

MILabICLR-26

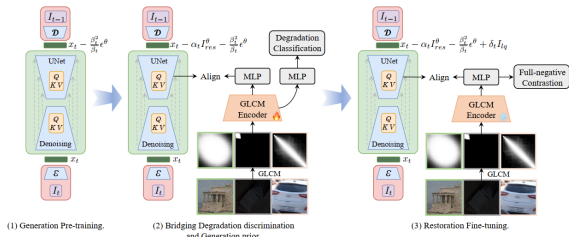
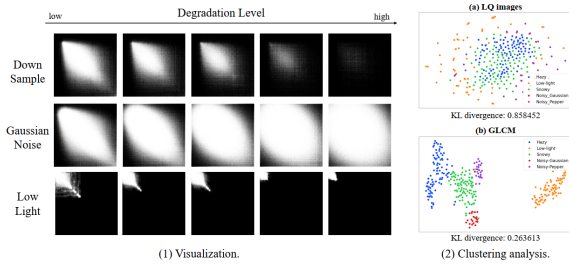
MILab "Bridging Degradation Discrimination and Generation for Universal Image Restoration" ICLR 2026

- all-in-one restoration
- diffusion hallucination

BDG

- restoration fidelity
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MAS-GLCM Multi-Angle and multi-Scale Gray Level Co-occurrence Matrix degradation characterization gradient frequency handcrafted degradation parameters degradation GLCM degradation pattern GLCM MAS-GLCM



MAS-GLCM MAS-GLCM MAS-GLCM BDG

BDG

- 5D all-in-one image restoration

Method	Deraining (face)		Enhancement		Desnowing		Dehazing		Deblurring (leaf)	
	PSNR ↑	SSIM ↑	PSNR ↑	SSIM ↑	PSNR ↑	SSIM ↑	PSNR ↑	SSIM ↑	PSNR ↑	SSIM ↑
PromptIR	29.56	0.888	22.89	0.847	31.98	0.924	32.02	0.952	27.21	0.817
DA-CLIP	28.96	0.853	24.17	0.882	30.80	0.888	31.39	0.983	25.39	0.805
DifUIR-L	31.03	0.904	25.12	0.907	32.65	0.927	32.94	0.956	29.17	0.864
InstructIR†	31.35	0.911	24.33	0.887	32.71	0.934	32.08	0.957	29.58	0.874
RAM-PromptIR†	32.17	0.914	24.88	0.891	32.75	0.939	33.79	0.976	29.76	0.871
DCPT-PromptIR†	32.29	0.921	25.39	0.893	32.79	0.941	32.94	0.956	30.32	0.888
BDG (Ours)	34.75	0.974	27.42	0.930	32.86	0.950	34.33	0.993	31.11	0.904

Table 2: All-in-one Image Restoration results. † means the methods are retrained within datasets we used for fair comparison. The best and second results are shown in red and blue respectively.

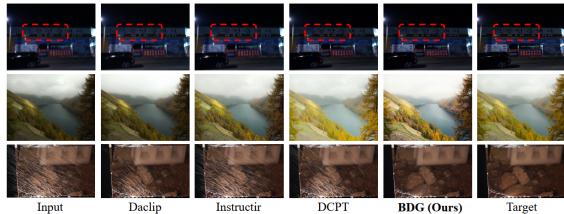


Figure 3: Visual comparison on the 5D all-in-one image restoration task. From top to bottom, each row corresponds to: deblurring, low-light enhancement, and deraining.

BDG deraininglow-light enhancementdesnowingdehazing deblurring state-of-the-art performance diffusion architecture DifUIR BDG deraininglow-light enhancementdehazing deblurring 3.72 dB2.30 dB 1.39 dB 1.94 dB degradation discrimination restoration fidelity DCPTBDG

- real-world all-in-one restoration

Degradation	Snow	Haze	Low-light
Method ↓	PIQE ↓ / BRISQUE ↓	PIQE ↓ / BRISQUE ↓	PIQE ↓ / BRISQUE ↓
DA-CLIP	31.34 / 24.45	47.67 / 34.90	37.64 / 27.45
InstructIR	33.35 / 24.41	50.97 / 31.45	36.08 / 26.31
DCPT-NAFNet	32.59 / 25.02	52.40 / 37.97	35.48 / 26.97
UniRestore	32.69 / 27.16	46.88 / 30.95	34.63 / 27.05
FoundIR	33.18 / 26.20	61.14 / 42.26	44.17 / 33.51
BDG (Ours)	31.45 / 24.00	47.59 / 34.75	34.44 / 27.41

BDG zero-shot generalization capability snowhaze low-light BDG PIQE BRISQUE no-reference image quality metrics diffusion-based model restoration consistency fidelity

