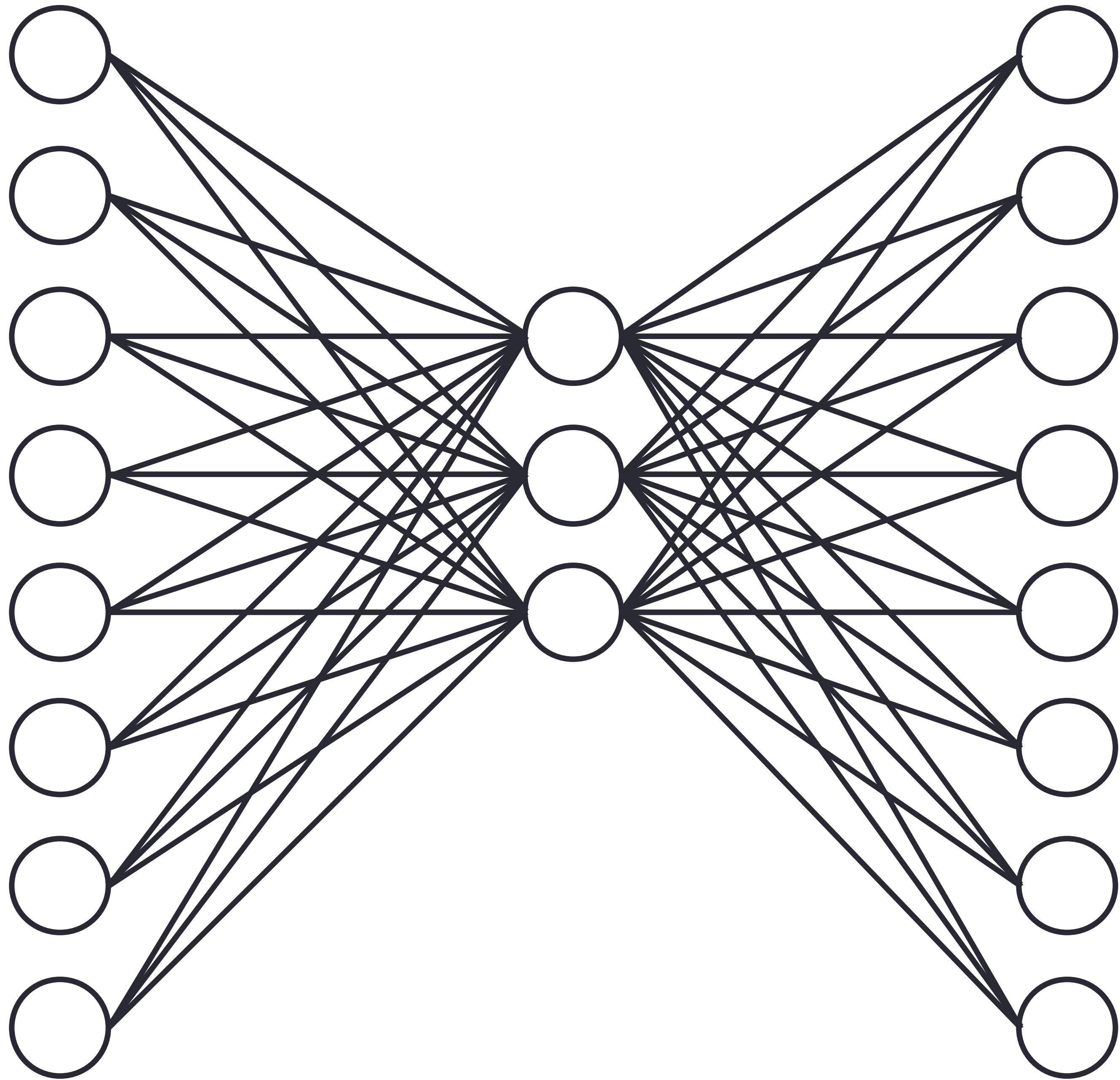


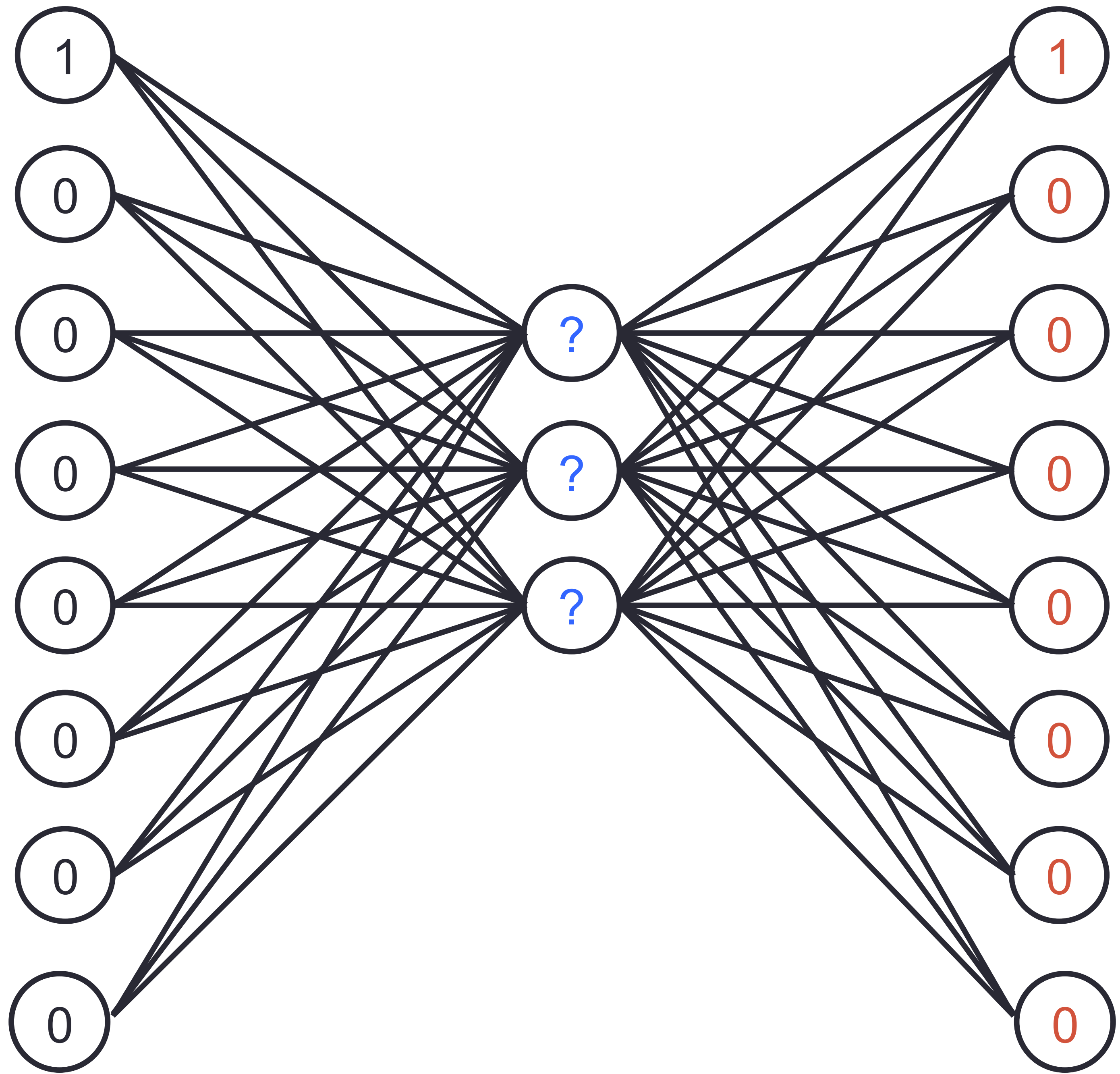
GENERATIVE MODELS

MICHELLE KUCHERA
DAVIDSON COLLEGE

ECT* TALENT SUMMER SCHOOL
02 JULY 2020



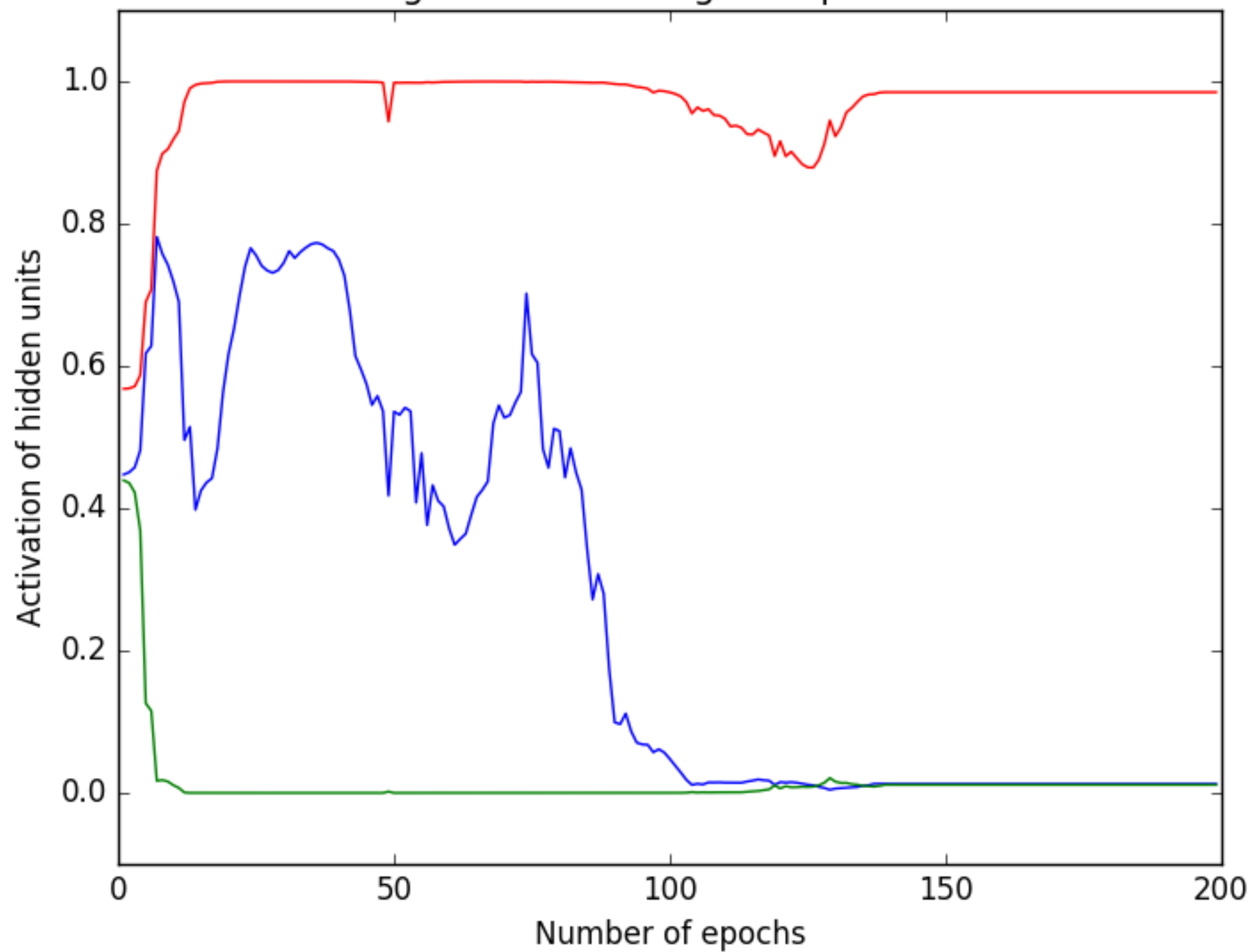
Input	Output
10000000	10000000
01000000	01000000
00100000	00100000
00010000	00010000
00001000	00001000
00000100	00000100



