Homework 1: Autoregressive Models

Deliverable: This PDF write-up by **Wednesday March 17th, 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."
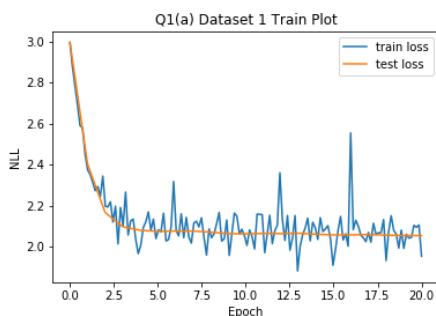
Name: YOUR NAME HERE

ID: YOUR ID HERE

Note: *This assignment is adapted from UC Berkeley CS294-158-SP20*
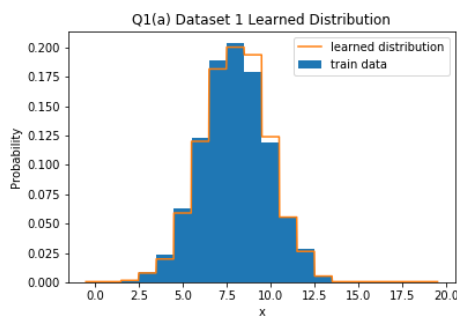
Question 1: 1D Data

(a) **[10pt] Fitting a Histogram**

Final test loss for dataset 1: 2.0553 nats / dim

(a) Dataset 1: Training curve   (b) Dataset 1: Learned distribution

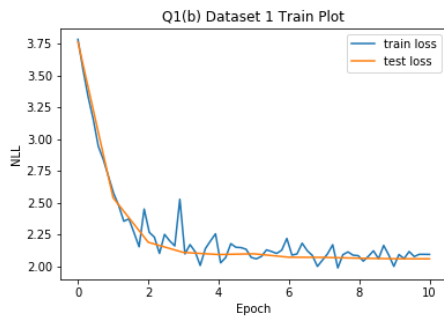Final test loss for dataset 2: FILL IN HERE nats / dim
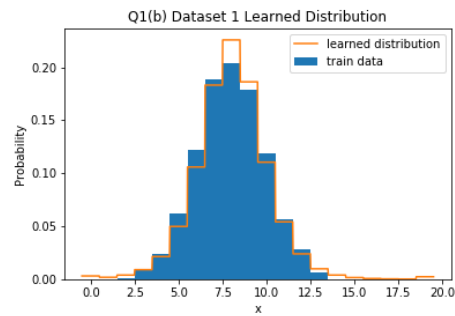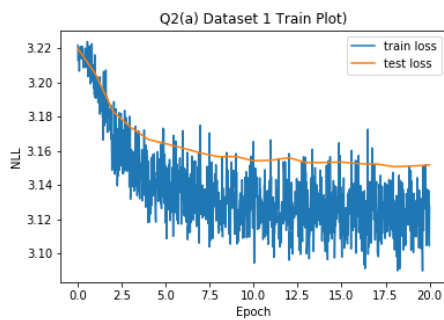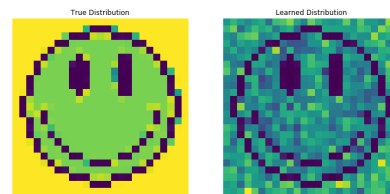
Placeholder

Placeholder

(a) Dataset 2: Training curve

(b) Dataset 2: Learned distribution

(b) **[10pth] Fitting Discretized Mixture of Logistics**

Final test loss for dataset 1: 2.0586 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Learned distribution

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

(a) Dataset 2: Training curve

(b) Dataset 2: Learned distribution

Question 2: MADE

(a) **[10pt] Fitting 2D Data**

Final test loss for dataset 1: 3.1518 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Learned distribution

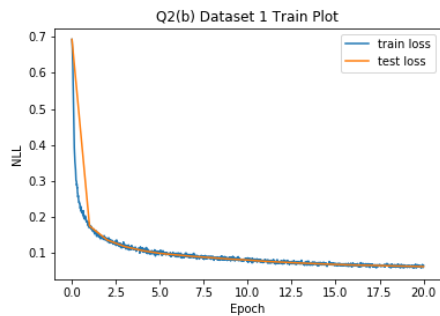Final test loss for dataset 2: FILL IN HERE nats / dim

Placeholder

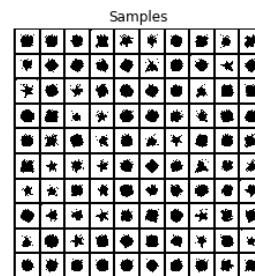(a) Dataset 2: Training curve

Placeholder

(b) Dataset 2: Learned distribution

(b) **[10pt] Shapes and MNIST**

Final test loss for dataset 1: 0.0623 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Samples

