Homework 2: Flow Models

Deliverable: This PDF write-up by **Tuesday February 25th, 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: 2D Data

(a) **[15pt] Autoregressive Flow**
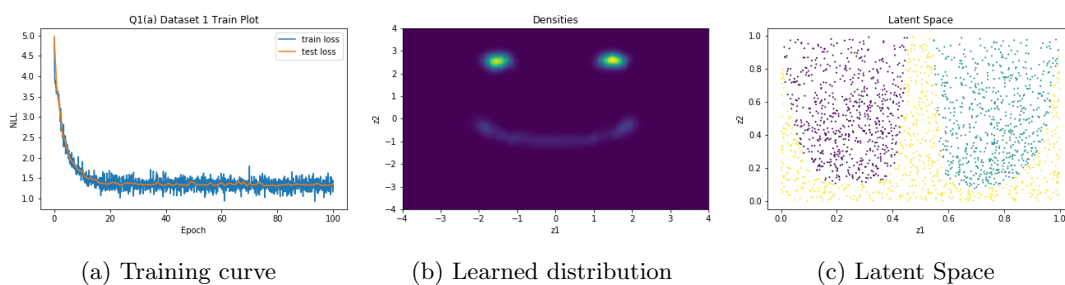
Final test loss for dataset 1: 1.3092 nats / dim

(a) Training curve   (b) Learned distribution   (c) Latent Space

Figure 1: Results for Dataset 1

Final test loss for dataset 2: 0.0000 nats / dim

figures/q1_a_dset2_train_plot.png   figures/q1_a_dset2_densities.png   figures/q1_a_dset2_latents.png
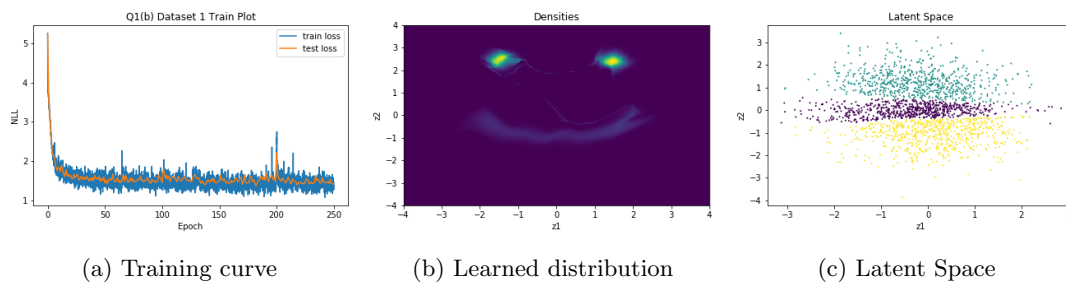
(a) Training curve   (b) Learned distribution   (c) Latent Space
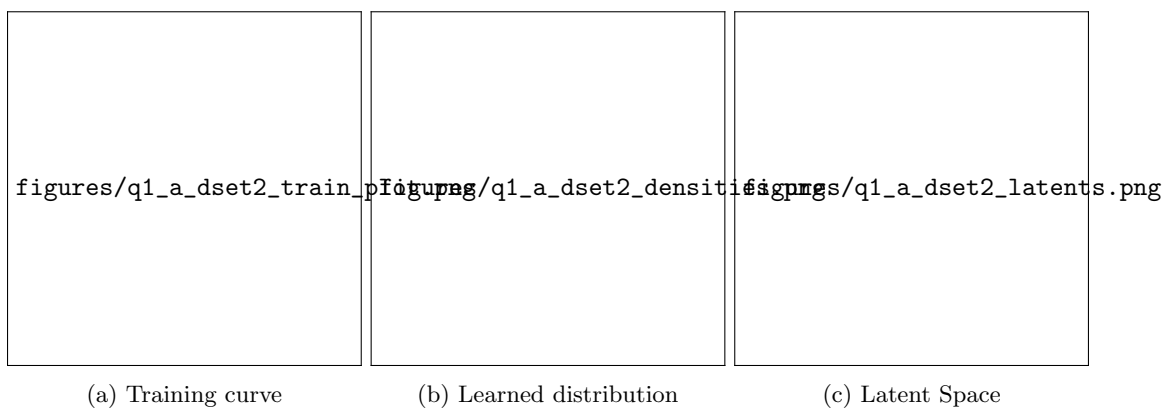
Figure 2: Results for Dataset 2

(b) **[15pt] RealNVP**

Final test loss for dataset 1: 2.0586 nats / dim

(a) Training curve   (b) Learned distribution   (c) Latent Space

Figure 3: Results for Dataset 1

Final test loss for dataset 2: 0.0000 nats / dim

figures/q1_b_dset2_train_plot.png   figures/q1_b_dset2_densities.png   figures/q1_b_dset2_latents.png

