



CS683 - Generative AI

Assignment-1

Assigned Date: 11/09/2024

11:59pm, Due Date:30/08/2024

Instructions

- Work on the assignments on your own. You are free to discuss among your selves, but don't copy. If we find the assignments of a group of (two or more) students very similar, the group will get zero points towards this assignment. Plagiarism will be checked with tools. Please use Python for writing code. You can submit the code as a Jupyter notebook and for the theory questions, please submit your work to TAs. Use piazza to discuss, if you have any doubts.
- **You don't need to use ChatGPT for this assignment. If you do and the TAs don't catch you, you might get marks, but you'll likely forget what you did. If you do it yourself, you'll understand the concepts much better ☺**

1 Theory

1.1 VAE and GAN

1. Take home questions from notes (from VAE to PGGAN)
2. Describe PGGAN contributions clearly

2 Programming - Use Pytorch/TF library

2.1 Variational Autoencoder

1. Implement basic VAE on celebA faces dataset.
2. **Latent Space arithmetic - Make your image smile.** Generate smiling face images by playing with latent space z vector. Take help from this blog [link](#)

2.2 Variants of GANs

1. Implement a standard GAN on MNIST/CIFAR-10 data. Plot Generator loss, Discriminator Loss and Classification accuracy of discriminator with respect to iterations.
2. Demonstrate the vanishing gradient problem of standard GAN by training your GAN for 5, 10 and 25 epochs. Then stop the GAN training, train only the discriminator till it reaches 100% accuracy and then use this perfect discriminator to train your GAN. Plot the generator loss/gradient norm and discriminator loss w.r.t epochs (using your perfect discriminator).
3. Implement WGAN (with weight clipping strategy) and WGAN-GP (Gradient penalty) with Cifar-10 dataset. Plot the generator loss and discriminator loss w.r.t epochs.
4. Implement SNGAN framework too with Cifar-10 dataset.

5. Observe and Compare the time complexity of SN-GAN and WGAN-GP. (Which one is better?) Write down your observations?
6. Use Inception score and FID scores to evaluate models trained in previous questions.