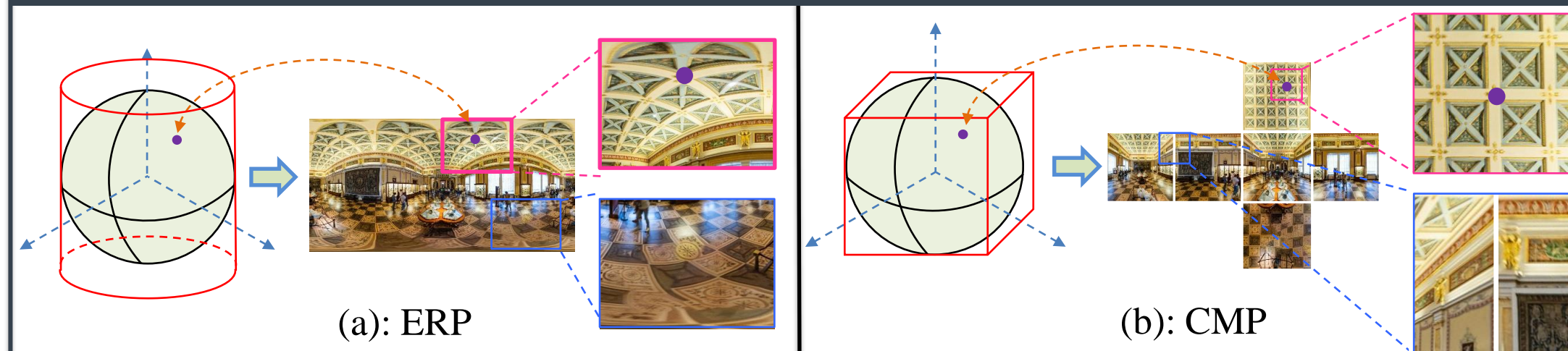
¹Shenzhen Campus of Sun Yat-sen University ²Technical University of Munich ³Beijing University of Posts and Telecommunications



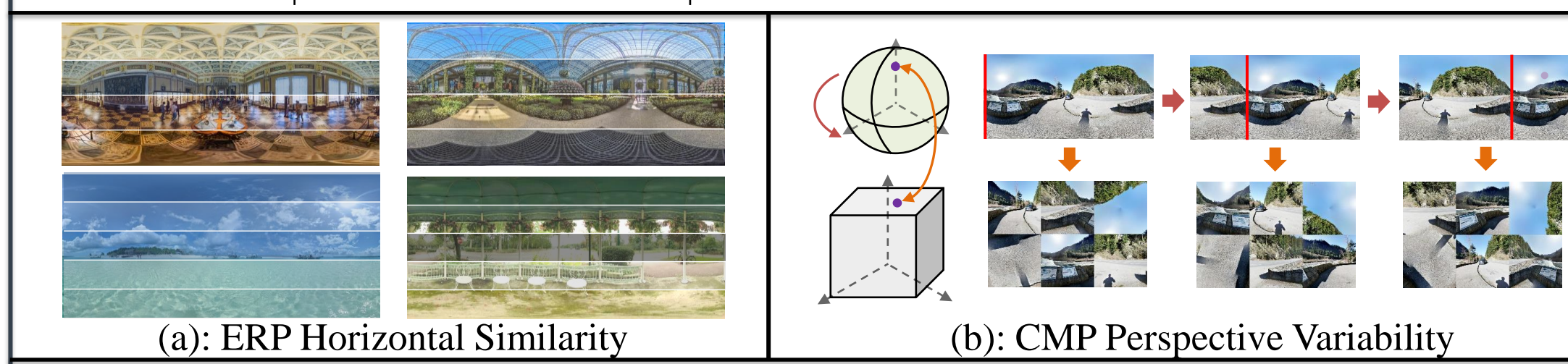
Motivation

- Traditional 2D image super-resolution network are **not suitable** for omnidirectional images
 - because of the difference in geometric features between the two images
- Existing omnidirectional image super-resolution network **only uses ERP**
 - the geometric features of omnidirectional images are not fully utilized