(a) Training curve   (b) Learned distribution   (c) Latent Space
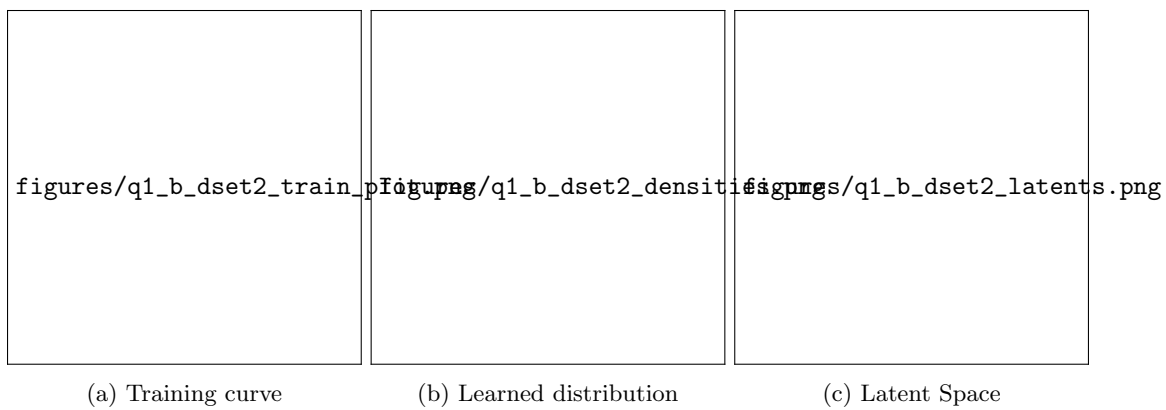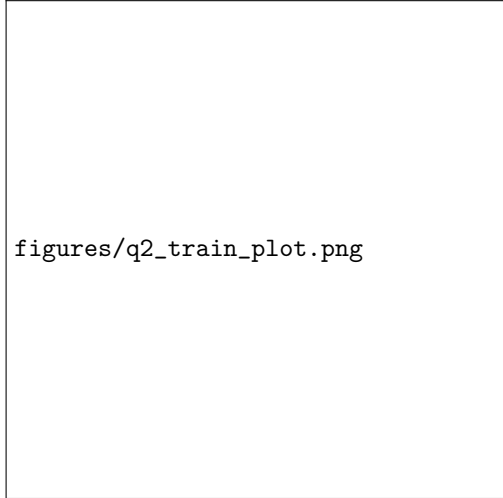
Figure 4: Results for Dataset 2

Question 2: Autoregressive Flows for Images [20pt]
Final test loss: 0.2258 nats / dim

figures/q2_train_plot.png

(a) Training curve
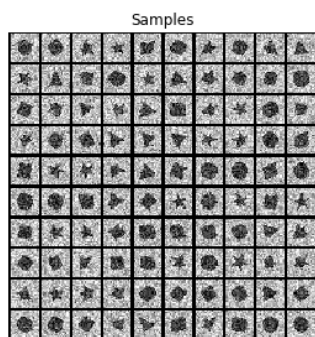
Samples

(b) Samples

figures/q2_flooredsamples.png

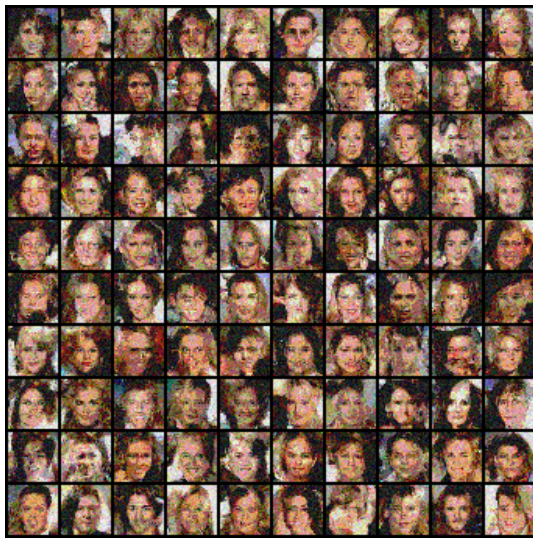(c) Samples, removing noise from dequantization

