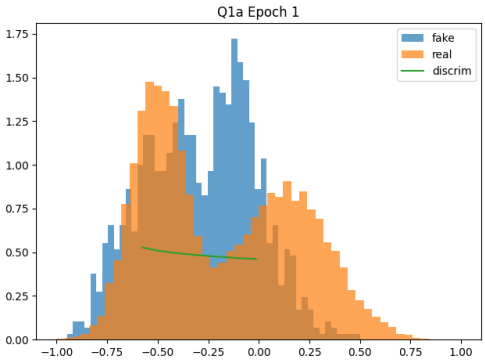
Homework 3: GAN Models

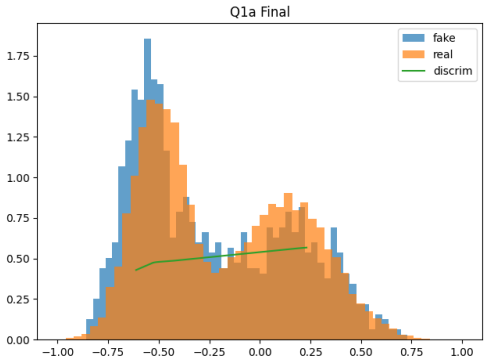
Deliverable: This PDF write-up by **Tuesday March 9th, 23:59pm**. Your PDF should be generated by simply replacing the placeholder images of this LaTeX document with the appropriate solution images that will be generated automatically when solving each question. The solution images are automatically generated and saved using the accompanying IPython notebook. Your PDF is to be submitted into Gradescope. This PDF already contains a few solution images. These images will allow you to check your own solution to ensure correctness.

Question 1: 1D Data

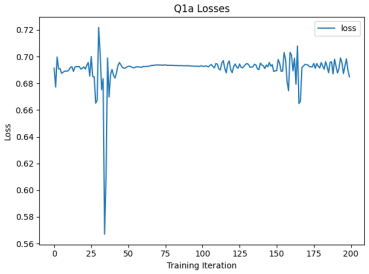
(a) **[10pt] Minimax GAN Objective**



(a) Samples at epoch 1

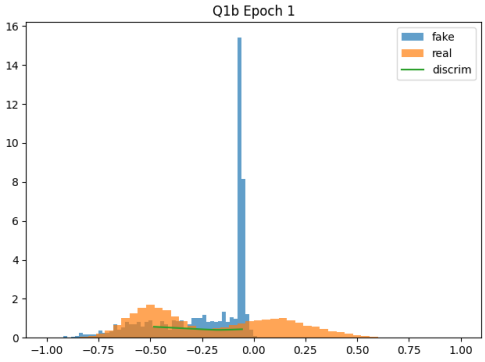


(b) Final samples

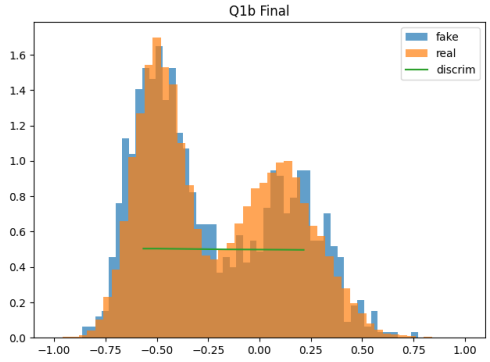


(c) GAN loss curve

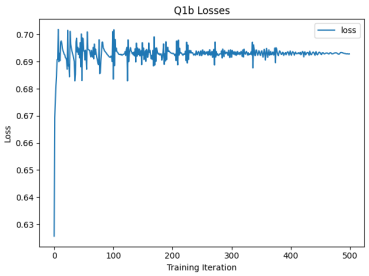
(b) **[10pt] Nonsaturating Objective**



(a) Samples at epoch 1



(b) Final samples

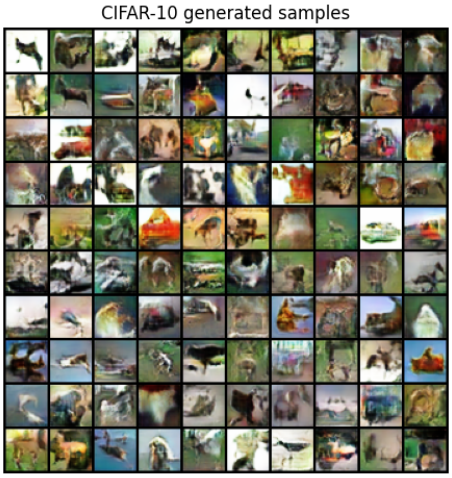


(c) GAN loss curve

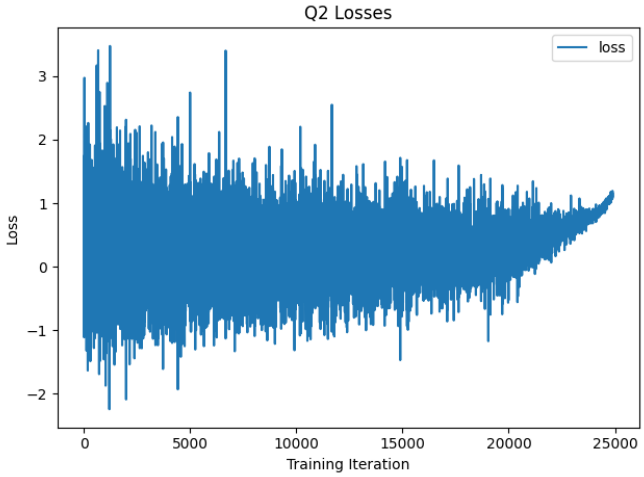
Question 2: WGAN-GP on CIFAR-10 [35pt]