- mixed degradation restoration BDG

Method	CDD11-Double						CDD11-Triple							
	L+H	L+R	L+S	H+R	H+S	L+H+S	L+H+R	L+H+S	L+H+R	L+H+S	L+H+R			
PromptIR	24.49	.789	25.05	.771	24.51	.761	24.54	.924	23.70	.925	23.74	.752	23.33	.747
WGWNet	24.27	.800	25.06	.772	24.60	.765	27.23	.955	27.65	.960	23.90	.772	23.97	.771
WeatherDiff	21.83	.756	22.69	.730	22.12	.707	21.25	.868	21.99	.868	21.23	.716	21.04	.698
OneRestore	25.79	.822	25.58	.799	25.19	.789	29.99	.957	30.21	.964	24.78	.788	24.90	.791
MoCE-IR	26.24	.817	26.25	.800	26.04	.793	29.93	.964	30.19	.970	25.41	.789	25.39	.790
BDG (Ours)	27.27	.833	26.67	.817	26.59	.809	34.21	.975	34.42	.979	26.14	.809	26.45	.809

low-light + hazehaze + rainlow-light + snow BDG benchmark state-of-the-art haze + rain previous SOTA 4.28 dB composite degradation

- BDG real-world super-resolution

Datasets	Metrics	BSRGAN	Real-ESRGAN	FcMaSR	StableSR	SUPIR	SecSR	DiffBIR	PASD	LDM	ResShift	BDG (Ours)
DIV2K-Val	PSNR ↑	21.87	21.94	20.85	20.84	18.68	21.19	20.94	20.77	21.26	21.75	24.1977
	SSIM ↑	0.5539	0.5736	0.5163	0.4887	0.4664	0.5386	0.4938	0.4938	0.5239	0.5422	0.6241
	LPIPS ↓	0.4136	0.3868	0.3973	0.4055	0.4102	0.3843	0.4270	0.4410	0.4154	0.4284	0.3669
	DISTS ↓	0.2737	0.2601	0.2428	0.2542	0.2207	0.2257	0.2471	0.2538	0.2500	0.2606	0.2571
	FID ↓	64.28	53.46	53.7	36.57	32.18	31.93	40.42	40.77	41.93	53.77	43.49
	MANQA ↑	0.4834	0.5251	0.4869	0.5914	0.5491	0.6198	0.6205	0.6049	0.5237	0.5232	0.5966
	MUSIQ ↑	59.11	58.64	58.1	62.95	65.33	68.33	65.23	66.85	36.52	58.23	61.2826
CLIPQA ↑	0.5183	0.5424	0.5397	0.6486	0.6035	0.6946	0.6664	0.6799	0.5695	0.5948	0.6396	
DrealSR	PSNR ↑	28.75	28.64	26.9	28.13	24.41	28.17	26.76	27	27.98	28.46	28.7961
	SSIM ↑	0.8031	0.8053	0.7572	0.7542	0.6696	0.7691	0.6576	0.7084	0.7453	0.7673	0.8039
	LPIPS ↓	0.2883	0.2847	0.3169	0.3315	0.3844	0.3189	0.4599	0.3931	0.3405	0.4006	0.3282
	DISTS ↓	0.2142	0.2089	0.2235	0.2263	0.2448	0.2315	0.2749	0.2515	0.2239	0.2656	0.2774
	MANQA ↑	0.4878	0.4907	0.442	0.5591	0.457	0.6042	0.5923	0.585	0.5043	0.4586	0.4899
	MUSIQ ↑	57.14	54.18	53.74	58.42	64.53	64.93	61.19	64.81	52.73	56.6	58.7432
	CLIPQA ↑	0.4915	0.4422	0.5464	0.6206	0.58	0.6804	0.6346	0.6773	0.5706	0.5342	0.6053
RealSR	PSNR ↑	26.39	25.69	25.07	24.7021	22.67	25.18	24.77	24.29	25.48	26.31	28.5105
	SSIM ↑	0.7654	0.7616	0.7358	0.7085	0.6567	0.7216	0.6572	0.663	0.7148	0.7421	0.7599
	LPIPS ↓	0.267	0.2727	0.2942	0.3002	0.3545	0.3019	0.3658	0.3435	0.318	0.346	0.3016
	DISTS ↓	0.2121	0.2063	0.2288	0.2139	0.2385	0.2223	0.231	0.2259	0.2213	0.2498	0.2574
	MANQA ↑	0.5399	0.5487	0.4865	0.6221	0.5396	0.6442	0.6253	0.6493	0.5423	0.5285	0.5578
	MUSIQ ↑	63.21	60.18	58.95	65.78	66.09	69.77	64.85	68.69	58.81	58.43	64.6183
	CLIPQA ↑	0.5001	0.4449	0.527	0.6178	0.5171	0.6612	0.6386	0.659	0.5709	0.5444	0.6332

Stable Diffusion 2BDG cross-attention control network benchmark consistently achieve top-tier performance full-reference metrics BDG DIV2K-Val diffusion-based 2.45 dB PSNR diffusion restoration methods ground truth BDG degradation-aware conditioning hallucination fidelity perceptual quality

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