ODIs Analysis

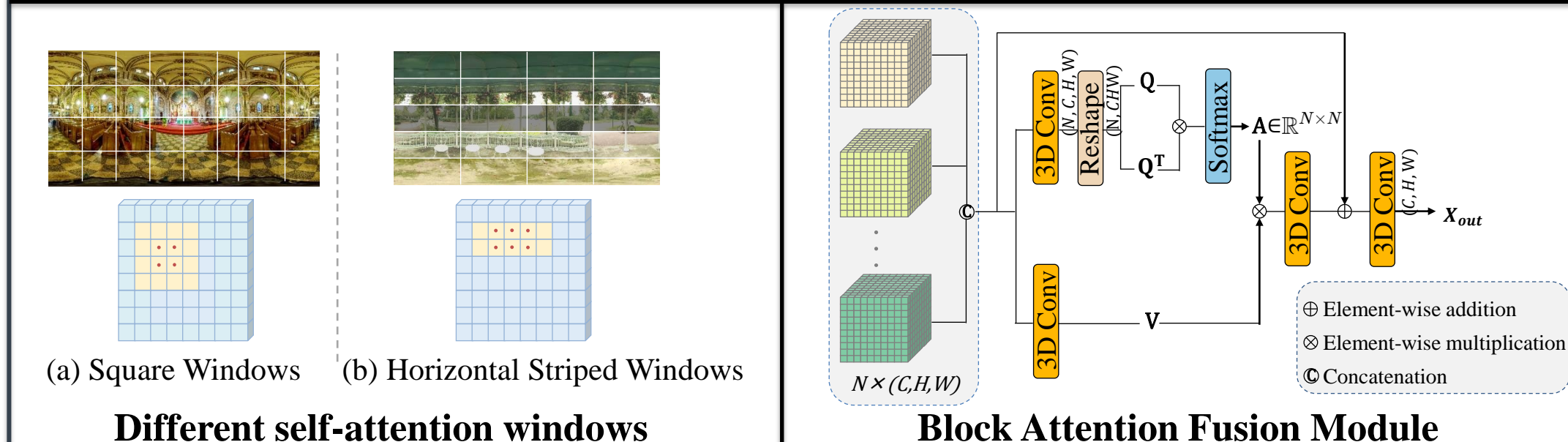
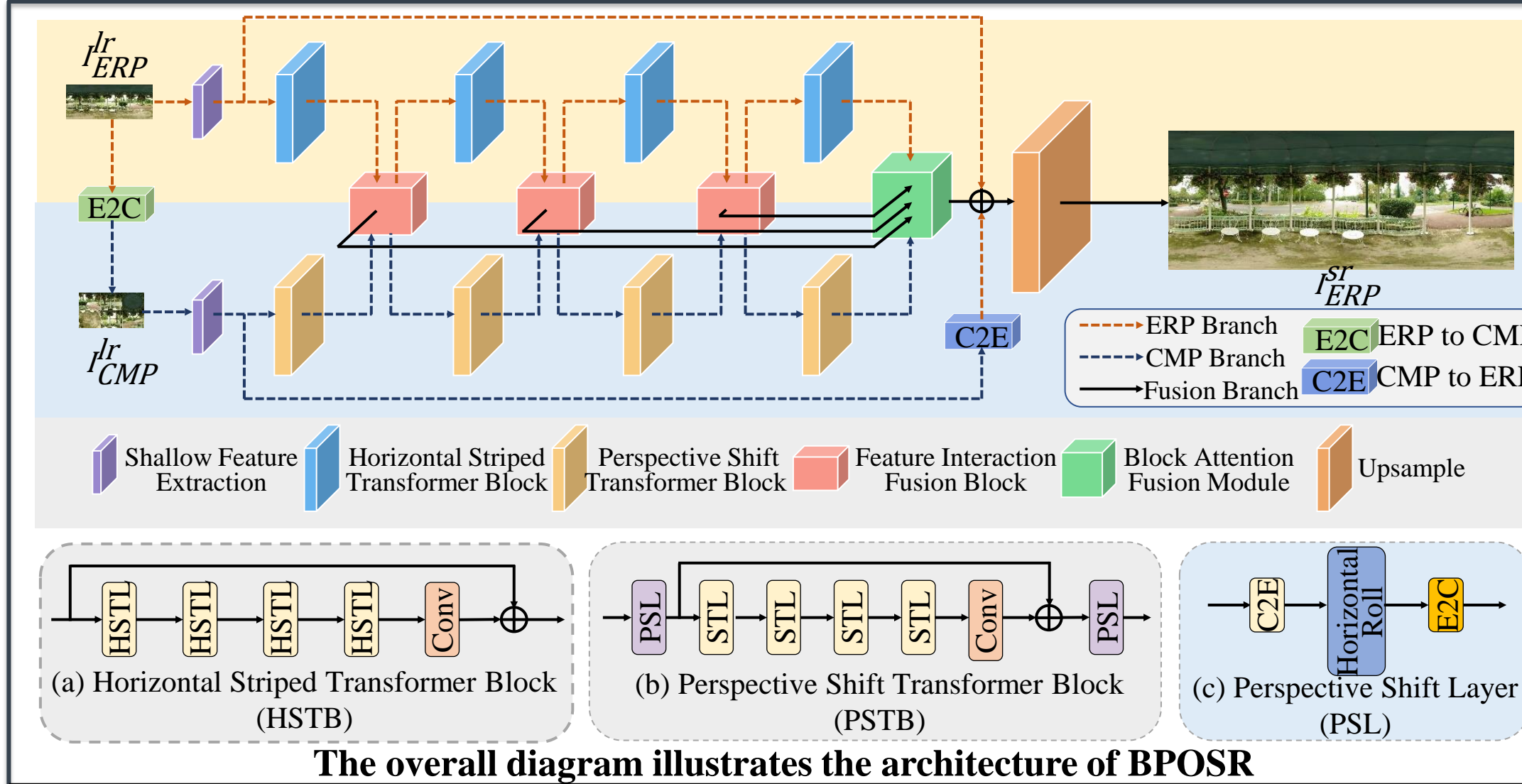