Question 3: RealNVP on Higher Dimensions

(a) [**40pt**] **RealNVP**

Final test loss: 0.55 bits / dim

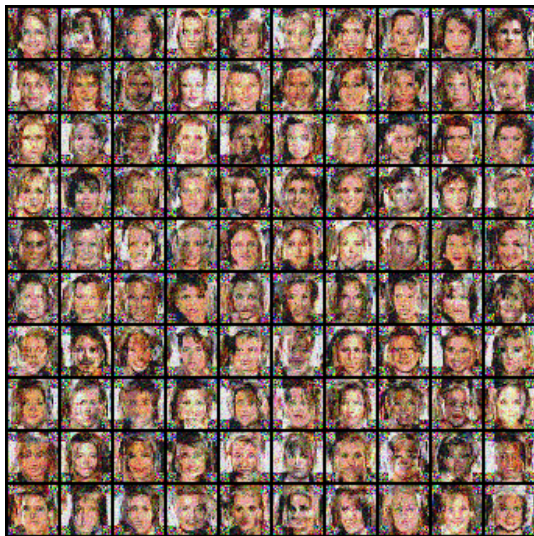figures/q3_a_train_plot.png

(a) Training curve

(b) Samples

(c) Interpolations

(b) **[10pt] Bad Masking**
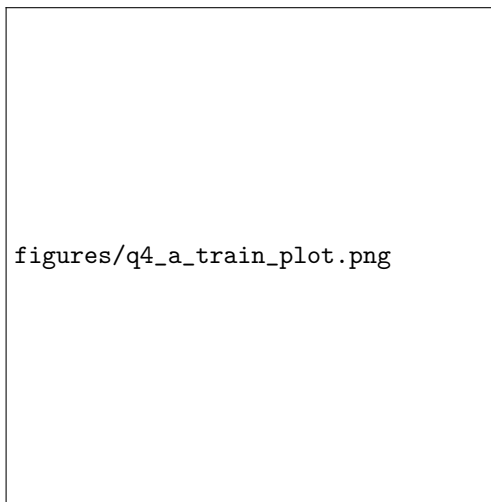
Final test loss: 0.0000 nats / dim

(a) Training curve

(b) Samples

(c) Interpolations

Bonus Questions (Optional)

1. **[10pt] Multiscale RealNVP**
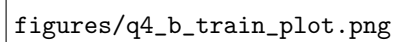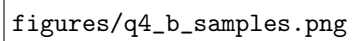
   Final test loss: 0.0000 nats / dim
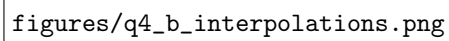
   figures/q4_a_train_plot.png

   (a) Training curve

   figures/q4_a_samples.png

   figures/q4_a_interpolations.png
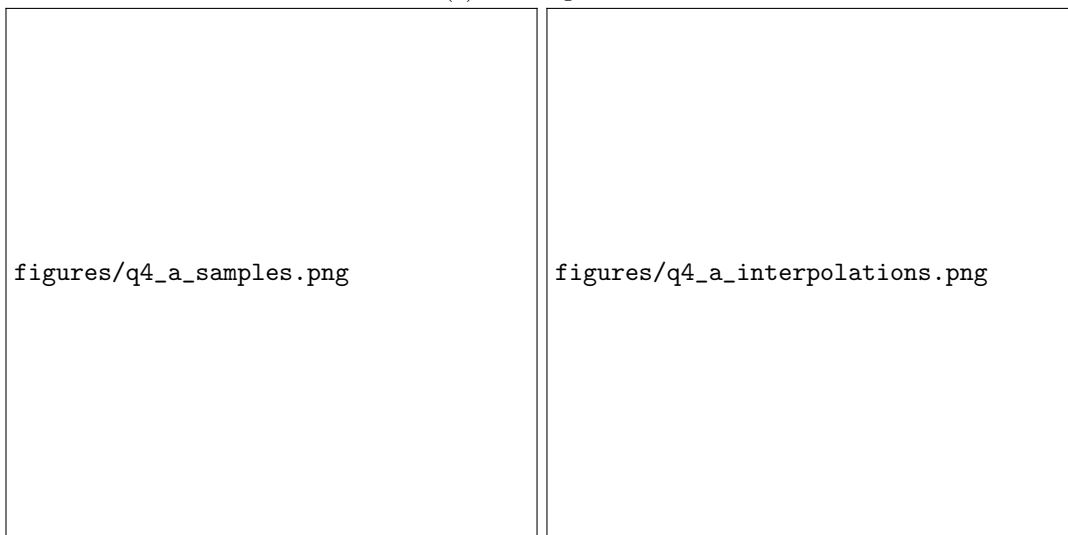
   (b) Samples

   (c) Interpolations

2. **[5pt] Glow**

Final test loss: 0.0000 nats / dim

(a) Training curve

(b) Samples

(c) Interpolations