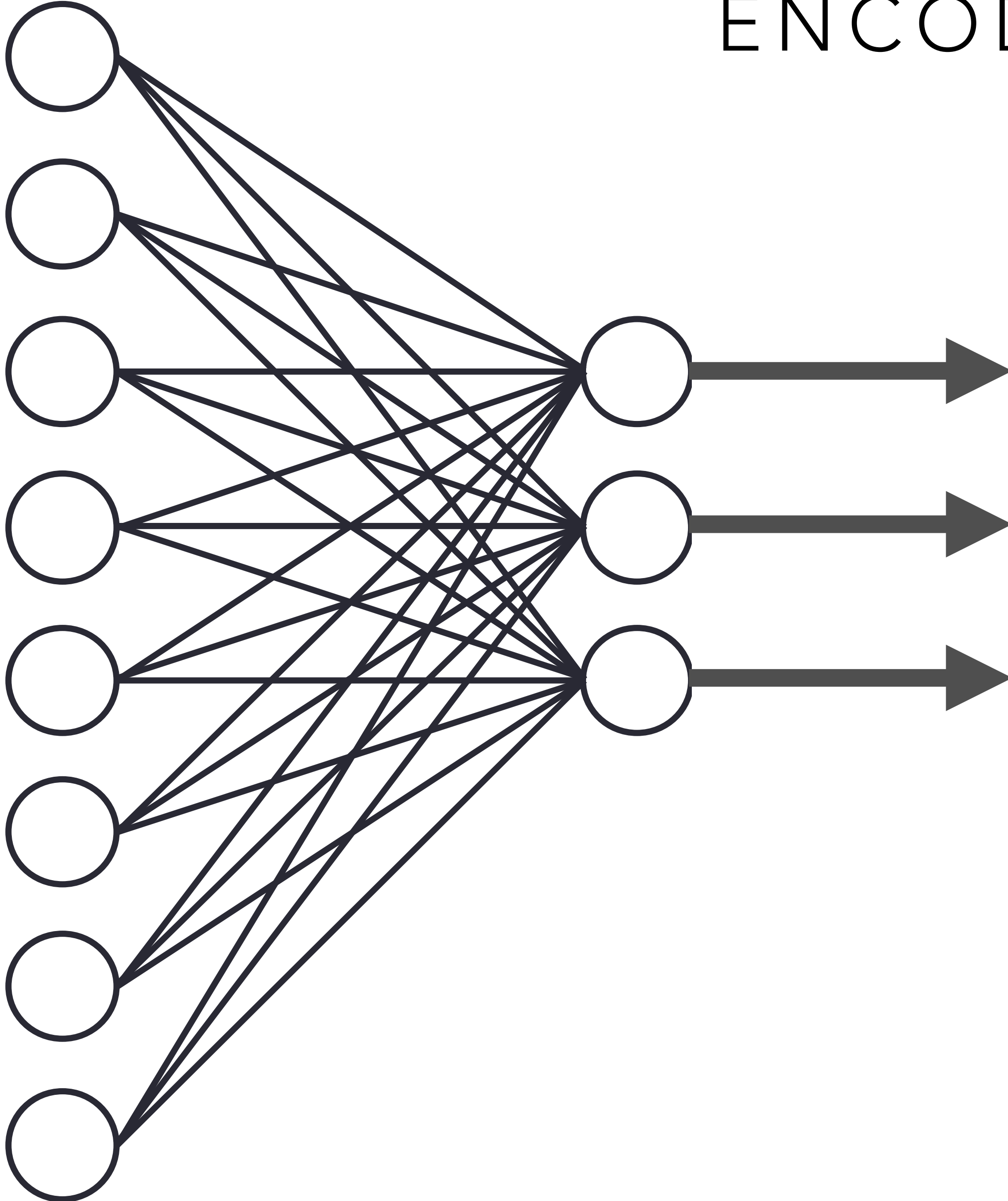
Input	Output
10000000	10000000
01000000	01000000
00100000	00100000
00010000	00010000
00001000	00001000
00000100	00000100

Input	A1	A2	A3	Output
10000000	0.9911	0.9869	0.0093	10000000
01000000	0.9892	0.0095	0.0124	01000000
00100000	0.0094	0.0283	0.0122	00100000
00010000	0.9840	0.9836	0.9900	00010000
00001000	0.0139	0.9904	0.0186	00001000
00000100	0.0128	0.9805	0.9868	00000100

Learning of the encoding for input 00000010



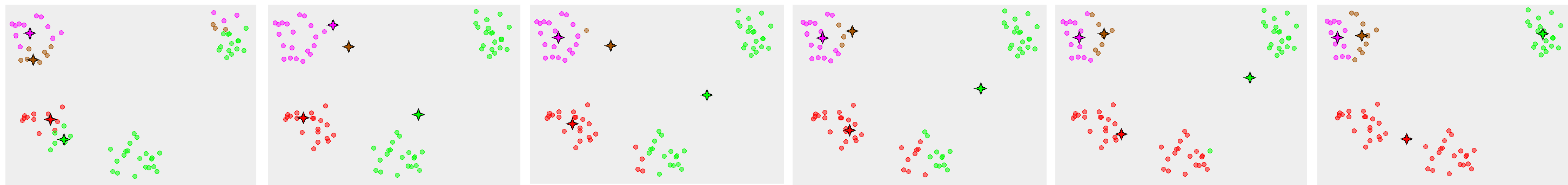
ENCODER



CLUSTERING — KMEANS

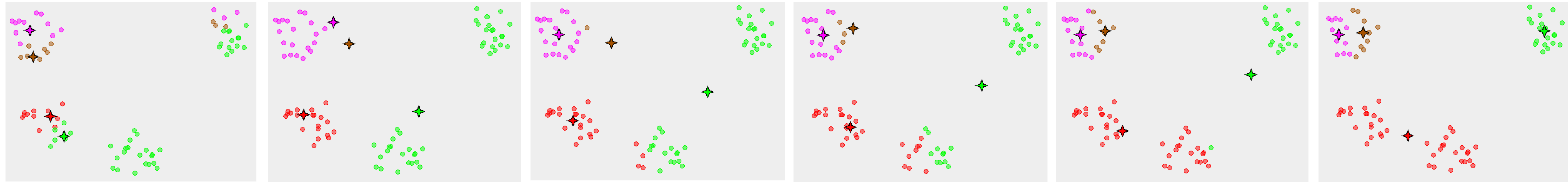
Goal: minimize pairwise distances between points in *same* cluster