Final inception score: **6.3**

Final Fréchet inception distance: **56.77** Note: The models were saved in multiple checkpoints. The loss curve is the first run of training. Final Generator loss: -1.557 Discirminator Loss: -0.727



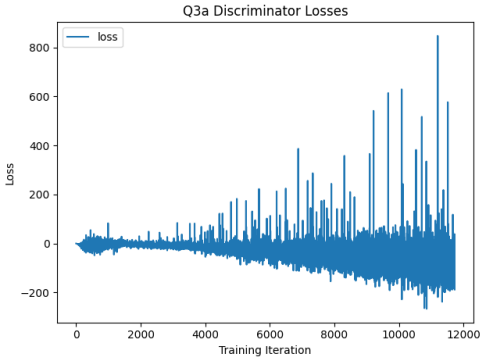
(a) Samples



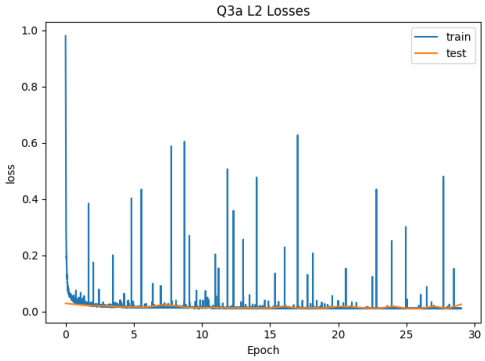
(b) Training curve

Question 3: Quantization with GANS [40 pt]

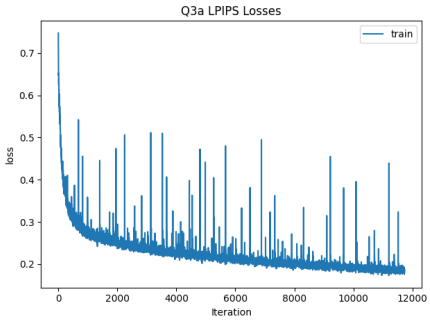
Part a: Vanilla VQGAN [25 pt] Final l2 validation reconstruction loss: **0.0252**



(a) Discriminator losses



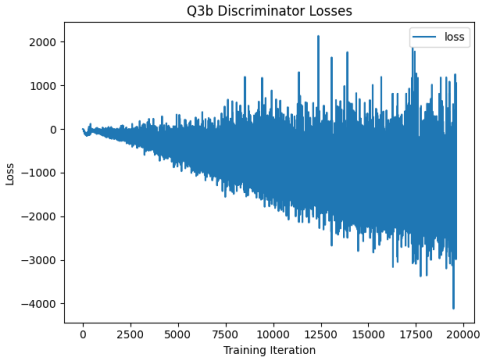
(b) L2 losses



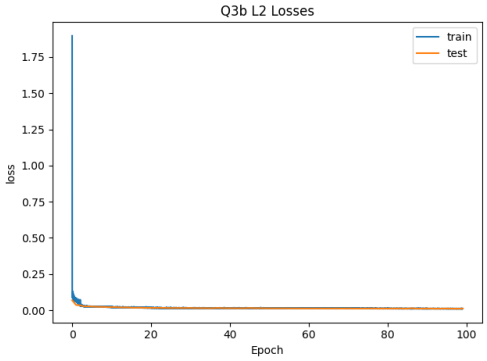
(c) LPIPS losses

(d) Reconstructions

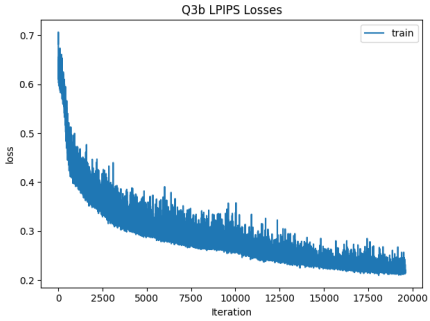
Part b: ViT-VQGAN [15 pt] Final l2 validation reconstruction loss: **0.01536**



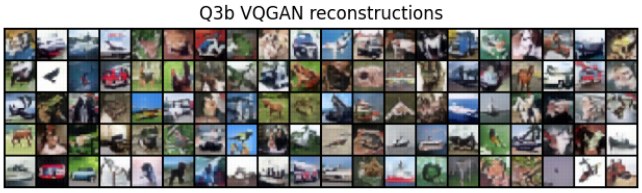
(a) Discriminator losses



(b) L2 losses



(c) LPIPS losses



(d) Reconstructions

Bonus Questions (Optional)

1. **[20pt] CycleGAN**

(a) MNIST: original images, translations, and reconstructions

(b) Colored MNIST: original images, translations, and reconstructions