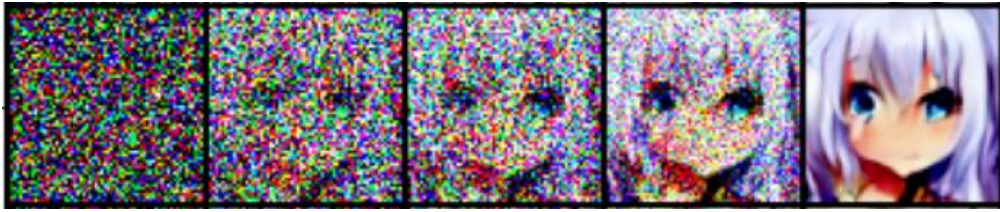


1. Sample 5 images and show the progressive generation. Then, briefly describe their differences in different time steps.



Timestep: 0 Timestep:70 Timestep:80 Timestep:90 Timestep:100
As time step increase, the images are clearer and seem anime face.

2. Canonical diffusion model (DDPM) is slow during inference, Denoising Diffusion Implicit Model (DDIM) is at least 10 times faster than DDPM during inference, and preserve the qualities.

Please describe the differences of training, inference process, and the generated images of the two models respectively. Briefly explain why DDIM is faster.

(1.)DDPM:

Training: forward process and reverse process(Markov chain) require many iterations to produce a high quality sample.

Interference, each sample need to go through long Markov chain

(2.)DDIM:

Training: like DDPM, but estimating the addition of multiple Markov chain steps and adding them all at once.

Interference: samples have “consistency” property, if we start with the same initial latent variable and generate several samples with Markov chains of various lengths, these samples would have similar high-level features.

(3.) Because DDIM use Non-Markovian forward process, which Accelerated inference and sampling.

REF: https://minibatchai.com/diffusion/generative-models/text2image/sampling/2022/07/14/Diffusion_Sampling.html

REF:[https://medium.com/ai-blog-](https://medium.com/ai-blog-tw/%E9%82%8A%E5%AF%A6%E4%BD%9C%E9%82%8A%E5%AD%B8%E7%BF%92diffusion-model-%E5%BE%9Eddpm%E7%9A%84%E7%B0%A1%E5%8C%96%E6%A6%82%E5%BF%B5%E7%90%86%E8%A7%A3-4c565a1c09c)

[tw/%E9%82%8A%E5%AF%A6%E4%BD%9C%E9%82%8A%E5%AD%B8%E7%BF%92diffusion-model-](https://medium.com/ai-blog-tw/%E9%82%8A%E5%AF%A6%E4%BD%9C%E9%82%8A%E5%AD%B8%E7%BF%92diffusion-model-%E5%BE%9Eddpm%E7%9A%84%E7%B0%A1%E5%8C%96%E6%A6%82%E5%BF%B5%E7%90%86%E8%A7%A3-4c565a1c09c)

[%E5%BE%9Eddpm%E7%9A%84%E7%B0%A1%E5%8C%96%E6%A6%82%E5%BF%B5%E7%90%86%E8%A7%A3-4c565a1c09c](https://medium.com/ai-blog-tw/%E9%82%8A%E5%AF%A6%E4%BD%9C%E9%82%8A%E5%AD%B8%E7%BF%92diffusion-model-%E5%BE%9Eddpm%E7%9A%84%E7%B0%A1%E5%8C%96%E6%A6%82%E5%BF%B5%E7%90%86%E8%A7%A3-4c565a1c09c)