$$\min \sum_{i=1}^k \frac{1}{2N} \sum_{x,y,x \neq y} (\bar{x} - \bar{y})^2$$

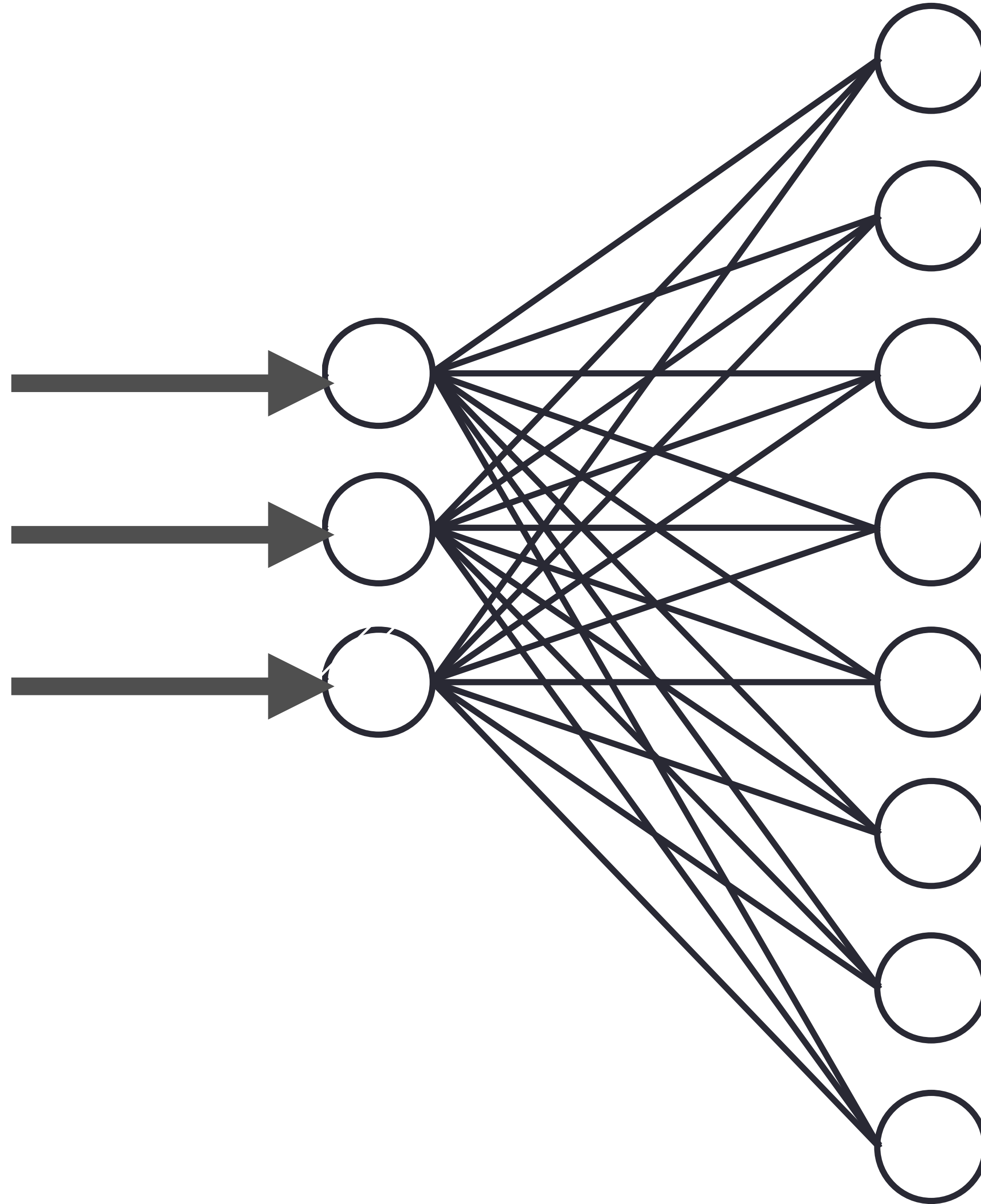


Goal: maximize pairwise distances between points in *different* clusters

CLUSTERING — KMEANS

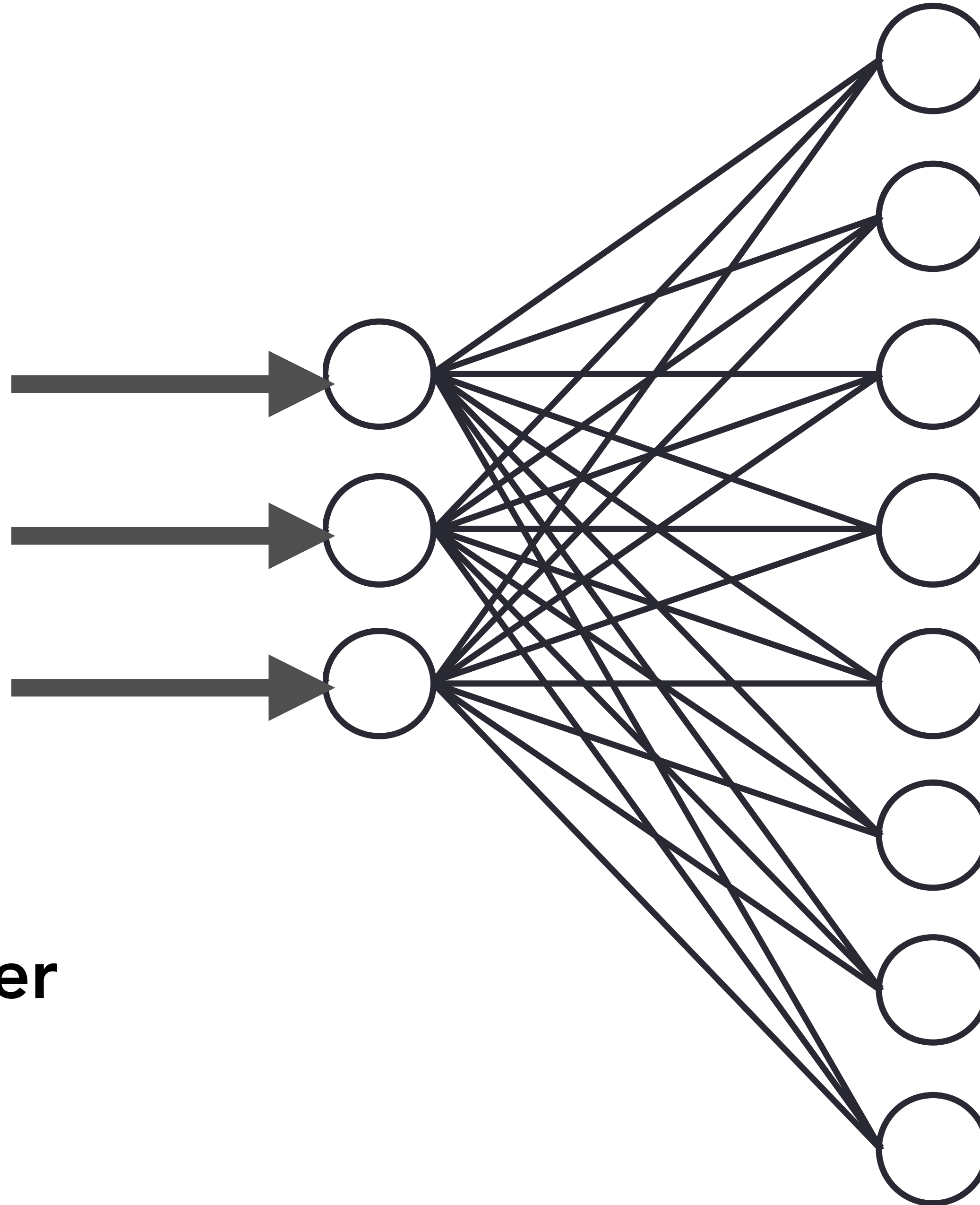


DECODER



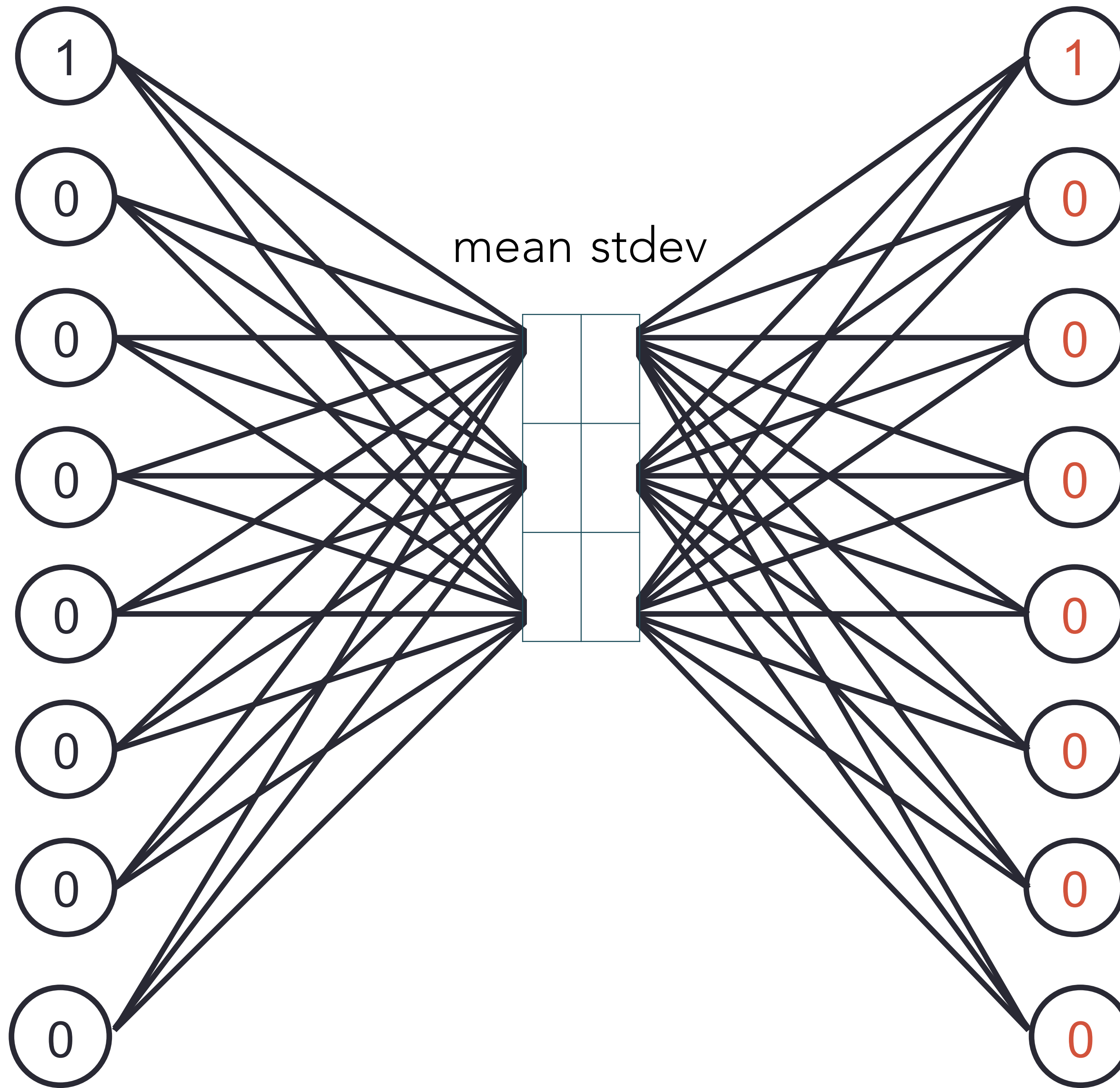
DECODER

How do we know that we are providing a latent vector that represents those seen in training?

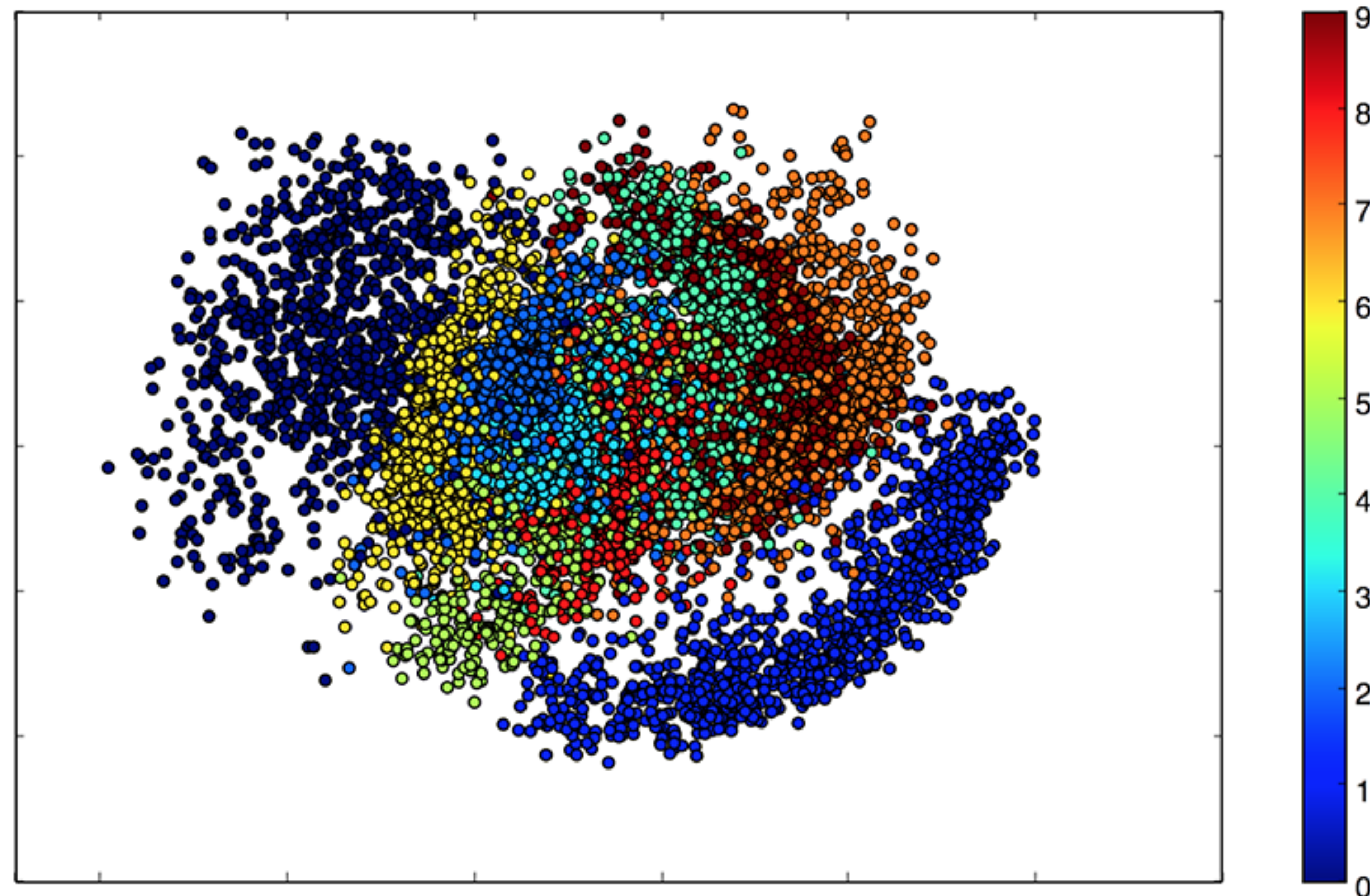
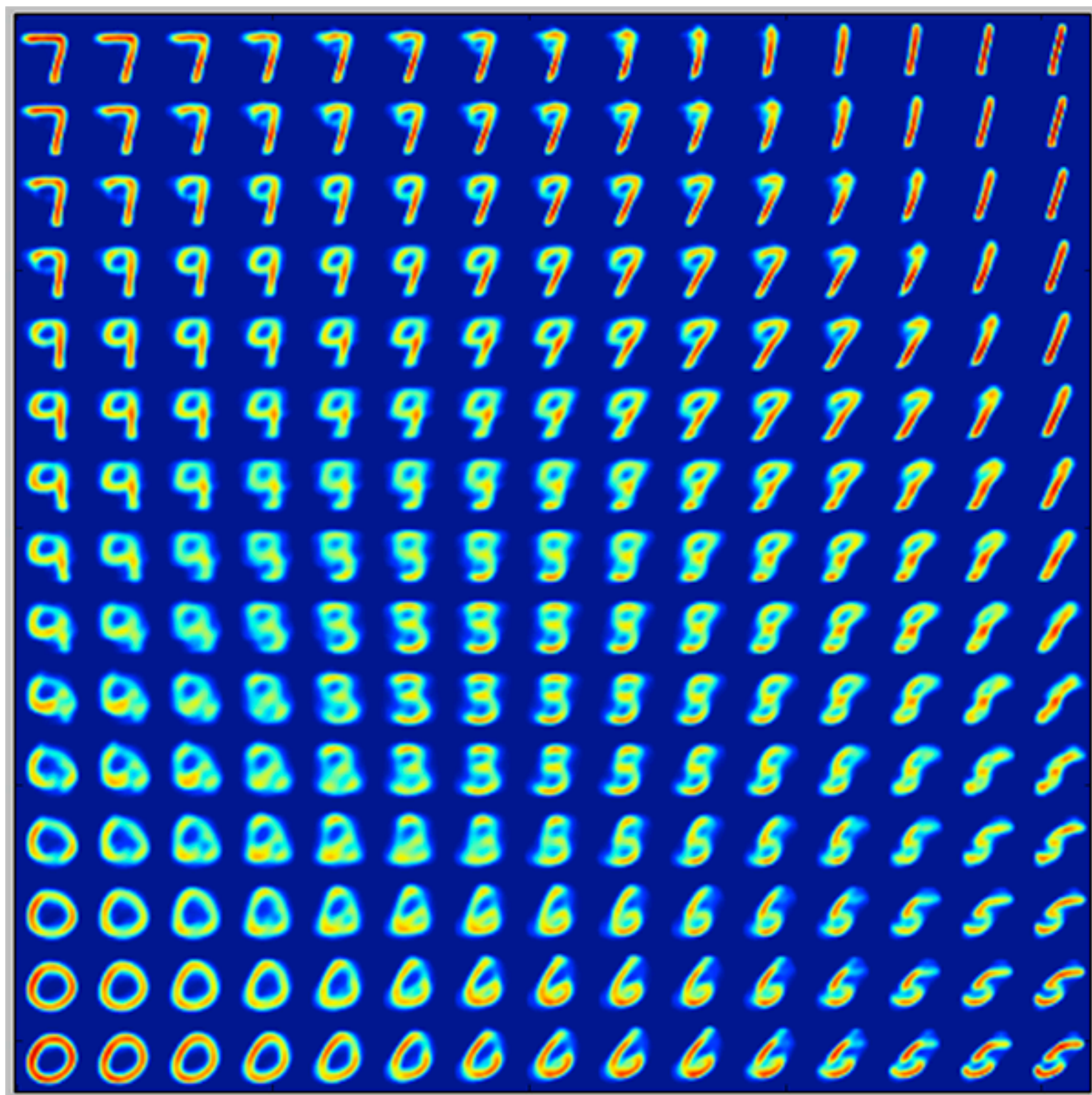


