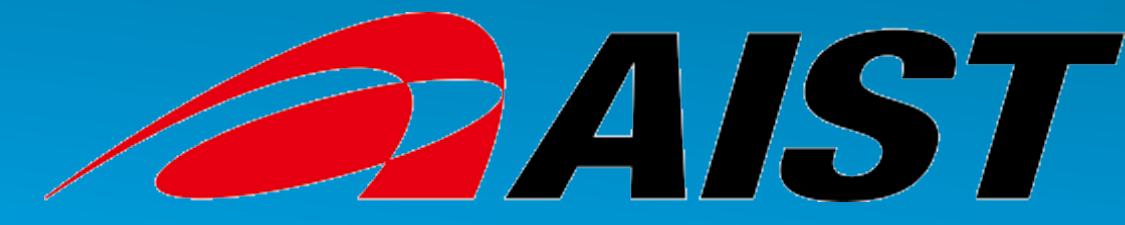


A Study on the Latent Space of VAE by Inducing Sparsity in the Encoder Network



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Abstract

The aim is to generate better latent disentanglement and good image reconstruction using Variational Autoencoder. We introduce sparsity at the prior distribution. Our model could disentangle latent unit such as position (X, Y), rotation, scale and identity from 2dSprite dataset. We also demonstrate the results with celebrity and 3d chairs dataset.

Problem

Unsupervised learning of Disentangled representations.

Motivation

Learning latent factors of variation in the data might be useful for downstream tasks such as classification.

Goal

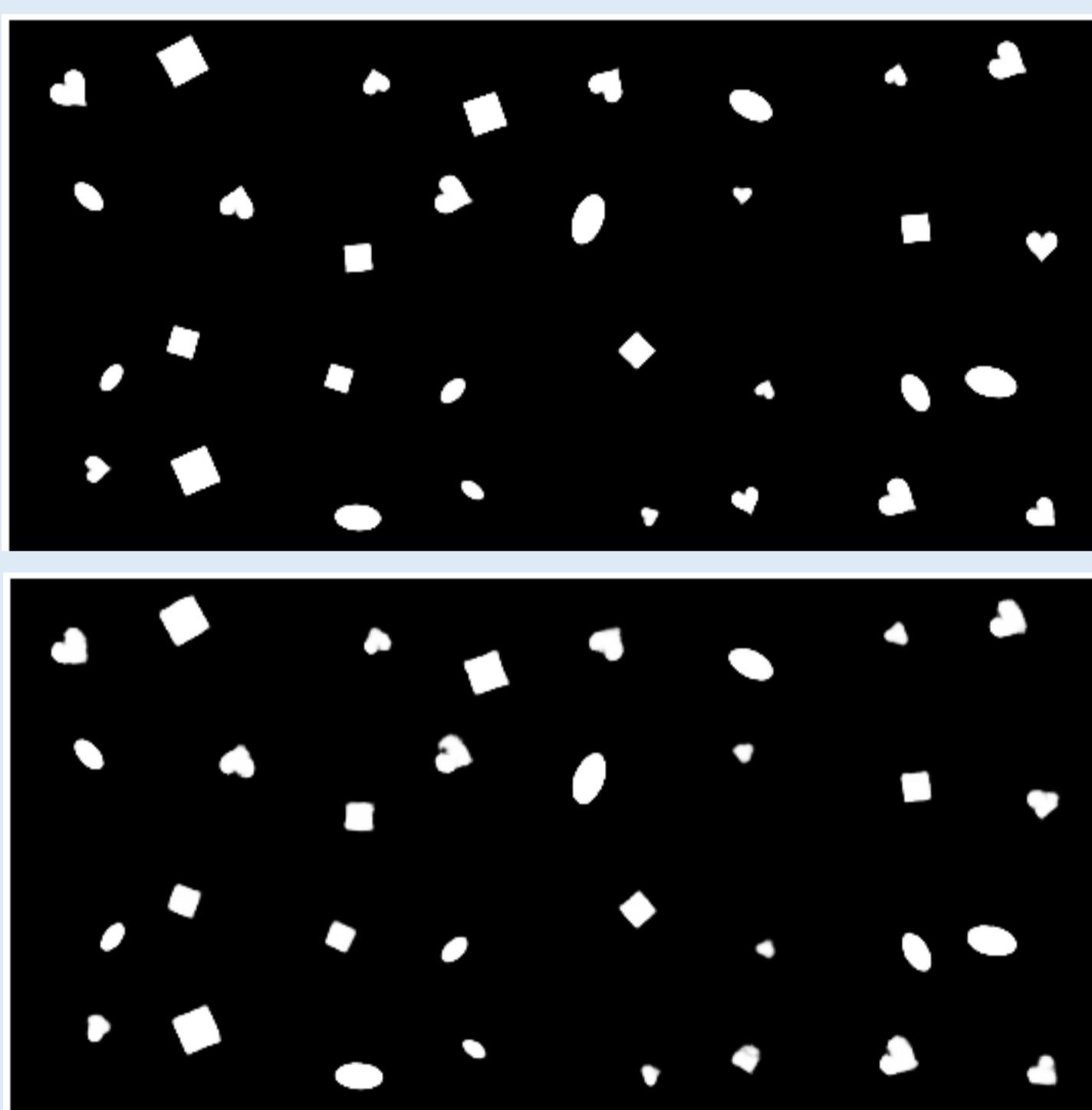
Achieve a better disentanglement and image reconstruction

