Progress Report (9/25/2025)

Leveraging Diffusion Models for LSM Image Restoration

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Masking

Masking technique: ratio of missing information (through skips)

Implement SparseRowMasker with three modes: fixed skip, sampled skip, or target_missing_ratio.

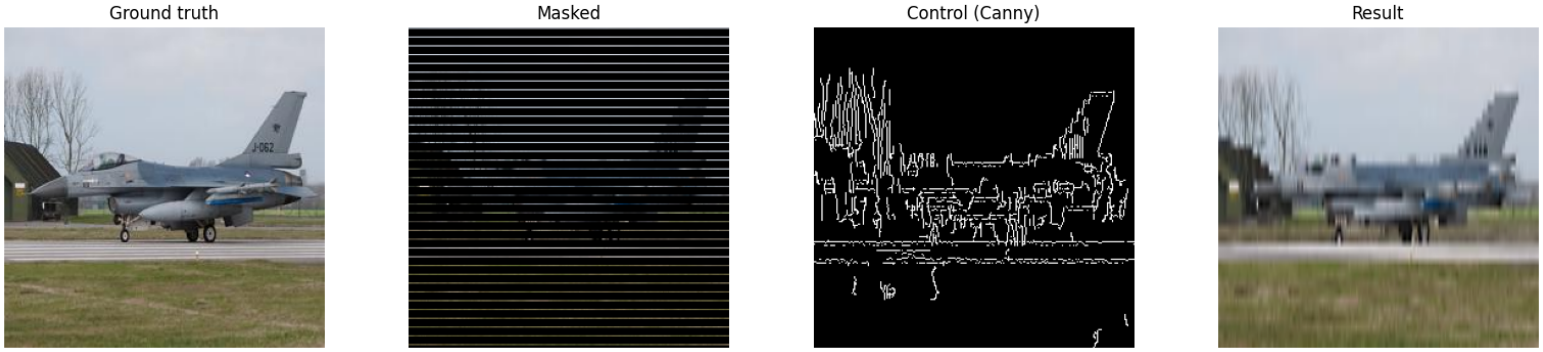
Sample skip: P({1,2,3,4,5,6}) = 50%, P(7) = 50%

Missing ratio: 1 − 1/skip → 2→50%, 3→66.7%, 4→75%, 5→80%, 6→83.3%, 7→85.7%

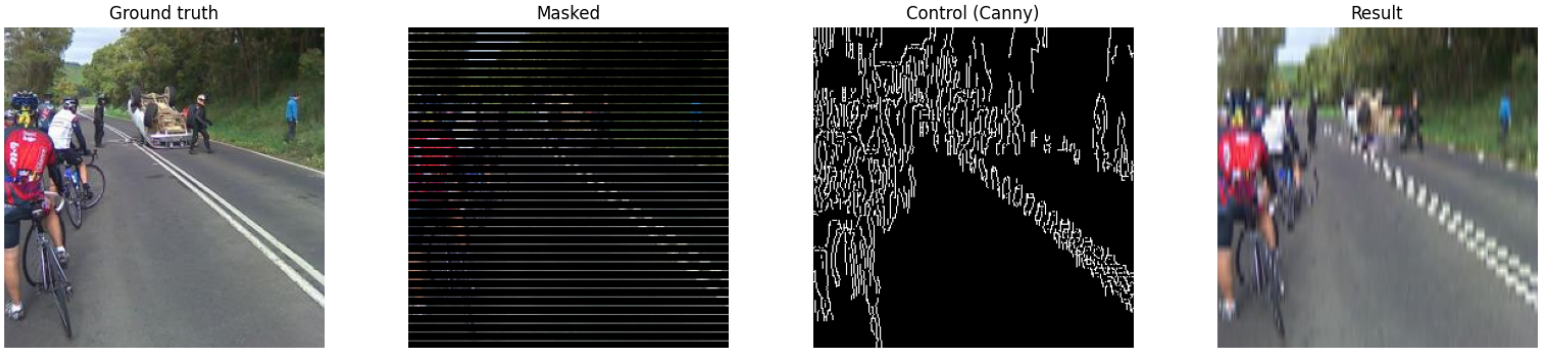
ControlNet

Pipeline: SD-Inpaint + ControlNet v1.1 (prefer softedge/canny).
Control image: edges from pseudo-full (vertical interpolation over missing rows) avoids reproducing stripes.