Variational Autoencoder

Encode to two outputs for each latent dimension: mean and stdev

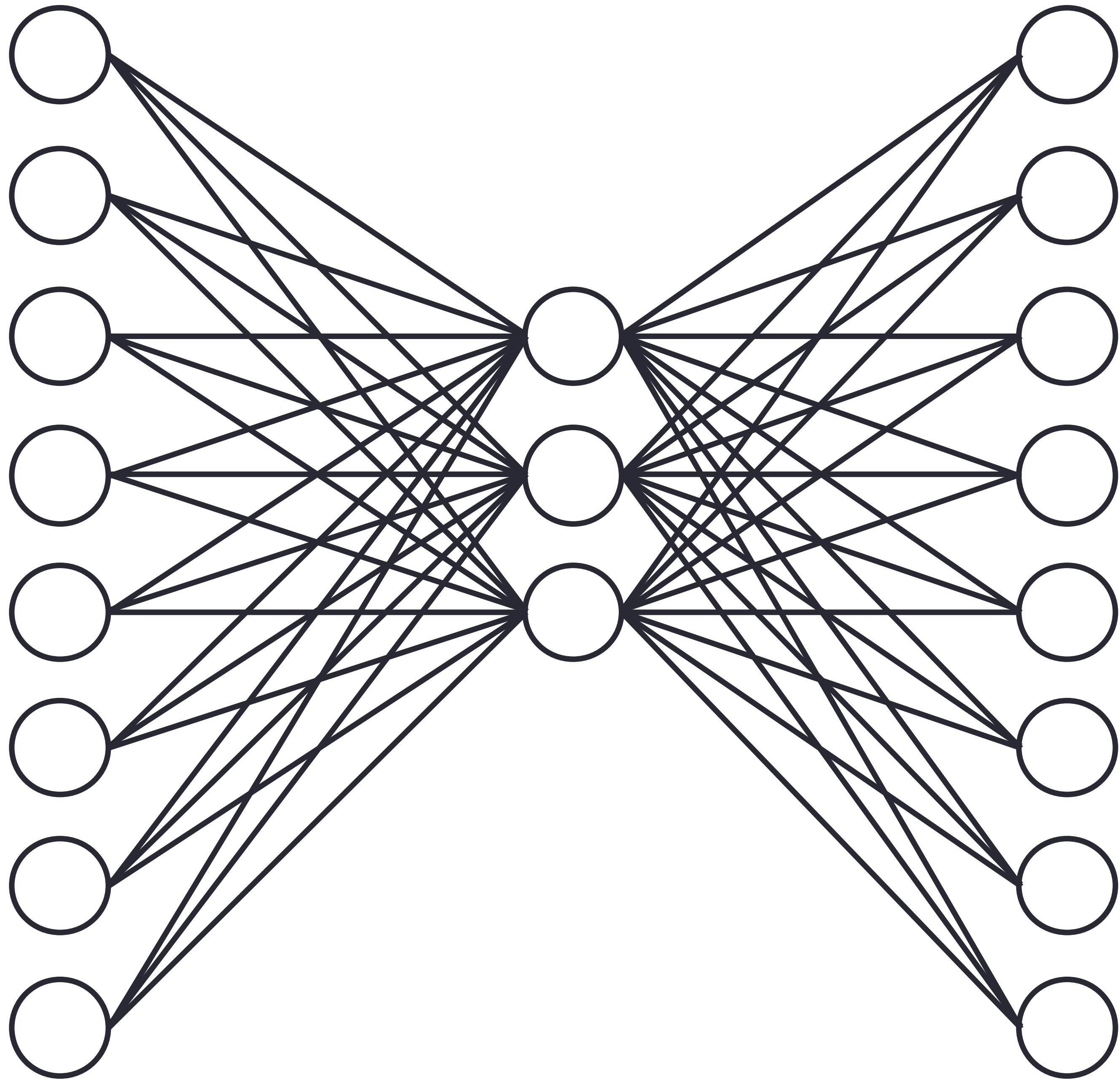


Sample similar points in latent space, decode, and compare with regularization



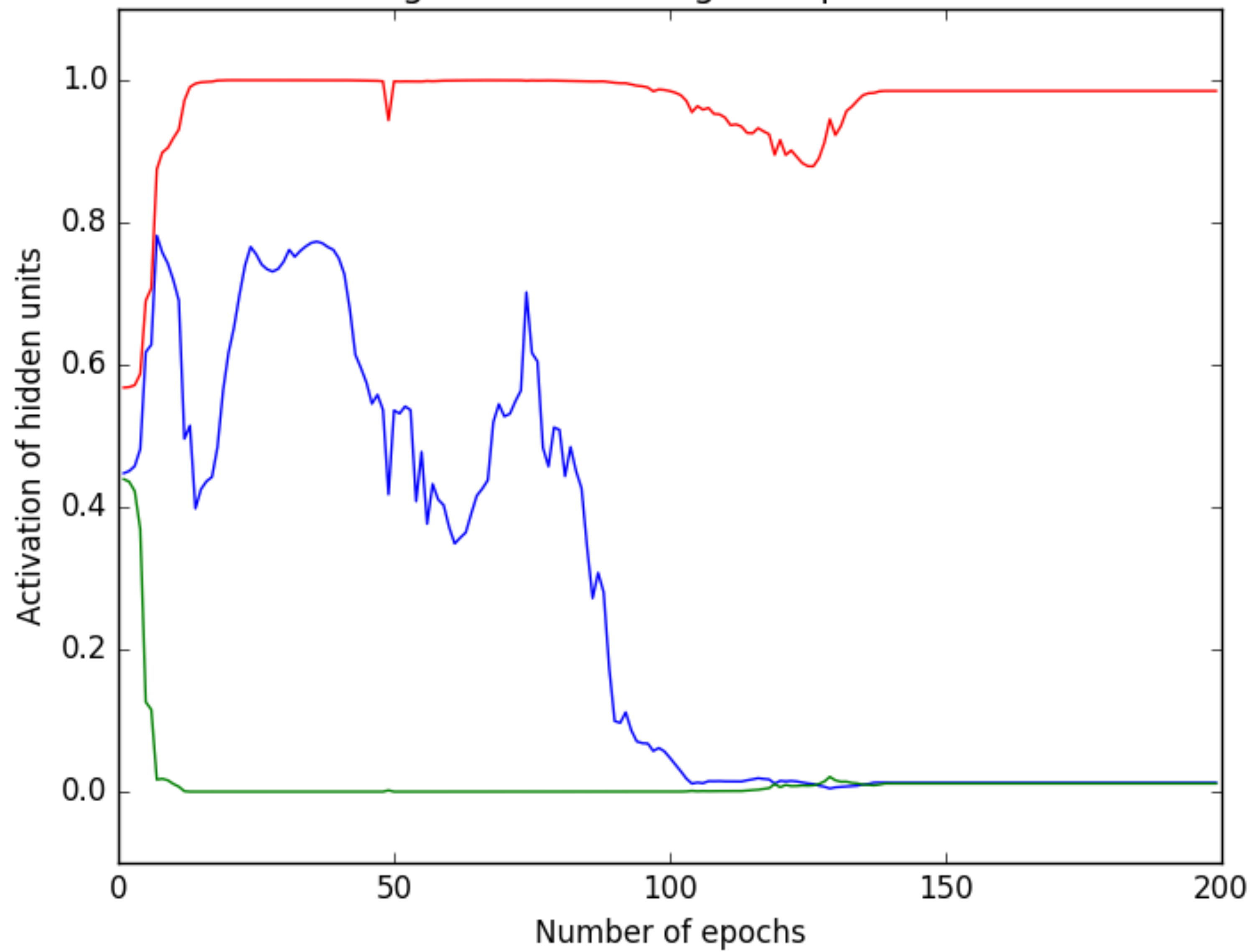
<https://blog.keras.io/building-autoencoders-in-keras.html>

GENERATIVE ADVERSARIAL NETWORKS (GANS)