Approach

For this task we use variational autoencoder. We alter the training procedure by inducing sparsity in the encoder.

Reconstructed

Our approach
(More realistic samples)

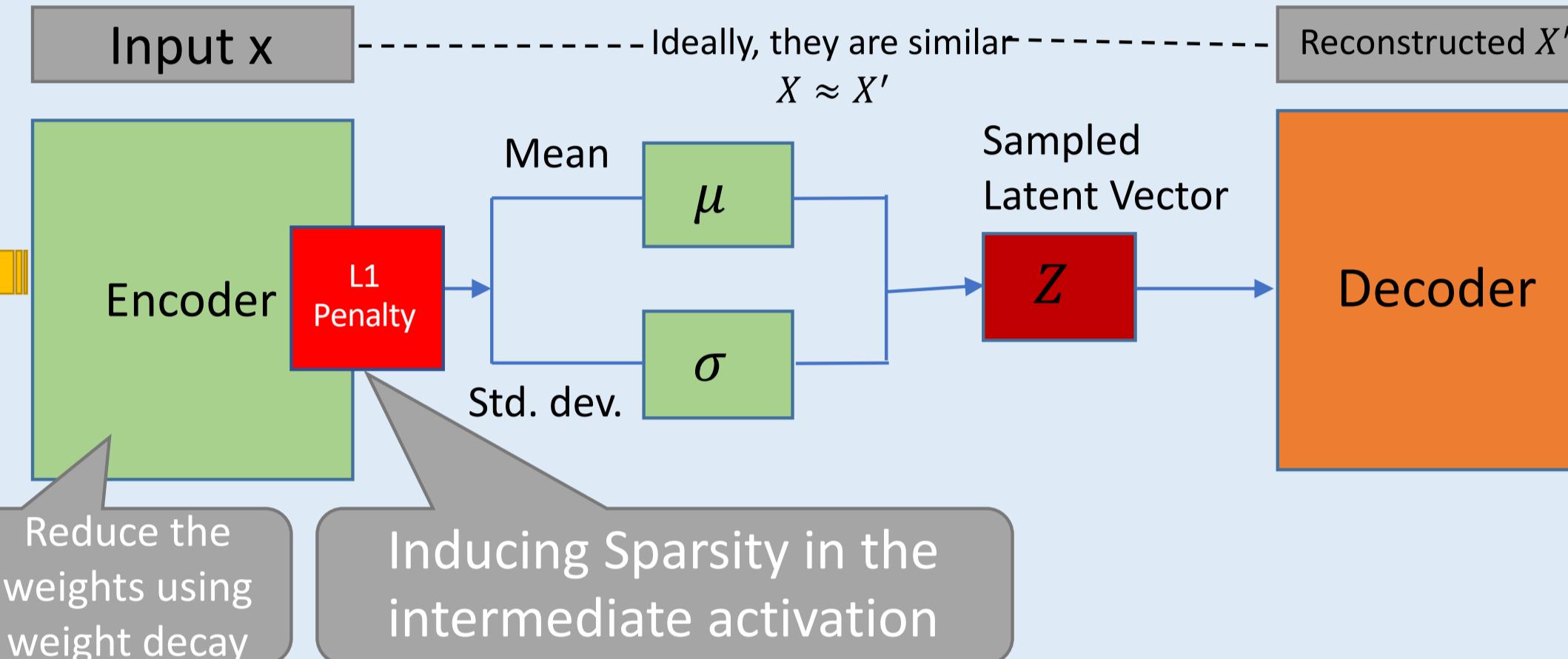


VAE

Dataset



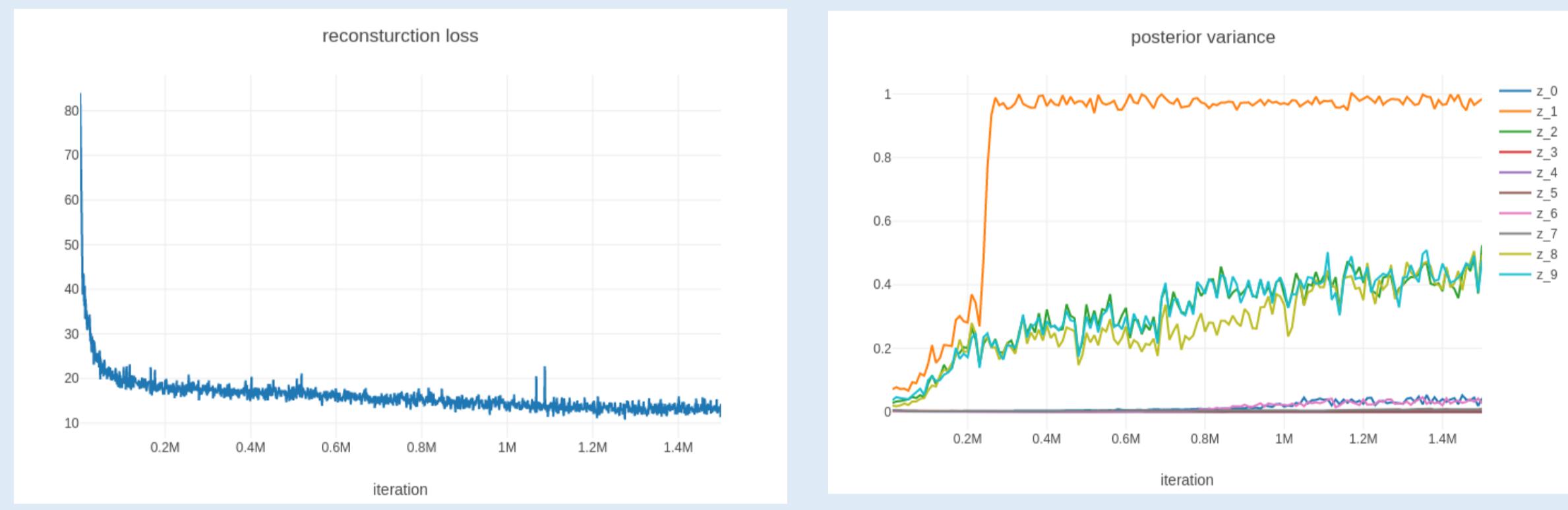
Model



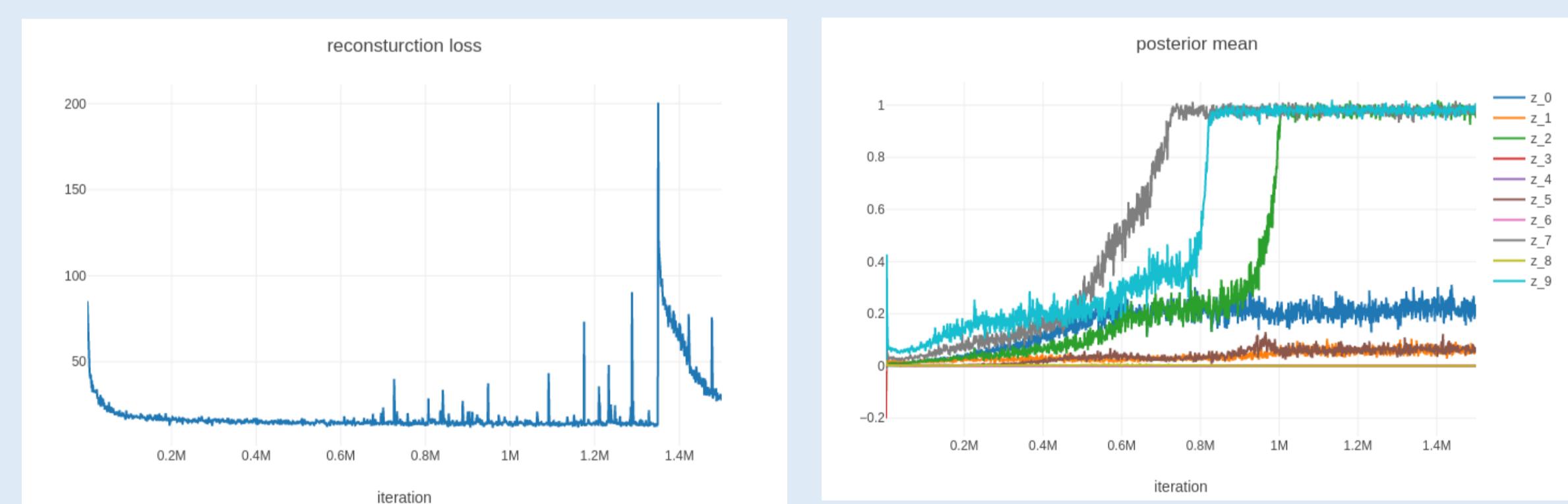
Variational Autoencoder

VAE is a Generative model which generates samples like the true data distribution. A disentangled representation can be defined as one where single latent units are sensitive to changes in single generative factors, while being relatively invariant to changes in other factors (Bengio et al., 2013)