Projection	Advantage	Disadvantage
ERP	Global perspective	High distortions, particularly at high latitudes
CMP	Low distortions	Local perspective and discontinuities



Projection	Geometric properties	Model structure design
ERP	Horizontal Similarity	Local similarity modeling
CMP	Perspective Variability	Multi-perspective information fusion

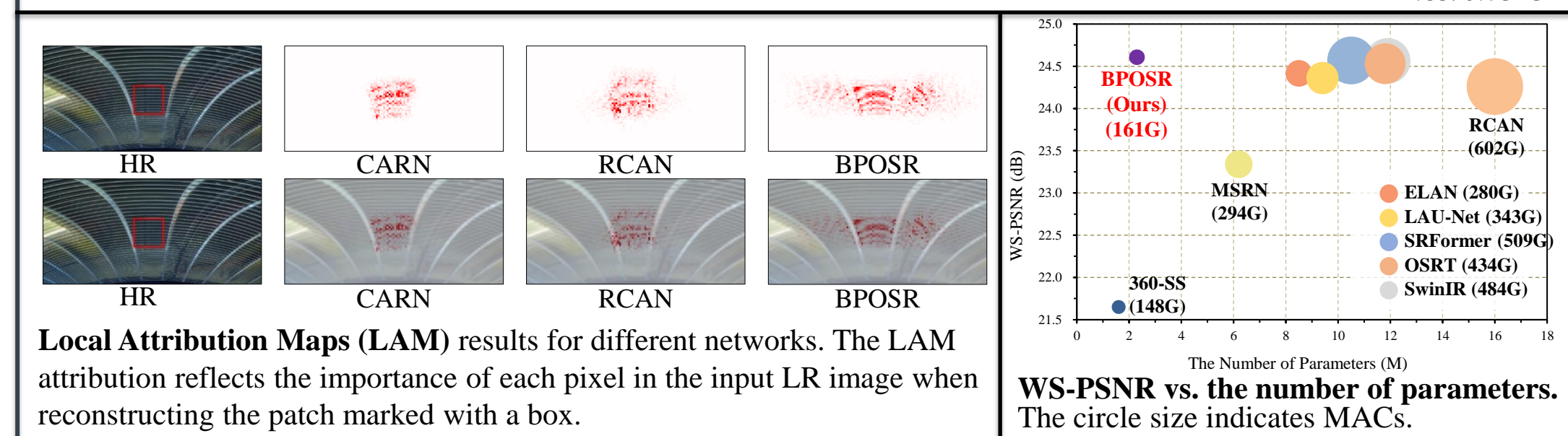
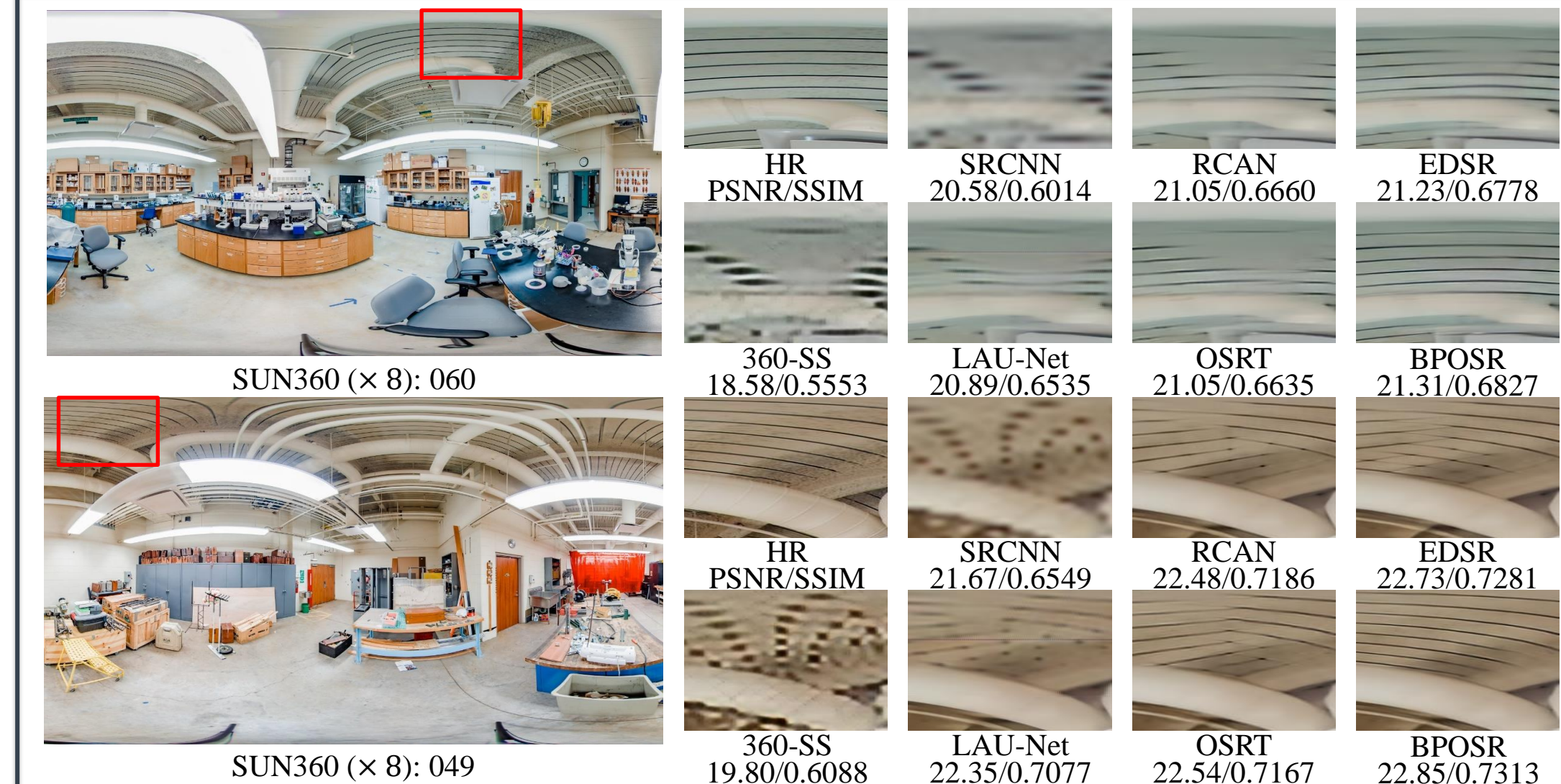
Method