01.png
SSIM: 0.6962, PSNR: 23.7763, LPIPS: 0.3716



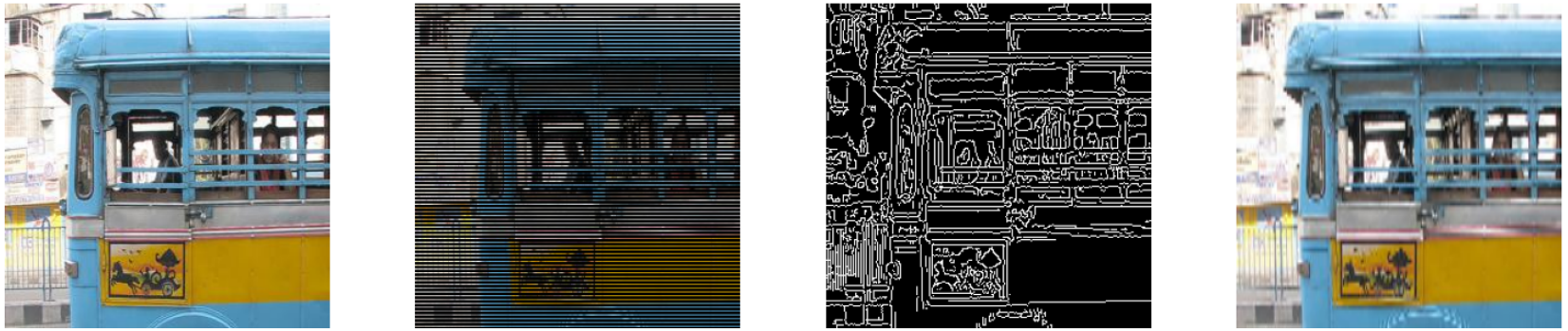
02.png
SSIM: 0.6983, PSNR: 21.5681, LPIPS: 0.4380



ControlNet

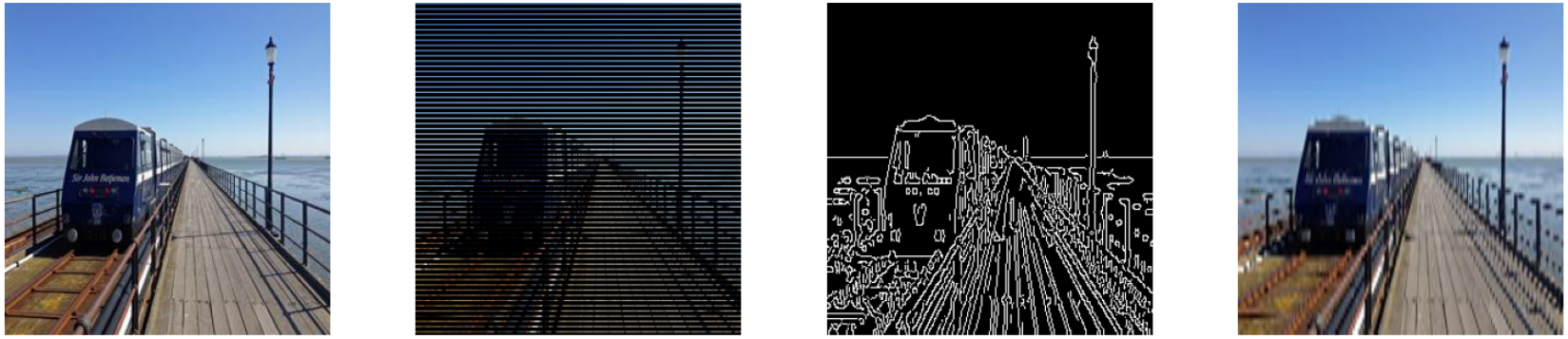
06.png
SSIM: 0.7855, PSNR: 22.1104, LPIPS: 0.2197

Ground truth | Masked | Control (Canny) | Result



10.png
SSIM: 0.8326, PSNR: 24.1927, LPIPS: 0.1971

Ground truth | Masked | Control (Canny) | Result



How many images per batch?

- Summarize UNet + ControlNet with torchsummary (params).
- Empirically find max batch: increase batch size on a single 256x256 test input until OOM; record per-GPU result.

Ongoing / next steps

•**Parameter sweeps:** control_scale, control_end, steps, resolution, Canny thresholds, pre-blur.
•**Batching:** finalize max batch per GPU; add auto-finder to batch script.
•**Domain adaptation:** try **ControlNet-LoRA** on LSM slices; evaluate gains.

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