

icassp_2026_Response

This repository provides supplementary experimental results to address the reviewers' comments, including extended baselines, dataset details, and quantitative comparisons under uniform/non-uniform lighting.

1. Extended Experimental ()

1.1 Datasets

We evaluate our method on two representative datasets covering diverse lighting scenarios:

| Dataset | Number of Scenes | Lighting Scenarios | Split Ratio (Train/Test) |
|--------------------|------------------|------------------------------------|--------------------------|
| MipNeRF360-varying | 7 | Varying exposure + normal lighting | 7:1 |
| LOM | 5 | Low-light + normal lighting | 7:1 |

1.2 Extended Baseline Methods

We add **LLGS (ICASSP 2025)** as an extra baseline, covering classic and state-of-the-art methods:

| Method | Conference (Year) | Core Contribution |
|--------------|--------------------------|--|
| 3DGS | ACM Trans. Graph. (2023) | Basic 3D Gaussian Splatting |
| Aleth-NeRF | AAAI (2024) | Illumination adaptive via concealing field |
| GS-W | ECCV (2024) | Gaussian feature decoupling for wild scenes |
| Luminance-GS | CVPR (2025) | View-adaptive curve adjustment for lighting |
| LLGS | ICASSP (2025) | Gaussian illumination via absorptance modulation |

1.3 Experimental results

The following table presents the performance metrics (PSNR↑, SSIM↑, LPIPS↓) of various methods under non-uniform illumination conditions on the NeRF360-Varying dataset.(Note: indicates the best-performing metric for each evaluation item.)

| scene | metric | 3DGS | Aleth-NeRF | GS-W | Luminance-GS | Ours |
|-------|--------|------------|------------|--------|--------------|--------|
| | PSNR ↑ | 18.523 | 12.943 | 15.616 | 18.383 | 18.237 |

| scene | metric | 3DGs | Aleth-NeRF | GS-W | Luminance-GS | Ours |
|-----------|--------------------|--------|------------|---------------|---------------|---------------|
| "bicycle" | SSIM \uparrow | 0.514 | 0.195 | 0.563 | 0.646 | 0.691 |
| | LPIPS \downarrow | 0.396 | 0.796 | 0.371 | 0.330 | 0.274 |
| ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| "garden" | PSNR \uparrow | 20.187 | 12.685 | 20.482 | 20.984 | 21.526 |
| | SSIM \uparrow | 0.736 | 0.229 | 0.756 | 0.791 | 0.807 |
| "counter" | LPIPS \downarrow | 0.203 | 0.813 | 0.212 | 0.195 | 0.191 |
| | ----- | ----- | ----- | ----- | ----- | ----- |
| "bonsai" | PSNR \uparrow | 15.098 | 12.454 | 15.892 | 16.850 | 17.341 |
| | SSIM \uparrow | 0.527 | 0.324 | 0.624 | 0.645 | 0.739 |
| "kitchen" | LPIPS \downarrow | 0.368 | 0.780 | 0.337 | 0.302 | 0.224 |
| | ----- | ----- | ----- | ----- | ----- | ----- |
| "kitchen" | PSNR \uparrow | 12.533 | 8.141 | 15.526 | 15.708 | 17.973 |
| | SSIM \uparrow | 0.299 | 0.403 | 0.554 | 0.563 | 0.684 |
| "kitchen" | LPIPS \downarrow | 0.561 | 0.685 | 0.419 | 0.433 | 0.273 |
| | ----- | ----- | ----- | ----- | ----- | ----- |
| "kitchen" | PSNR \uparrow | 22.310 | 11.357 | 20.672 | 23.100 | 16.858 |
| | SSIM \uparrow | 0.831 | 0.397 | 0.802 | 0.833 | 0.848 |
| "kitchen" | LPIPS \downarrow | 0.177 | 0.579 | 0.164 | 0.143 | 0.148 |
| | ----- | ----- | ----- | ----- | ----- | ----- |
| "kitchen" | PSNR \uparrow | 14.354 | 7.151 | 17.198 | 16.825 | 17.150 |

| scene | metric | 3DGS | Aleth-NeRF | GS-W | Luminance-GS | Ours |
|---------|--------------------|--------|------------|--------|--------------|--------------------|
| "room" | SSIM \uparrow | 0.549 | 0.315 | 0.558 | 0.643 | 0.762 ✓ |
| | LPIPS \downarrow | 0.299 | 0.733 | 0.375 | 0.319 | 0.245 ✓ |
| ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| "stump" | PSNR \uparrow | 16.619 | 12.434 | 14.891 | 15.639 | 19.458 ✓ |
| | SSIM \uparrow | 0.476 | 0.471 | 0.503 | 0.532 | 0.664 ✓ |
| | LPIPS \downarrow | 0.402 | 0.665 | 0.432 | 0.389 | 0.304 ✓ |