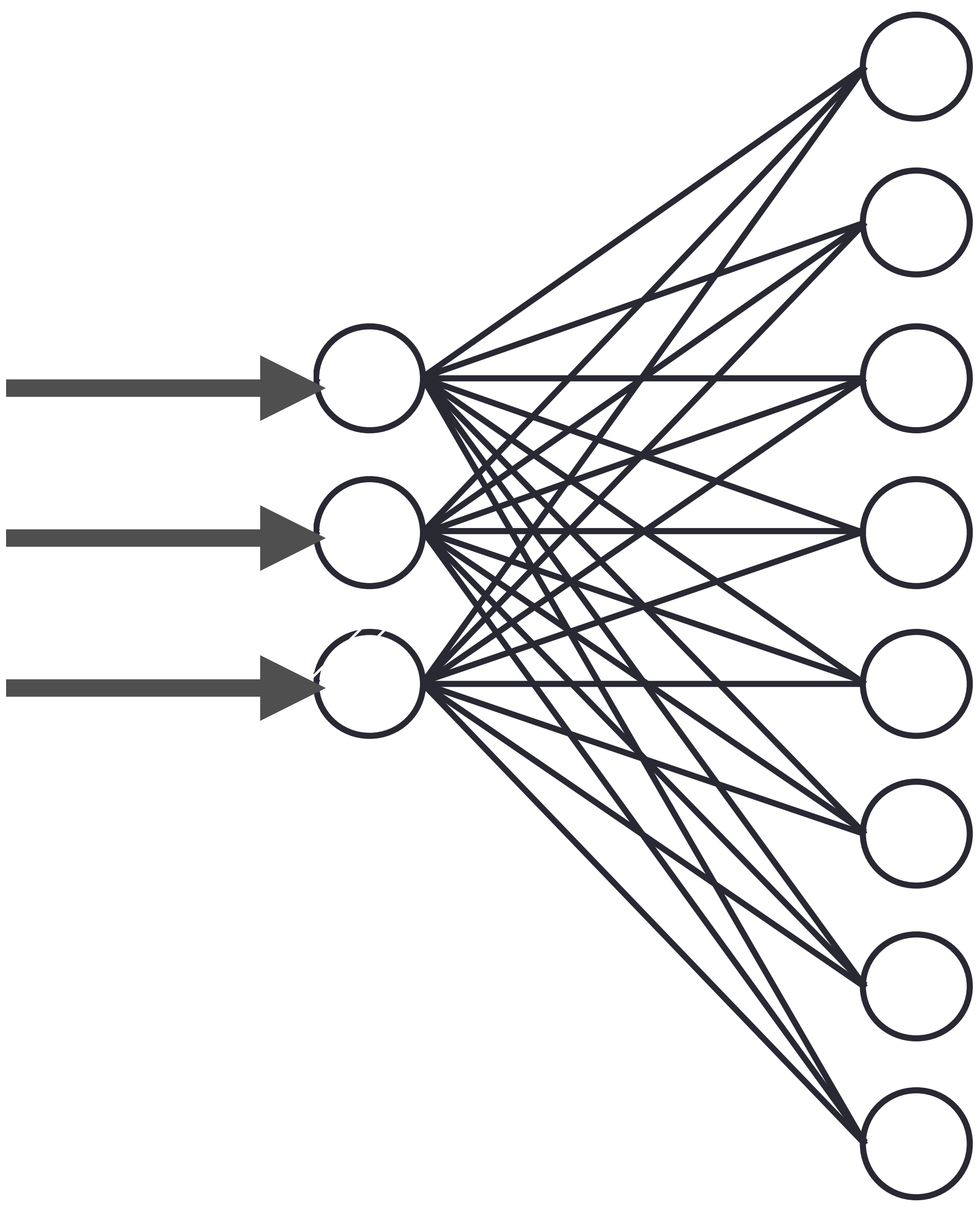


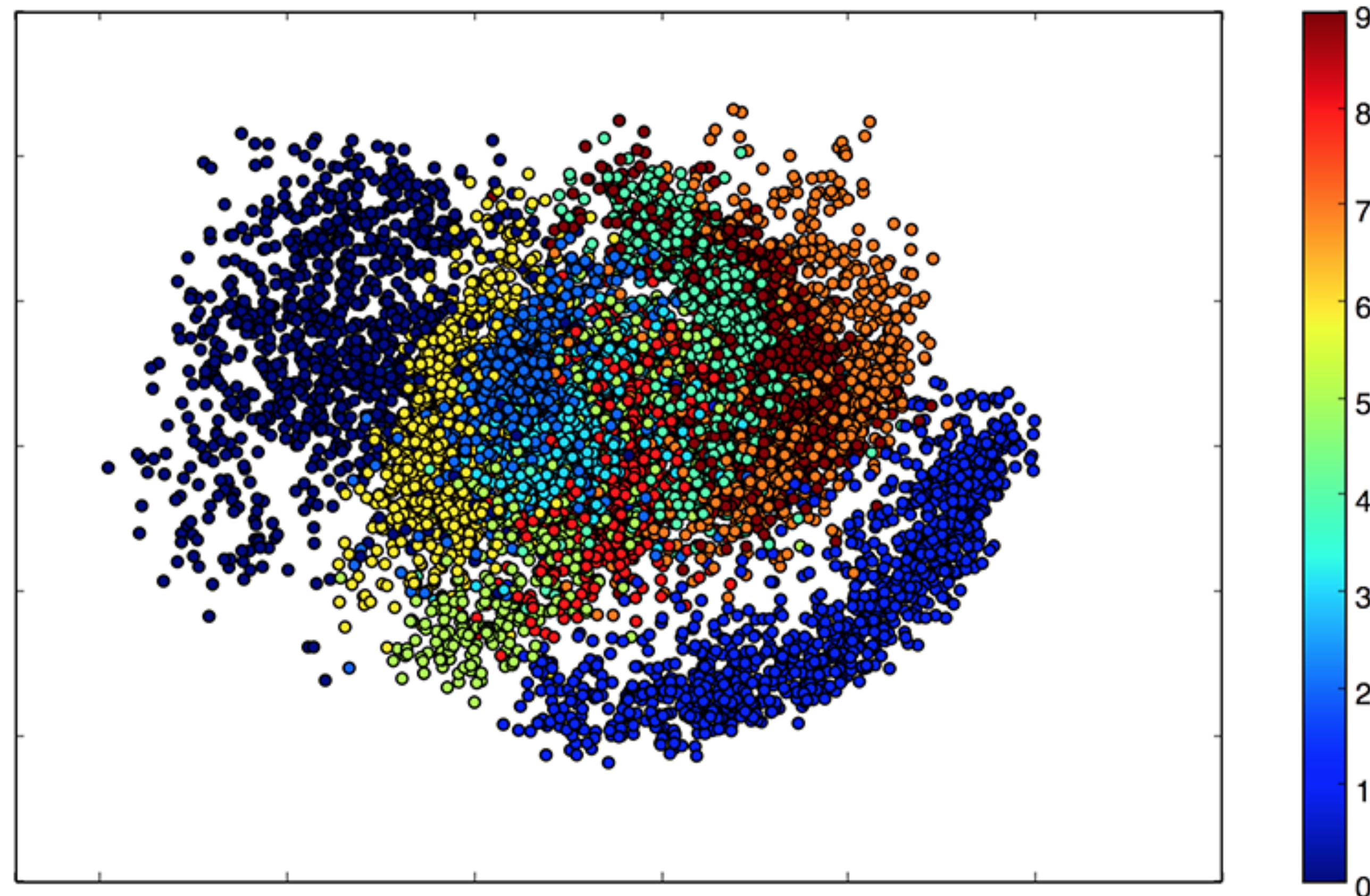
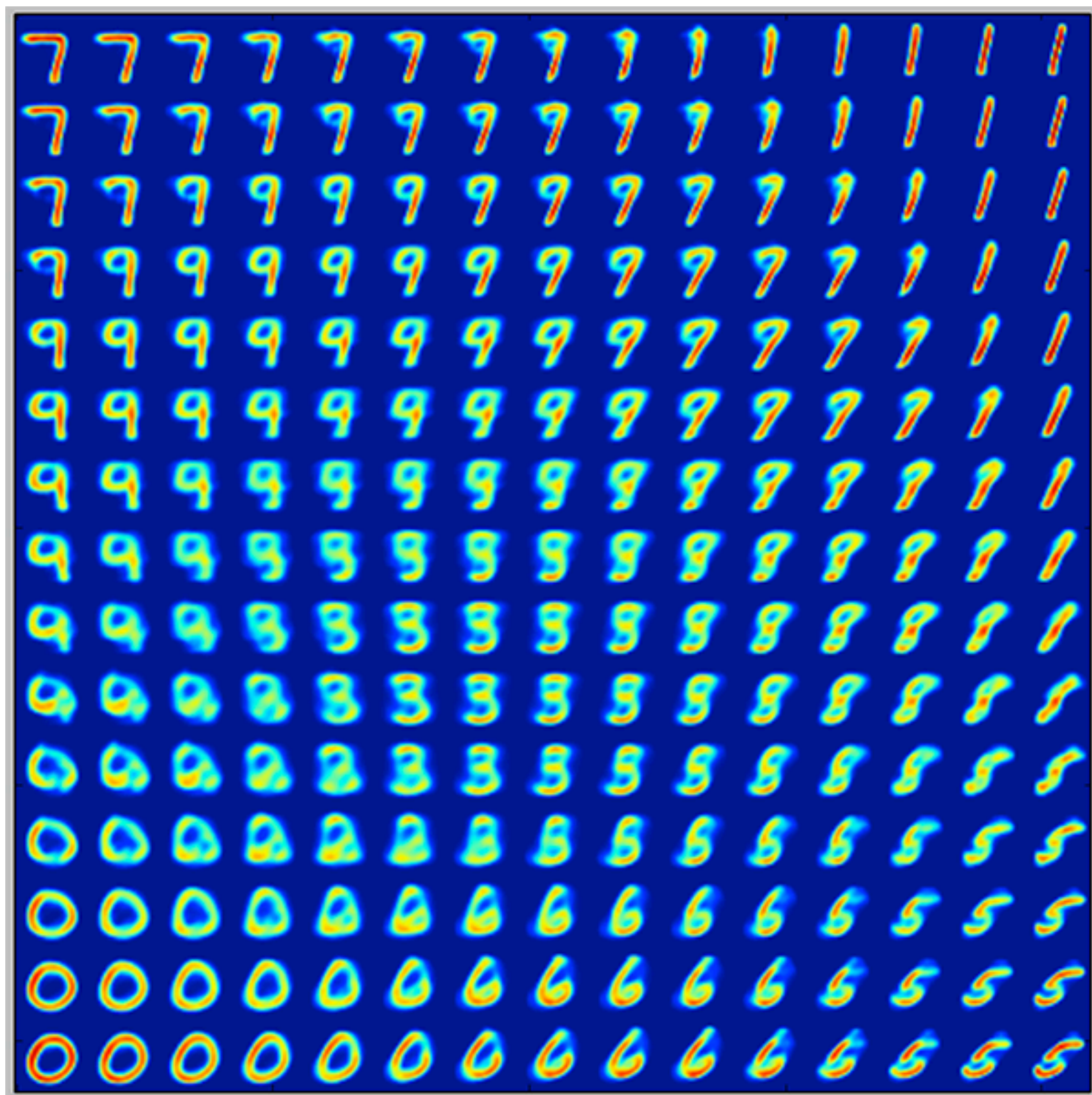
Input	A1	A2	A3	Output
10000000	0.9911	0.9869	0.0093	10000000
01000000	0.9892	0.0095	0.0124	01000000
00100000	0.0094	0.0283	0.0122	00100000
00010000	0.9840	0.9836	0.9900	00010000
00001000	0.0139	0.9904	0.0186	00001000
00000100	0.0128	0.9805	0.9868	00000100

Learning of the encoding for input 00000010



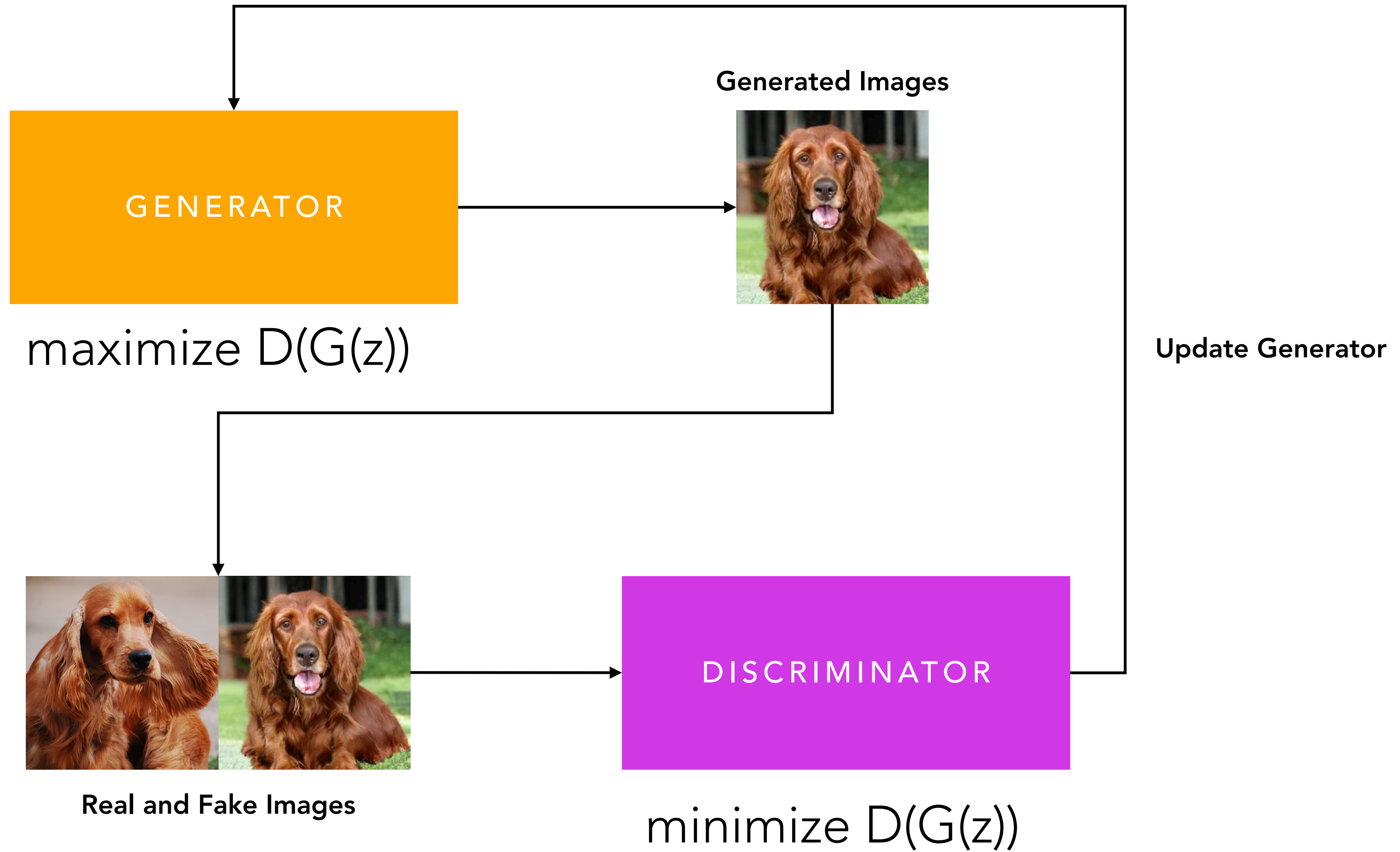
VARIATIONAL AUTOENCODERS (VAES)