Ours

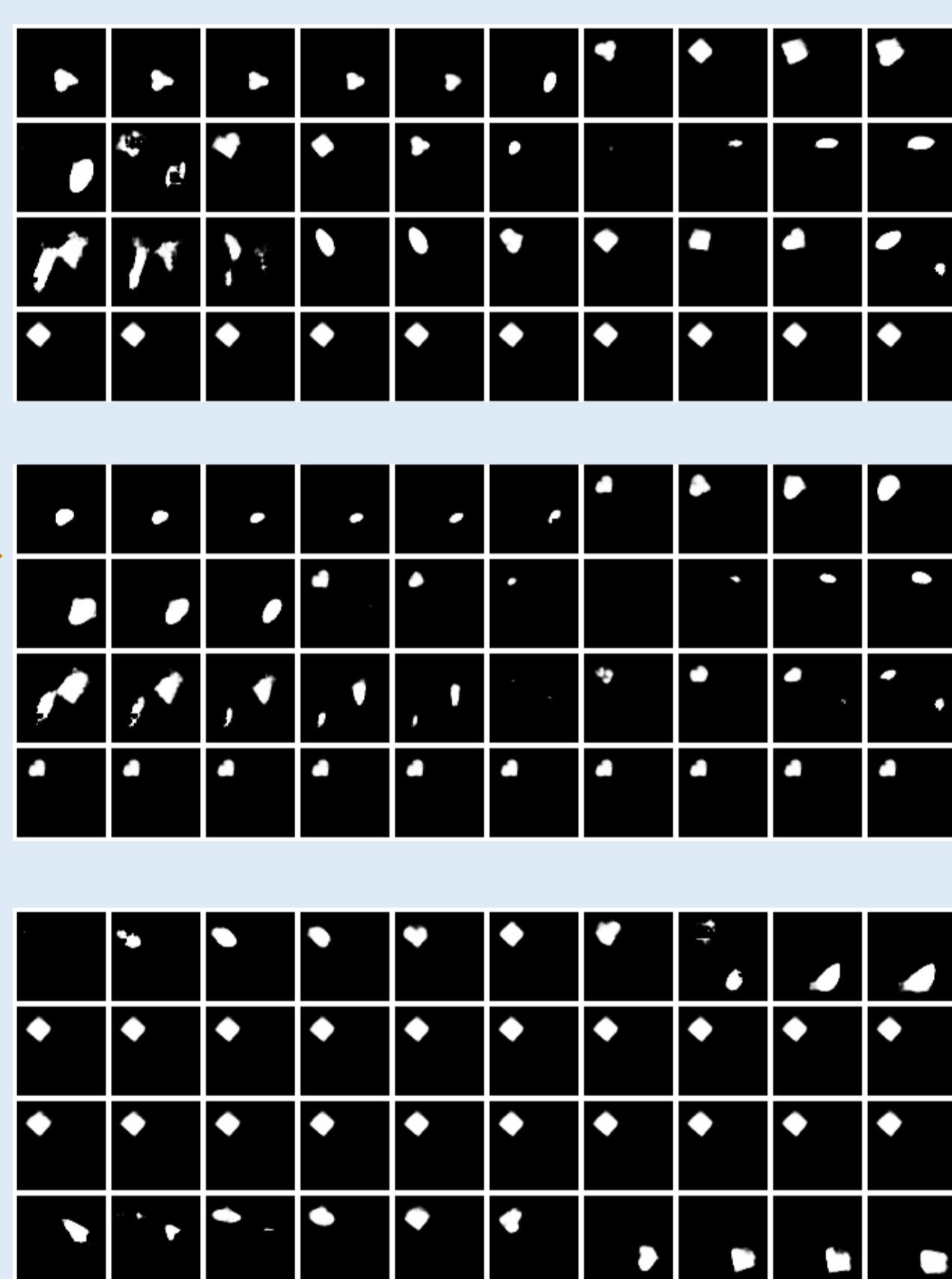


VAE

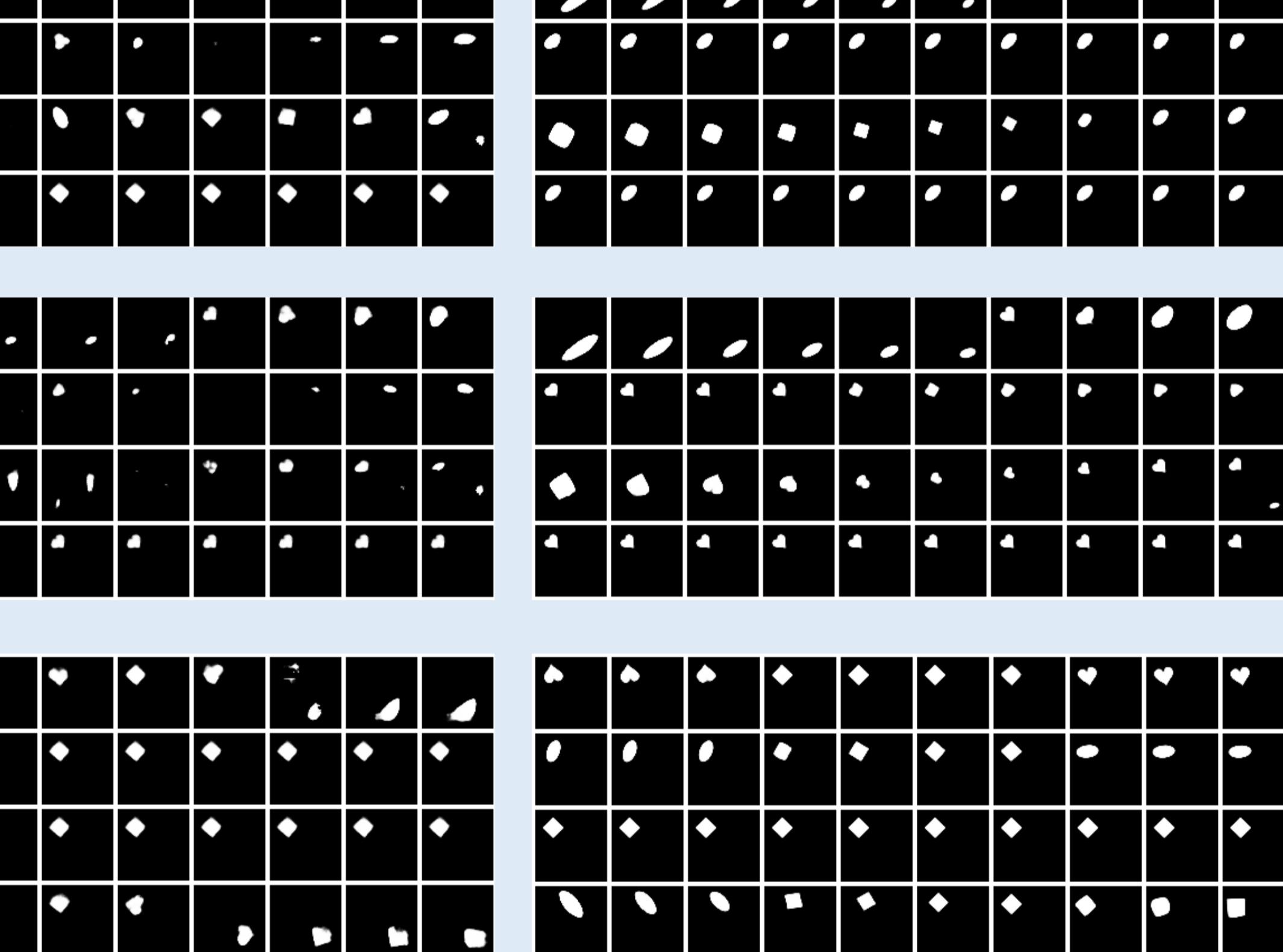


Latent traversal plots from our model that learnt disentangled representations

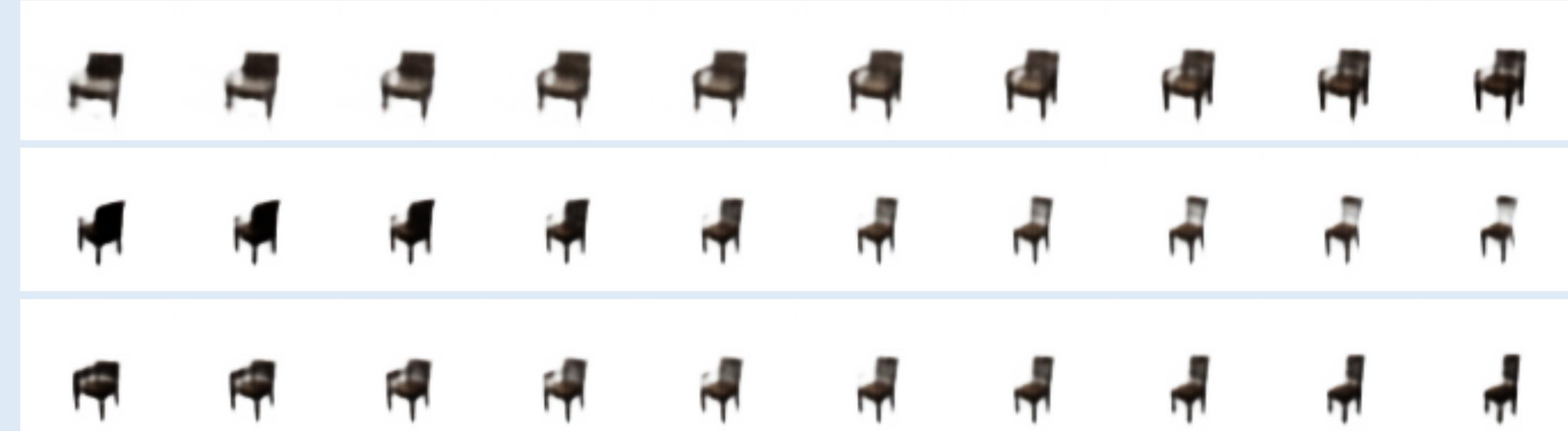
