

Computational Imaging and Diffusion Project

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Motivation

- Understand diffusion models and explore different applications them –
 - Denoising
 - Unconditional generation
 - Controlled Edit with SDEdit
 - Generation with priors
- Generate realistic images by reversing a gradual noising process

New Technique

- Diffusion models comprise of
 - forward process which iteratively adds noise to real data (image) until it becomes pure noise
 - Learning to undo the noise by reverse iteration to recover realistic images
- Unconditional generation from pure noise
- Controlled/creative edit of partially noised image
- Solve inverse problems using DDPM with Bayesian formulation using priors
 - Score based Annealed Langevin Dynamics
 - Diffusion Prior Model

Related Work

- SDEdit: Guided Image Synthesis and Editing with Stochastic Differential Equations
- Denoising Diffusion Probabilistic Models

References

C. Meng, Y. He, Y. Song, J. Song, J. Wu, J.Y. Zhu, S. Ermon, "SDEdit: Guided Image Synthesis and Editing with Stochastic Differential Equations", ICLR 2022

J. Ho, A. Jain, P. Abbeel, "Denoising Diffusion Probabilistic Models", NeurIPS 2020 (DDPM)

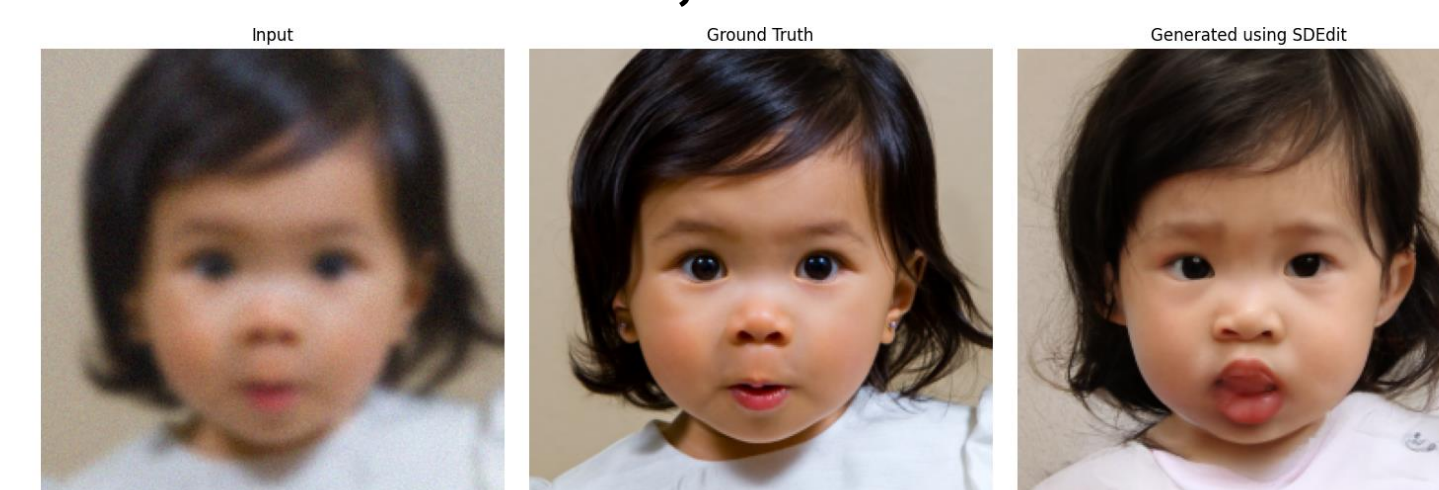
Experimental Results

SDEdit

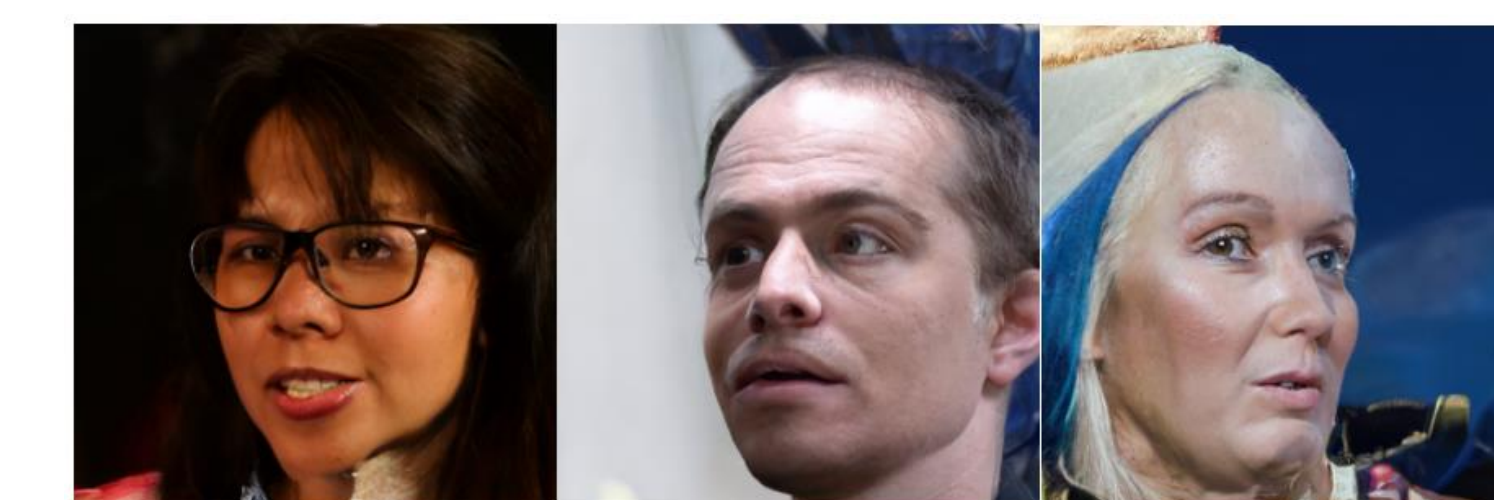
PSNR=20.02, LPIPS=0.18



PSNR=20.25, LPIPS=0.19



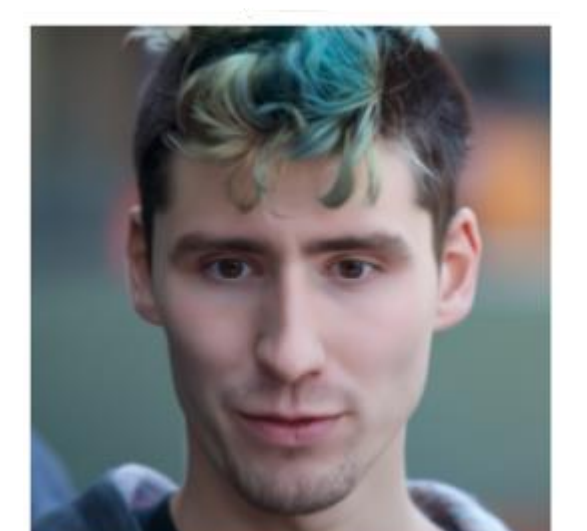
Uncond. Generation



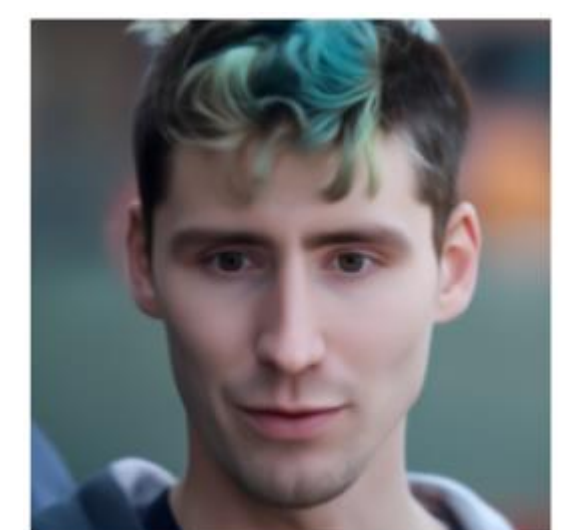
SALD: PSNR=9.3, LPIPS=0.74



30



100



500

