Homework 2: Flow Models & Latent Variable Models

Deliverable: This PDF write-up by **Monday April 4th, 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. Download your results from Google Colab and replace the images in the figures/ folder with your result images. Write your name and ID in the necessary parts below, confirming the Honor Pledge. Then, you will run the .tex file to generate your PDF file. Your PDF is to be submitted into Blackboard along with your notebook, please follow the instructions given in the GitHub page. This PDF already contains a few solution images. These images will allow you to check your own solution to ensure correctness.

Honor Pledge: "I affirm that I have not given or received any unauthorized help on this assignment, and that this work is my own."

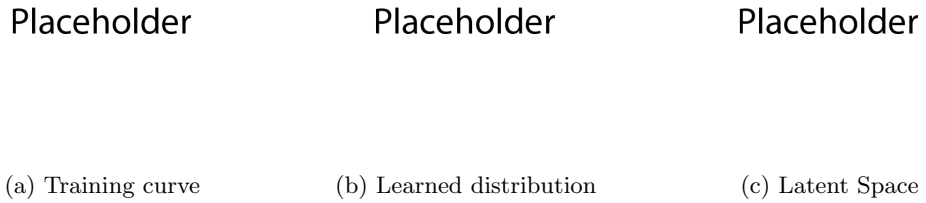
Name: YOUR NAME HERE

ID: YOUR ID HERE

Note: *This assignment is adapted from UC Berkeley CS294-158-SP20*

Question 1: RealNVP on 2D Data

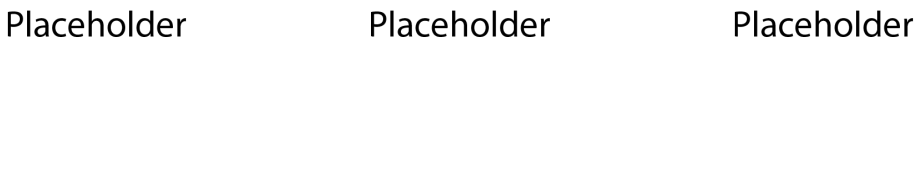
Final test loss for dataset 1: FILL IN HERE nats / dim



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

Figure 1: Results for Dataset 1

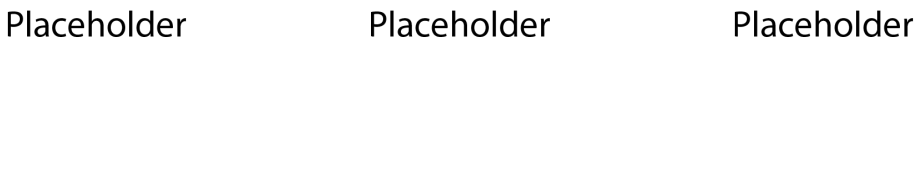
Final test loss for dataset 2: FILL IN HERE nats / dim



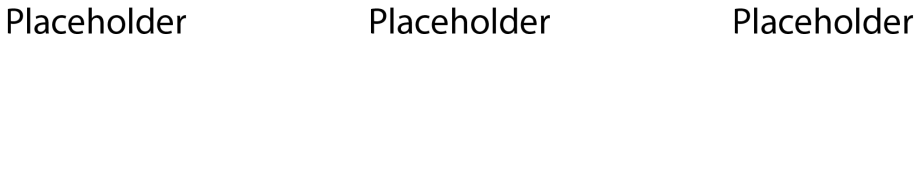
(a) Training curve (b) Learned distribution (c) Latent Space

Figure 2: Results for Dataset 2

Latent Space Visualizations



(a) Layer 0 (b) Layer 1 (c) Layer 2



(d) Layer 3 (e) Layer 4 (f) Layer 5

Figure 3: Latent Space Visualizations

Question 2: VAEs on Images

(a) **VanillaVAE**

Final Full -ELBO: FILL IN HERE, Recon Loss: FILL IN HERE, KL Loss: FILL IN HERE

(a) Training Curve

(b) Samples

(c) Reconstructions

(d) Interpolations

Figure 4: Results for Vanilla VAE

(b) **BetaVAE**

Final Full -ELBO: FILL IN HERE, Recon Loss: FILL IN HERE, KL Loss: FILL IN HERE

(a) Training Curve

(b) Samples

(c) Reconstructions

(d) Interpolations

Figure 5: Results for Beta VAE

Question 3: VQ-VAE
Final VQ-VAE Test Loss: FILL IN HERE, PixelCNN Prior Test Los: FILL IN HERE

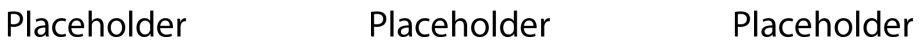
(a) VQ-VAE Training Curve

(b) PixelCNN Prior Training Curve

(c) Samples

(d) Reconstructions

Figure 6: Results for VQ-VAE



(a) K = 64 (b) K = 128 (c) K = 256

Figure 7: Codebook Histogram Visualizations