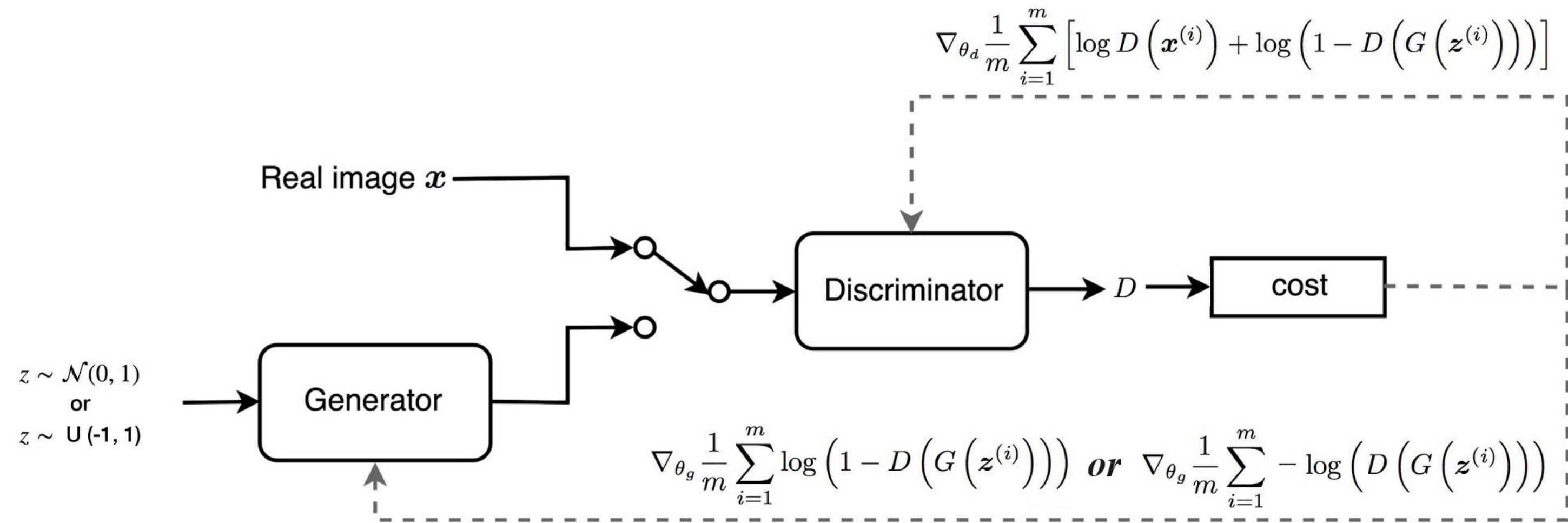
<https://blog.keras.io/building-autoencoders-in-keras.html>

GENERATIVE ADVERSARIAL NETWORKS (GANS)