VAE



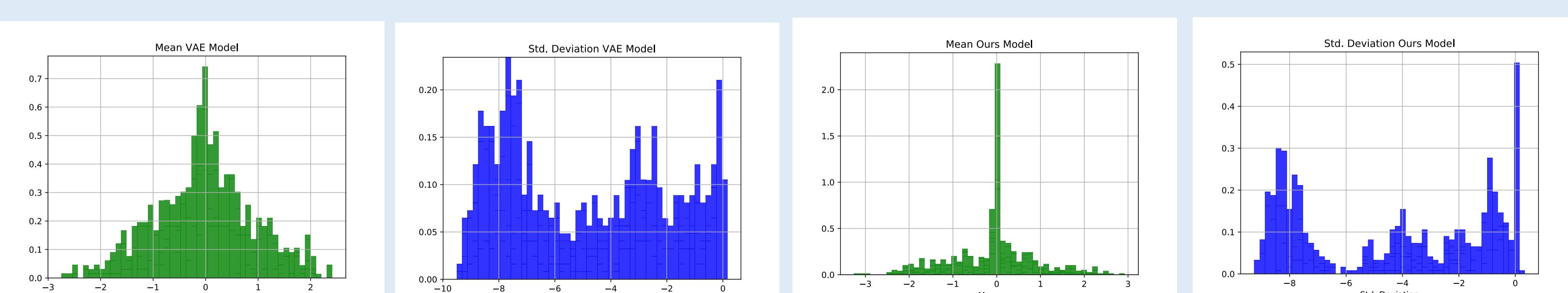
Ours



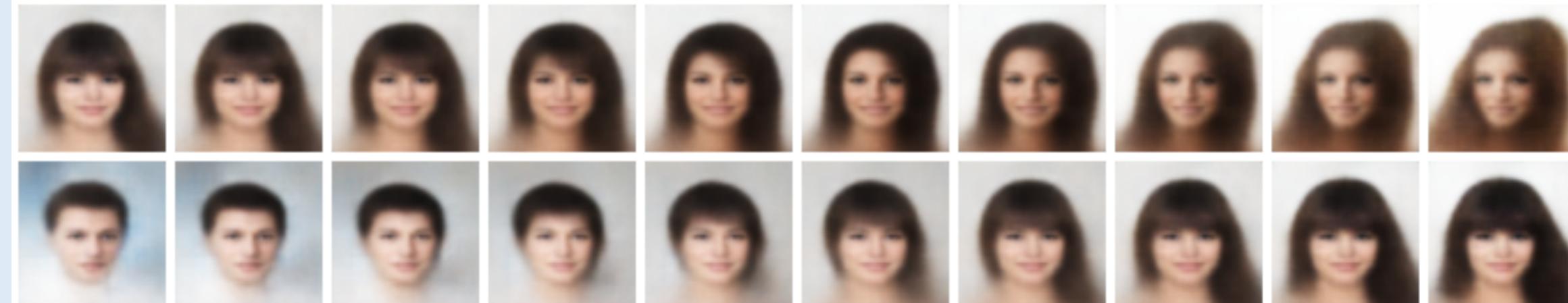
3D Chairs – Latent traversal



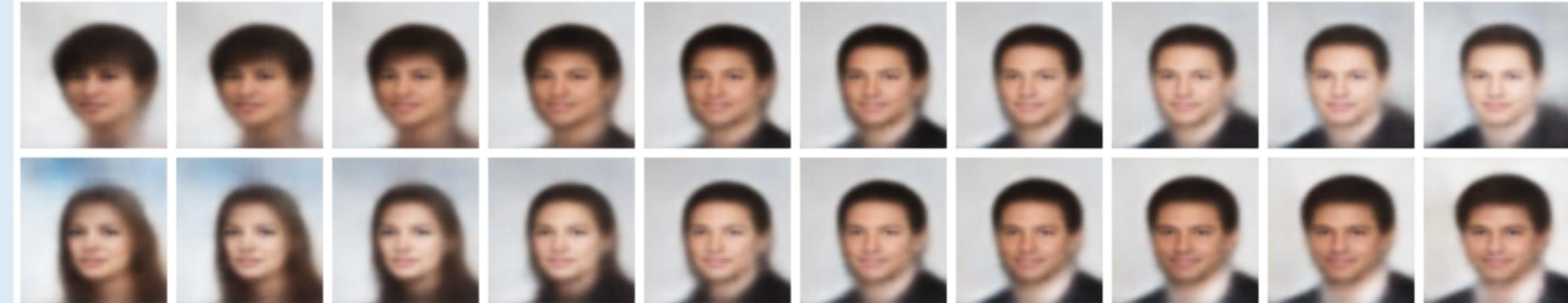
Histogram of Mean and Standard Deviation



