

ADRL 2024 - Assignment 3

Prathosh A. P.

November 1, 2024

1. Train a DDPM on the butterfly dataset. Plot the U-Net training loss curves.
2. Plot a 10 by 10 grid of images for generated images.
3. Compute FID by sampling 1000 data-points from both the true and the generated data distributions.
4. Repeat the above experiments by training the DDPM on the latent space of the VQ-VAE trained in the previous assignment. You should compute the FID and plot the images.
5. Implement conditional generation using classifier-guided diffusion.
6. Implement a noise conditional score network and repeat the above experiments. Compare the sampling procedures in terms of speed and generation quality.
7. By using the same network trained for DDPM, implement a DDIM sampler and compare the generation quality (via FID) with the DDPM. Note that this question does not need any additional training.
8. Implement a DDIM inversion method. Get the (inverted) latents for a pair of real images and plot the generated images obtained via linear interpolation of the latents corresponding to these images.
9. Train a Resnet-50 on the Animal dataset and measure the accuracy on the test dataset.
10. Distill the above resnet on a small-sized MLP (using KL distillation loss across logits) and measure the test accuracy.
11. Implement i-JEPG on the animal dataset and train the same small-sized used in the distillation question and compare the accuracies.

General Instructions:

1. You should use both the animal and butterfly datasets for this assignment.
2. You need to resize all images to 128x128 pixels before implementing.
3. Use Google collab with Jupiter notebook for all the computing.
4. You are supposed to submit a single Jupiter notebook with all the solutions made into separate blocks.
5. Use Pytorch for building neural networks. You are supposed to directly use the off-the-shelf functions for the models asked.
6. A report has to be submitted that would list all the experiments, results, and observations. This should be embedded in the Jupiter notebook itself.
7. Use matplotlib for plotting.
8. The final evaluation **does not** depend on the accuracy metrics but is based on the **quality of your experiments and observations thereof**.
9. We will run a plagiarism check on the codes. Any suspicion of copying would lead to a harsh penalty from negative marks in the assignment to a failing grade in the course, depending upon the severity. Therefore, kindly refrain from copying others' codes and/or reports.