Add the method LLGS (ICASSP) for comparison on the LOM dataset. Training with a mixed dataset of normal-light and low-light images (Note: ✓ indicates the best-performing metric for each evaluation item.)

| scene | metric | 3DGS | Aleth-NeRF | GS-W | Luminance-GS | LLGS | Ours |
|---------|--------------------|--------|------------|--------------------|--------------|--------|--------------------|
| "bike" | PSNR \uparrow | 18.447 | 9.378 | 26.747 ✓ | 20.358 | 15.753 | 22.371 |
| | SSIM \uparrow | 0.547 | 0.254 | 0.851 | 0.754 | 0.623 | 0.858 ✓ |
| "buu" | LPIPS \downarrow | 0.328 | 0.751 | 0.278 | 0.368 | 0.445 | 0.219 ✓ |
| | ----- | - | ----- | ----- | ----- | - | ----- |
| "room" | PSNR \uparrow | 14.472 | 13.288 | 27.012 ✓ | 16.486 | 22.877 | 26.119 |
| | SSIM \uparrow | 0.634 | 0.633 | 0.895 | 0.741 | 0.878 | 0.916 ✓ |
| "stump" | LPIPS \downarrow | 0.407 | 0.639 | 0.199 | 0.376 | 0.218 | 0.176 ✓ |
| | ----- | - | ----- | ----- | ----- | - | ----- |
| | PSNR \uparrow | 16.582 | 12.229 | 19.173 | 16.161 | 16.543 | 19.845 ✓ |

| scene | metric | 3DGS | Aleth-NeRF | GS-W | Luminance-GS | LLGS | Ours |
|---------|---------|-------|------------|-------|--------------|-------|------------|
| "shrub" | SSIM ↑ | 0.449 | 0.169 | 0.557 | 0.667 | 0.511 | 0.714 ✓ |
| | LPIPS ↓ | 0.374 | 0.713 | 0.289 | 0.207 | 0.366 | 0.204 ✓ |

2. Experimental results under normal illumination conditions

2.1 Quantitative Comparisons (normal Lighting)

We report the SSIM/PSNR/LPIPS metrics of our method under both uniform lighting conditions (lower LPIPS = better perceptual quality) to better evaluate the contribution of our approach.

The following table shows the average results of the MipNeRF360-varying dataset under normal illumination conditions.(Note: ✓ indicates the best-performing metric for each evaluation item.)

| | SSIM | PSNR | LPIPS |
|----------|---------|----------|---------|
| 3DGS | 0.870 | 28.691 | 0.182 |
| ----- | ----- | ----- | ----- |
| Pixel-GS | 0.886 | 29.490 | 0.152 |
| ----- | ----- | ----- | ----- |
| Ours | 0.895 ✓ | 29.601 ✓ | 0.108 ✓ |

The quantitative comparison results of SSIM/PSNR/LPIPS across all scenarios under normal illumination conditions are presented in the following table.(Note: Red font indicates the optimal metric value.)