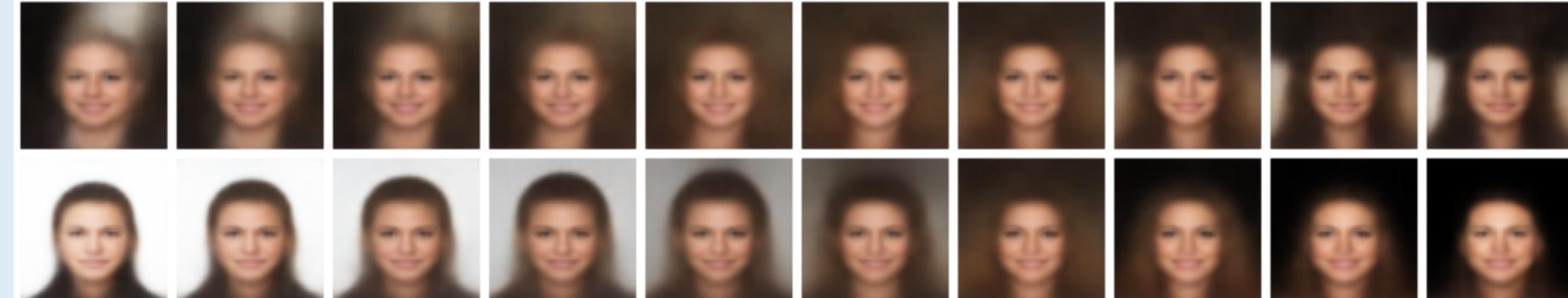
Disentangle hair (fringe)



Disentangle gender



Emotion (smile)



Discussion

We show that for this specific data (2dSprites), the model can disentangle latent factor such as position(X, Y), rotation, shape, identity. Our reconstruction is more realistic than VAE. In future, we will evaluate quantitatively the degree of disentanglement using methods proposed by Higgins et al. and Kim et al.