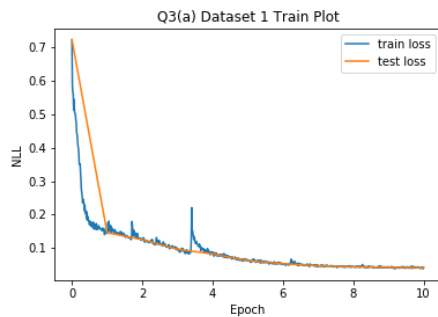Final test loss for dataset 2: FILL IN HERE nats / dim

Placeholder

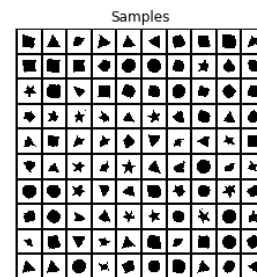
Placeholder

(a) Dataset 2: Training curve

(b) Dataset 2: Samples

Question 3: PixelCNNs

(a) **[15pt] PixelCNNs on Shapes and MNIST**

Final test loss for dataset 1: 0.0420 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Samples

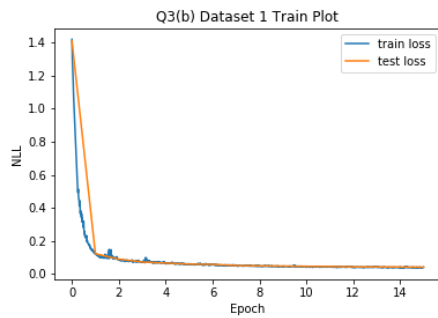Final test loss for dataset 2: FILL IN HERE nats / dim

Placeholder

Placeholder

(a) Dataset 2: Training curve

(b) Dataset 2: Samples

(b) **[15pt] PixelCNN on Colored Shapes and MNIST: Independent Color Channels**

Final test loss for dataset 1: 0.0444 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Samples

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

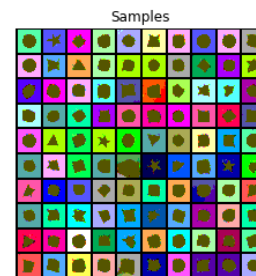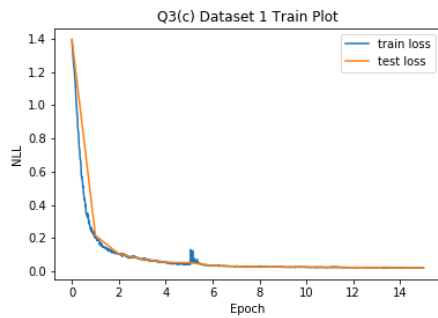

Placeholder

Placeholder

(a) Dataset 2: Training curve

(b) Dataset 2: Samples

(c) **[15pt] PixelCNN on Colored Shapes and MNIST: Autoregressive Color Channels**

Final test loss for dataset 1: 0.0236 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Samples

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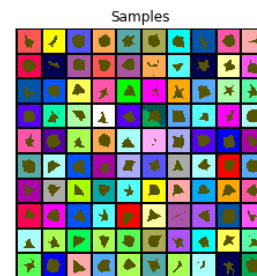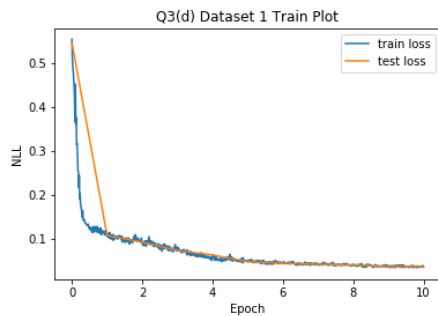
Placeholder
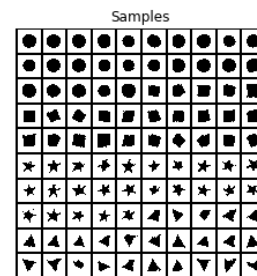
Placeholder

(a) Dataset 2: Training curve

(b) Dataset 2: Samples

(d) [**15pt**] **Conditional PixelCNNs**

Final test loss for dataset 1: 0.0368 nats / dim

(a) Dataset 1: Training curve

(b) Dataset 1: Samples

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

(a) Dataset 2: Training curve

(b) Dataset 2: Samples

Bonus Questions (Optional)

1. **[10pt] Gated PixelCNN**

   Final test loss: FILL IN HERE nats / dim

   Placeholder   Placeholder

   (a) Training curve   (b) Samples

2. **[10pt] Grayscale PixelCNN**

   Final test loss: FILL IN HERE nats / dim

   Placeholder   Placeholder

   (a) Training curve   (b) Samples

3. **[10pt] Parallel Multiscale PixelCNN**

Final test loss: FILL IN HERE nats / dim

Placeholder

Placeholder

(a) Training curve

(b) Samples