Comparisons with State-of-the-Art

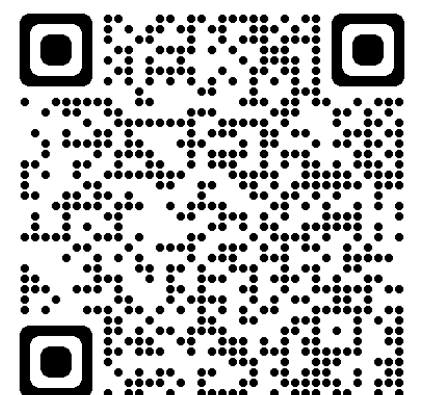
	Dataset	ODI-SR						SUN360					
	Scale	X4		X8		X16		X4		X8		X16	
SISR	Method	WS-PSNR	WS-SSIM	WS-PSNR	WS-SSIM	WS-PSNR	WS-SSIM	WS-PSNR	WS-SSIM	WS-PSNR	WS-SSIM	WS-PSNR	WS-SSIM
	Bicubic	24.62	0.6555	19.64	0.5908	17.12	0.4332	24.61	0.6459	19.72	0.5403	17.56	0.4638
	SRCNN	25.02	0.6904	20.08	0.6112	18.08	0.4501	26.30	0.7012	19.46	0.5701	17.95	0.4684
	VDSR	25.92	0.7009	21.19	0.6334	19.22	0.5903	26.36	0.7057	21.60	0.6091	18.91	0.5935
	EDSR	25.69	0.6954	23.97	0.6483	22.24	0.6090	26.18	0.7012	23.79	0.6472	21.83	0.5974
	RCAN	26.23	0.6995	24.26	0.6554	22.49	0.6176	26.61	0.7065	23.88	0.6542	21.86	0.5938
	DRN	26.24	0.6996	24.32	0.6571	22.52	0.6212	26.65	0.7079	24.25	0.6602	22.11	0.6092
ODISR	360-SS	25.98	0.6973	21.65	0.6417	19.65	0.5431	26.38	0.7015	21.48	0.6352	19.62	0.5308
	LAU-Net	26.34	0.7052	24.36	0.6602	22.52	0.6284	26.48	0.7062	24.24	0.6708	22.05	0.6058
	SphereSR	-	-	24.37	0.6777	22.51	0.6370	-	-	24.17	0.6820	21.95	0.6342
	OSRT	26.89	0.7581	24.53	0.6780	22.69	0.6261	27.47	0.7985	24.38	0.7072	22.13	0.6388
	BPOSR	26.95	0.7760	24.61	0.6782	22.72	0.6285	27.59	0.7997	24.47	0.7084	22.16	0.6433

Experimental Results



Conclusion

- A Bi-Projection Omnidirectional Image Super-Resolution network
- ERP Horizontal Similarity and CMP Perspective Variability
- Horizontal Striped Transformer Block and Perspective Shift Transformer Block



Code