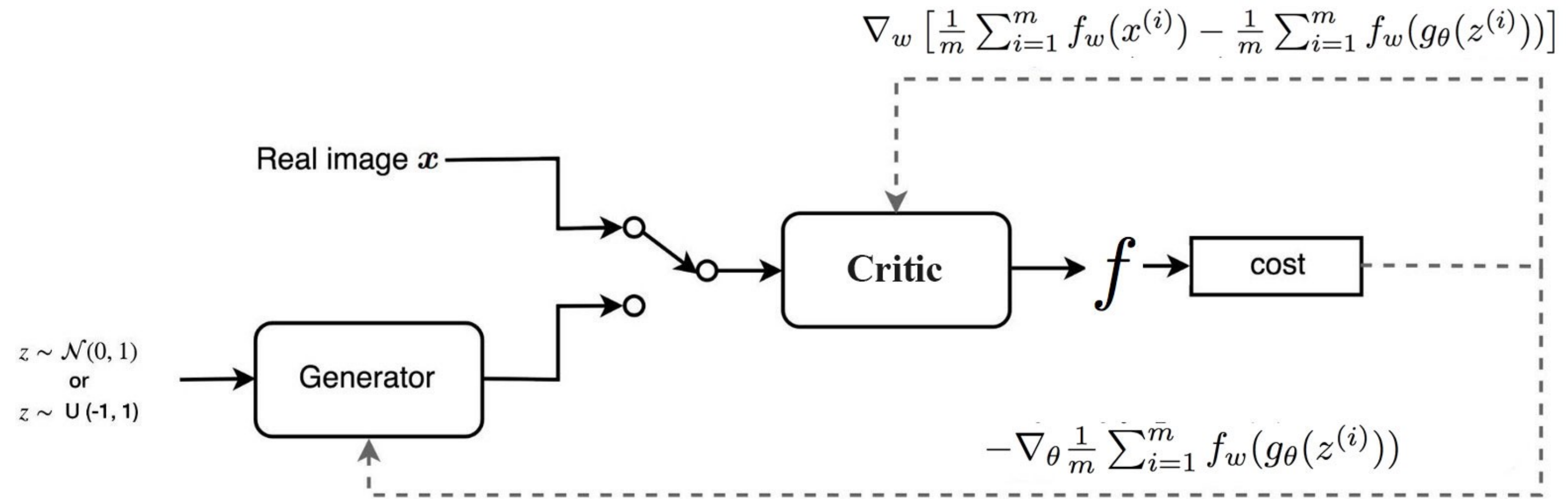


minimax / binary cross entropy

GAN



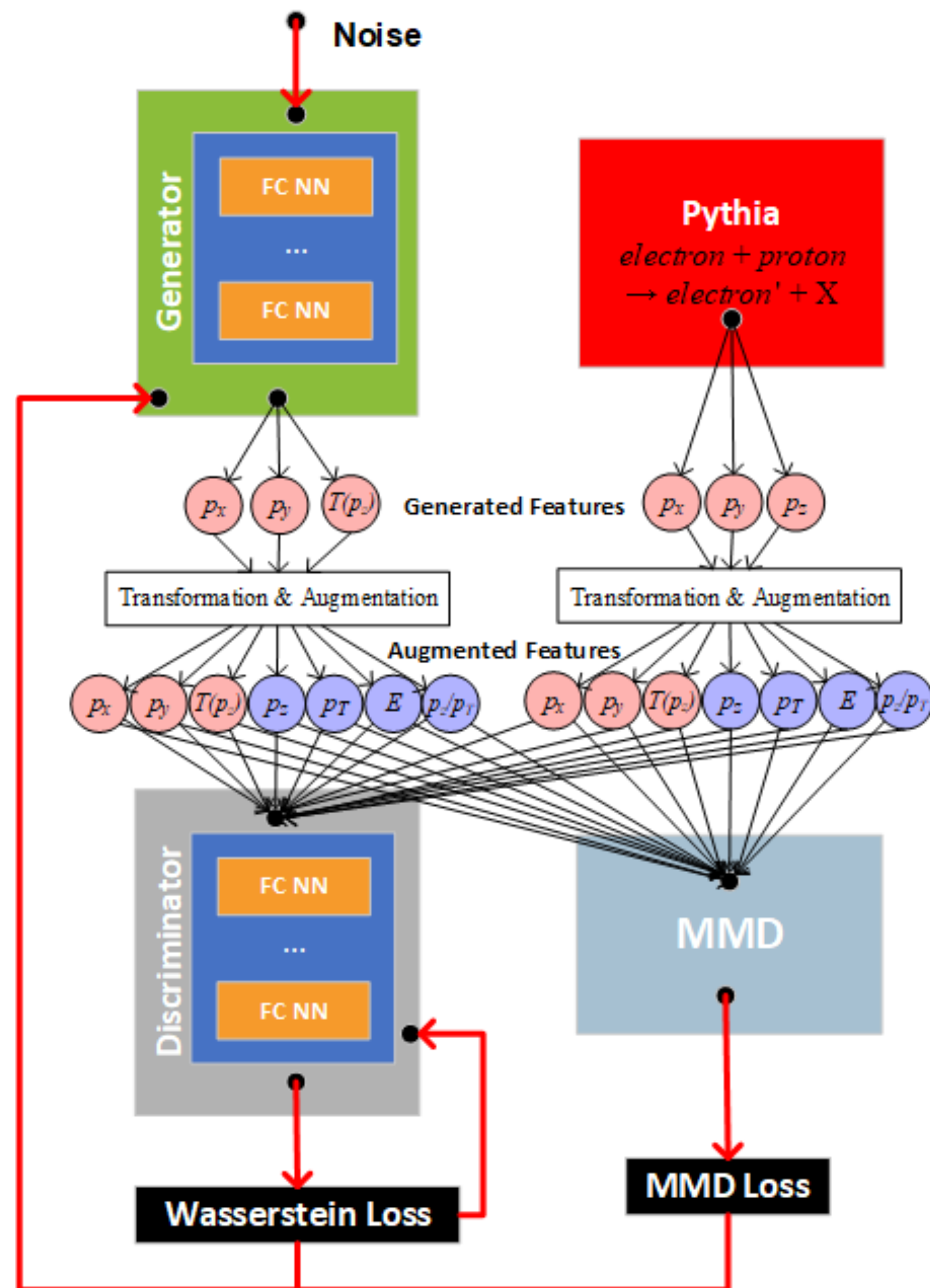
WGAN

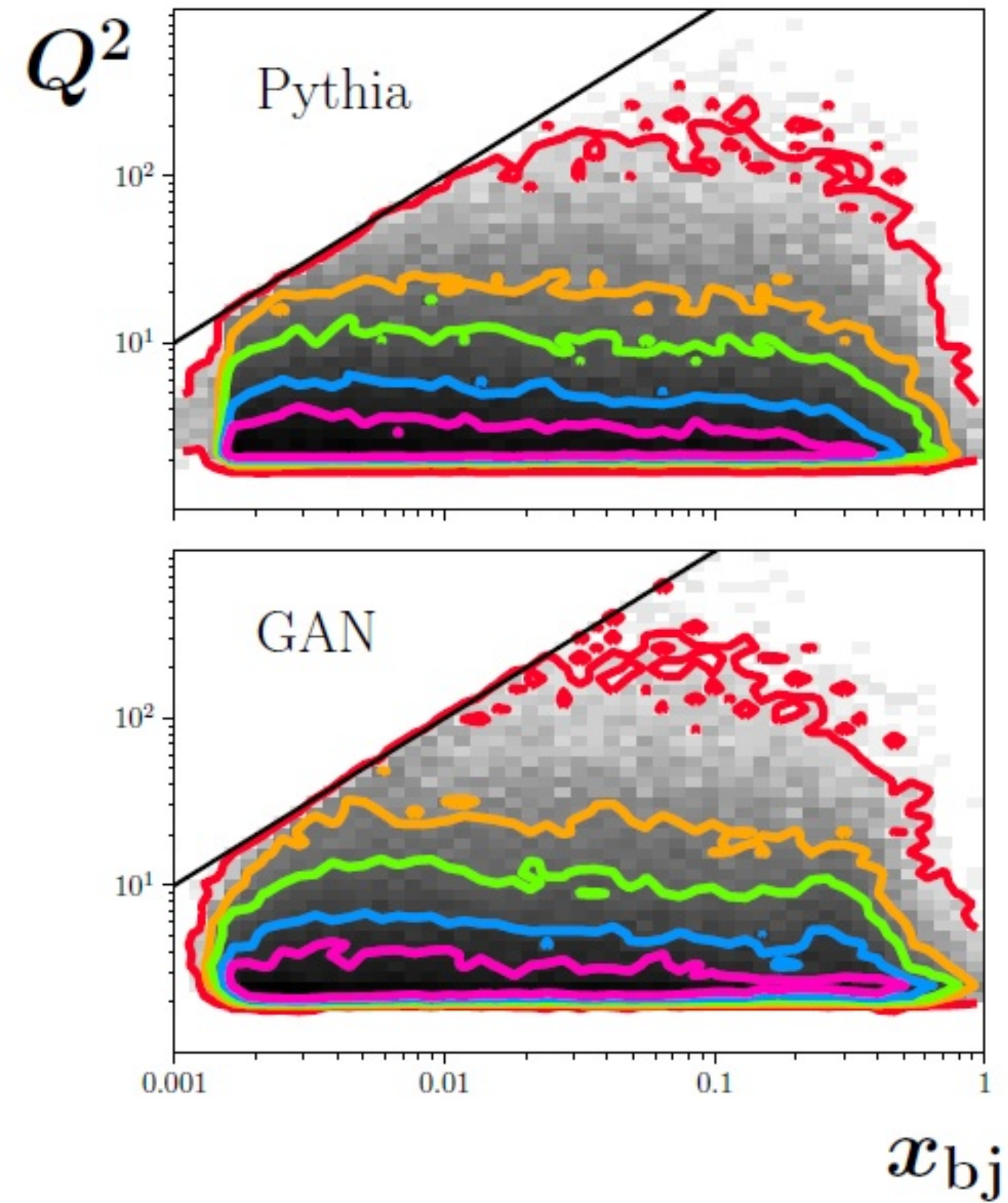
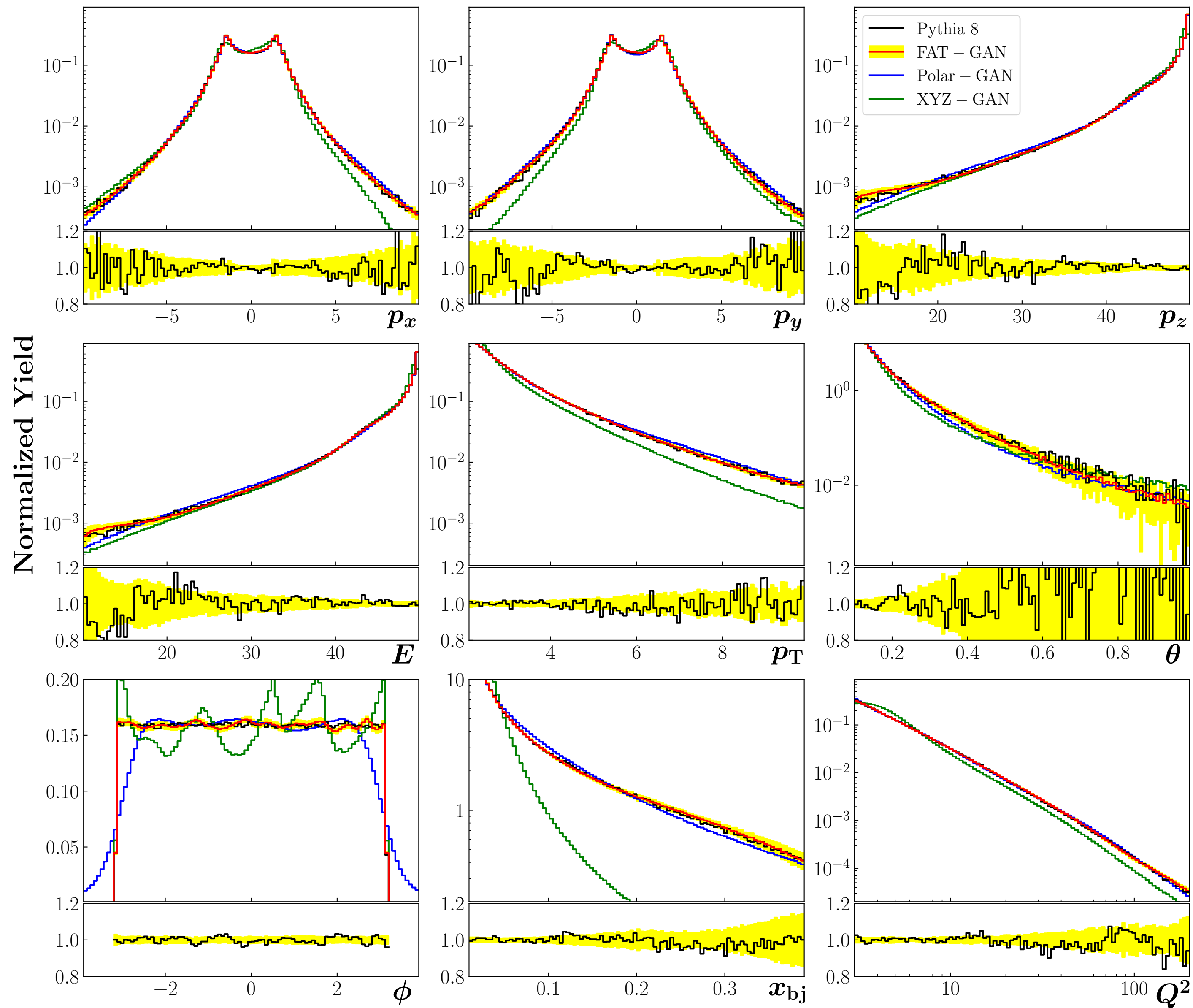


