Reimplementation of DDRM

CHRISTIAN SIMAN-CHERECHES JIA FU HAOYE CHEN
chrsc | jiafu | haoye @kth.se

October 31, 2023

We choose the topic "Deep Generative Models" and we will reimplement DDRM based on NeurIPS 2022 paper "Denoising Diffusion Restoration Models" [1].

1 Grade Aim and Justification

We are aiming for an excellent grade. We believe that successfully reimplementing this model from scratch, understanding its intricacies, and potentially extending its applications warrant an excellent grade due to the complexity of the task and its conspicuous impact in current research.

2 Project Plan

2.1 Experiments

We plan to replicate the experiments conducted in the original paper, namely, the experiments for super-resolution, deblurring, inpainting, and colorization under various amounts of measurement noise.

2.2 Datasets

We will test our model on ImageNet and Flickr-Faces-HQ (FFHQ) dataset in terms of reconstruction faithfulness and perceptual quality to demonstrate its performance compared to the original results.

2.3 Additional Methods

For the deblurring tasks, we will further realize the motion deblurring beyond the original work.

2.4 Computational Resources & Software Packages

We have at least one Nvidia RTX 3080 GPU available. And we will use `torch` and `opencv-python` for implementation.

3 Success Metrics

The success of our project will be measured by how closely our results align with those in the original paper, specifically, for average peak signal-to-noise ratio (PSNR), structural similarity index measure (SSIM), kernel inception distance (KID) and neural function evaluations (NFEs).

4 Skills Acquisition

Through this project, we aim to acquire a deeper understanding of denoising diffusion generative models and gain practical experience in PyTorch implementation for GPU-consuming deep learning models.

References

[1] B. Kawar, M. Elad, S. Ermon, and J. Song, "Denoising diffusion restoration models," 2022.