

Reproducibility of "Refining Generative Process with Discriminator Guidance in Score-based Diffusion Models"

GROUP MEMBERS

Timo Kleger Viktoria Sartor

I. DESCRIPTION OF THE PROJECT PLAN

We plan to firstly reproduce the results of the paper on the CIFAR-10 dataset. We will use pyTorch as our machine learning backbone as it is the standard library we have most experience with overall in the group. Similar to the paper [1] we plan to use a pretrained standard diffusion model and a pretrained encoder of U-Net for the discriminator. However we still need to finetune a shallow encoder. Therefore we have the resource on Google Colab provided via the course. The author mentioned that training the Discriminator Guidance (DG) does not require too much resources, since the generator is pretrained and fixed when training the DG. In case, the Colab resources are not sufficient, Viktoria has a Nvidia RTX 3070 on her computer.

We want to adapt the EDM-G+ model to be used for the MNIST dataset, which we want to compare with the MNIST reimplementation from Guang Zhou [3] of the paper from J. Ho et al. [2]. For the MNIST dataset we train our own discriminator UNet.

II. TIME TABLE, PLANNING

Week 44	Week 45	Week 46	Week 47	Week 48	Week 49	Week 50
Project proposal, study code repository, write dataloader	Reproduce Code	Reproduce: Finish model implementation	Reproduce: Training CIFAR-10, MNIST	Experiments: Evaluation CIFAR-10, MNIST (run DDPM MNIST)	Experiments: MNIST (run DDPM), Report	Report Clean code, finish report

III. MEASUREMENT OF SUCCESS

We are aiming for a B-A as we want to compare the MNIST to the paper of Denoising Diffusion Probabilistic Models [2] as it is written in the first point of the grading scheme. Our measures of success are first of all reproducing the results from the paper using the CIFAR-10 dataset. Furthermore we would like to compare MNIST with Denoising Diffusion Probabilistic Models [2], additional to the comparison with this paper on the CIFAR-10 dataset.

IV. PERSONAL LEARNING'S

Timo: I want to improve my pyTorch skills, understand how diffusion models really work and learn about recent improvements. Previously I haven't worked with diffusion models.

Viktoria: I would like to learn more about state of the art models, since most of my studies focussed on older models. I would also like to refine my pyTorch skills

REFERENCES

- [1] Yeongmin Kim Dongjun Kim et al. Refining generative process with discriminator guidance in score-based diffusion models. ICML 2023.
- [2] Jonathan Ho, Ajay Jain, and Pieter Abbeel. Denoising diffusion probabilistic models. *CoRR*, abs/2006.11239, 2020.
- [3] Guang Zhou. Mnist diffusion. 2022. <https://github.com/bot66/MNISTDiffusion>.