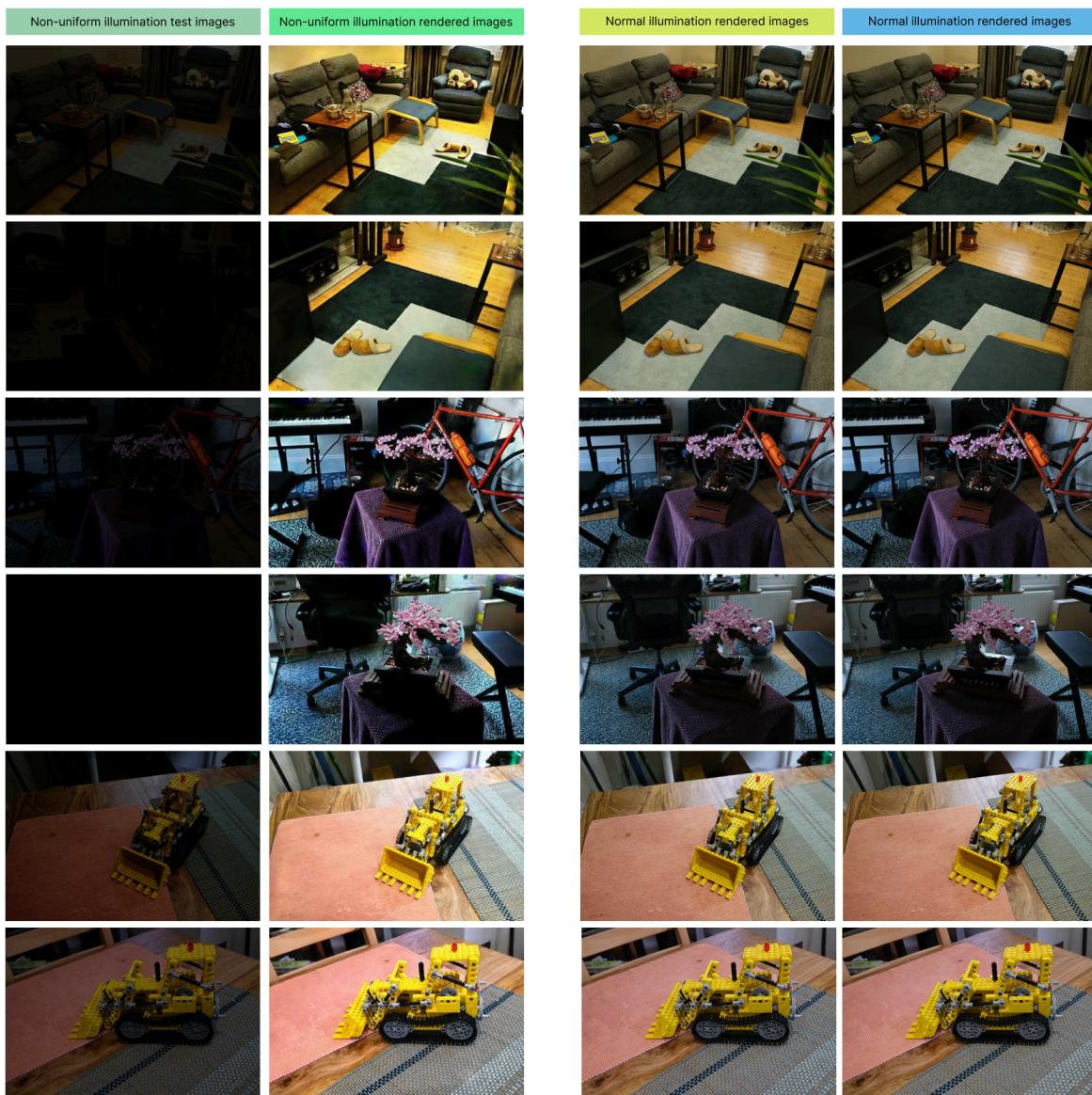
| | bicycle | bonsai | counter | garden |
|----------|----------------------------|-----------------------------|----------------------------|----------------------------|
| 3DGS | 0.771/25.246/0.205 | 0.938/31.980/0.205 | 0.905/28.700/0.204 | 0.868/27.410/0.103 |
| ----- | ----- | ----- | ----- | ----- |
| Pixel-GS | 0.793/25.739/ 0.173 | 0.951/ 32.697 /0.162 | 0.921/29.299/0.162 | 0.878/27.834/ 0.094 |
| ----- | ----- | ----- | ----- | ----- |
| Ours | 0.808/26.365 /0.204 | 0.955 /32.183/0.057 | 0.920/29.373 /0.080 | 0.893/28.549 /0.096 |

| | kitchen | room | stump |
|-------|--------------------|--------------------|--------------------|
| 3DGS | 0.922/30.317/0.129 | 0.914/30.632/0.220 | 0.775/26.550/0.210 |
| ----- | ----- | ----- | ----- |

| | kitchen | room | stump |
|----------|--------------------|--------------------|--------------------|
| Pixel-GS | 0.936/31.956/0.106 | 0.930/31.794/0.183 | 0.796/27.111/0.181 |
| ----- | ----- | ----- | ----- |
| Ours | 0.954/32.107/0.041 | 0.950/32.115/0.064 | 0.787/26.518/0.211 |

Although our method is specifically proposed for non-uniform illumination scenarios, experimental results demonstrate that it still achieves state-of-the-art (SOTA) performance even under normal illumination conditions.

2.2 Qualitative comparison under normal and non-uniform illumination conditions



3. Comparison of Colors Before and After Conversion