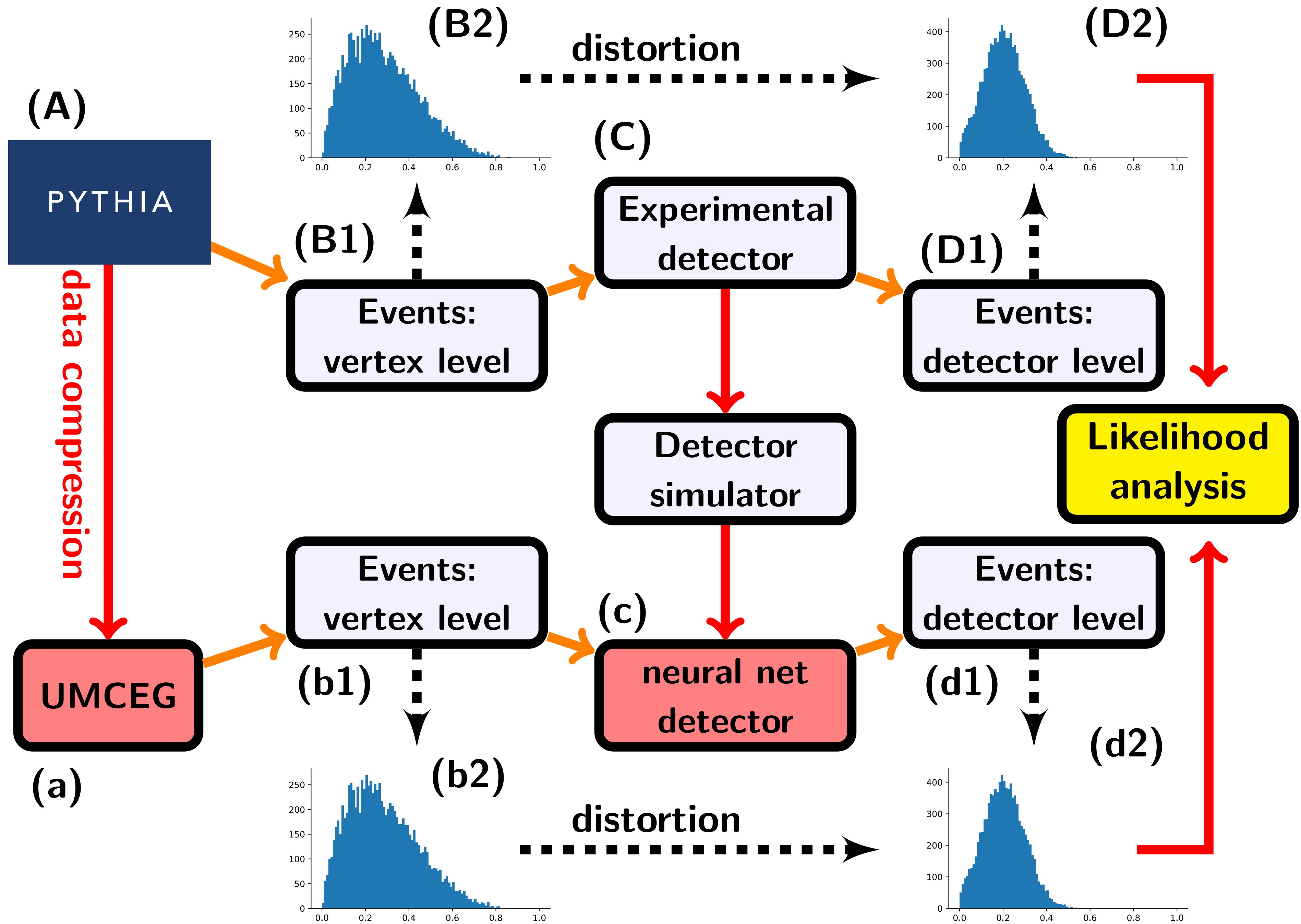
MAXIMUM MEAN DISCREPANCY (MMD) GAN

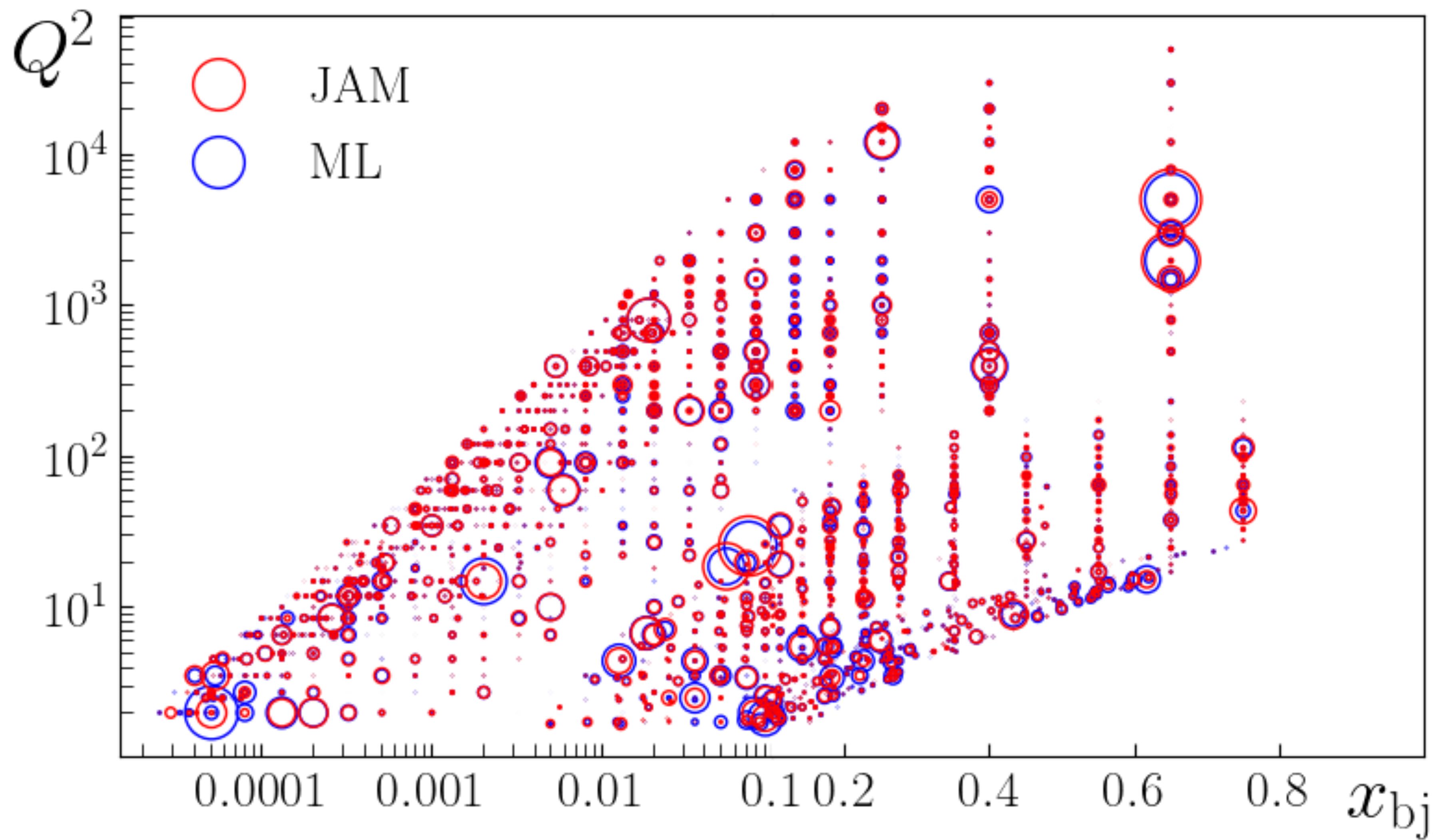
FAT-GAN

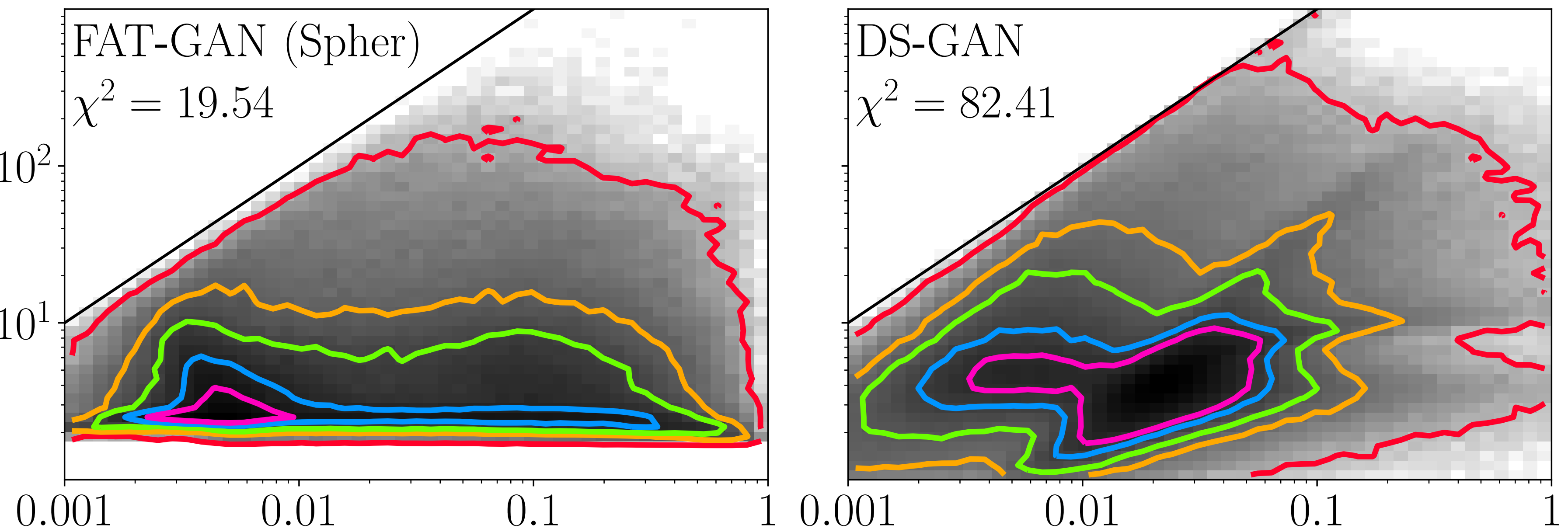
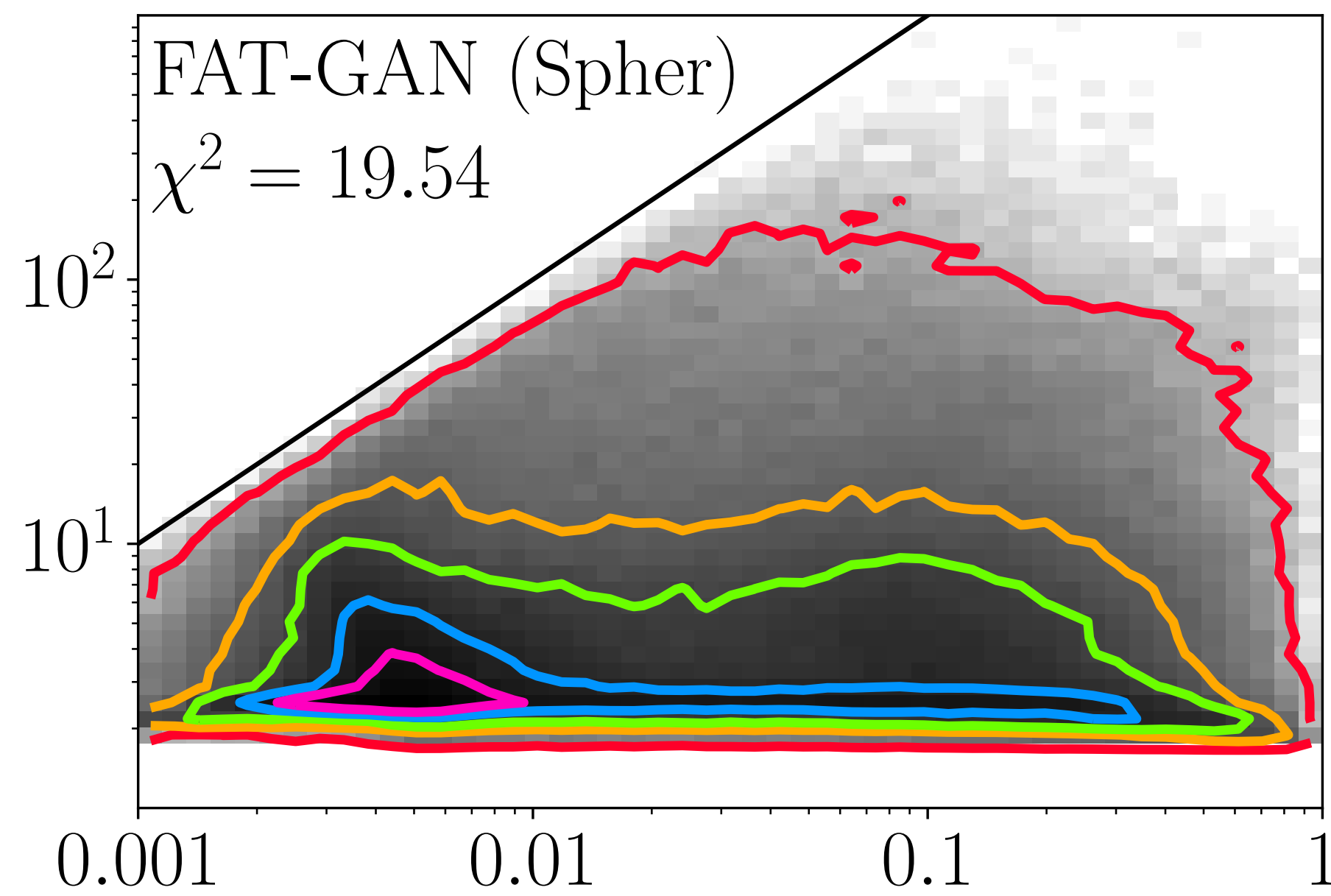
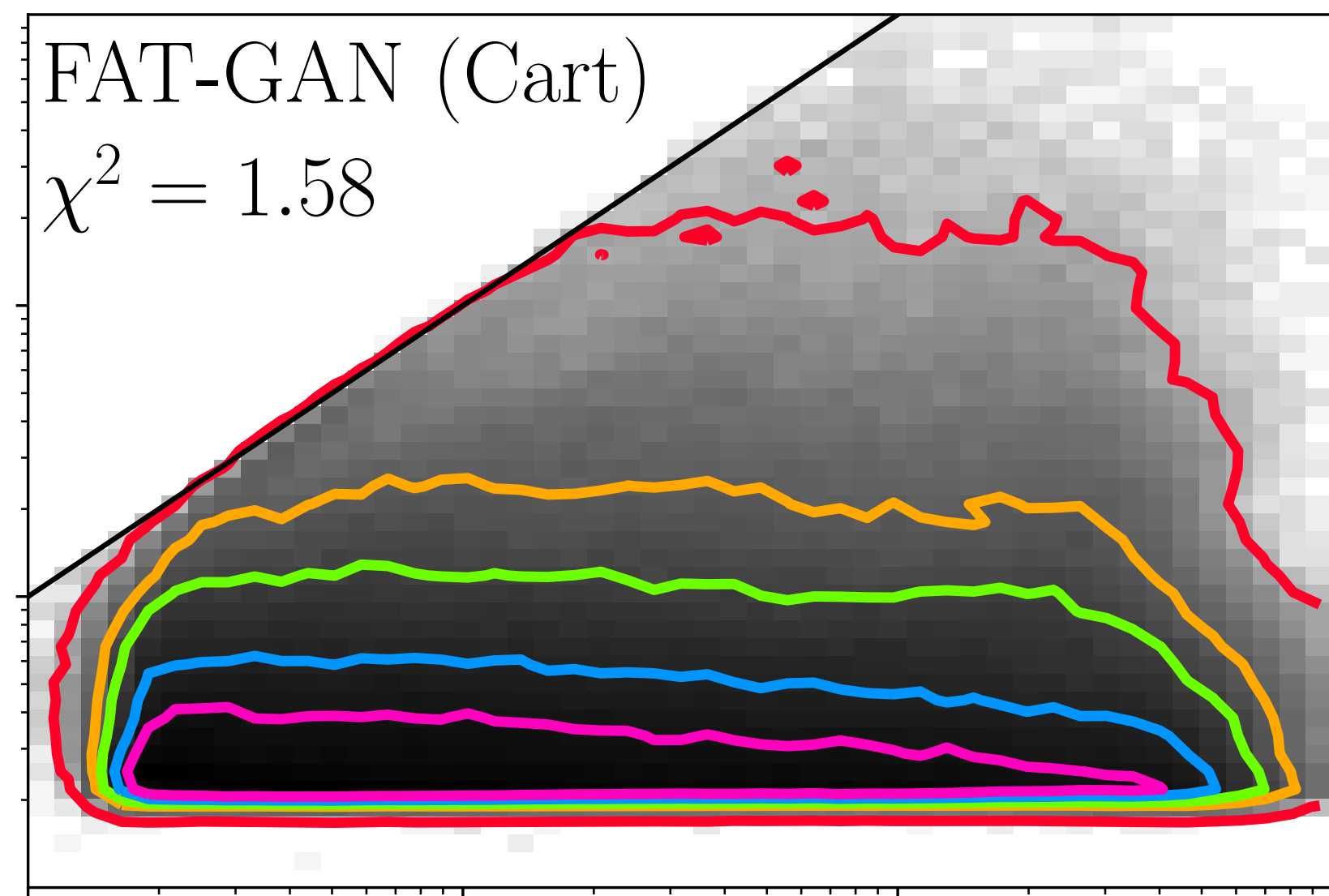
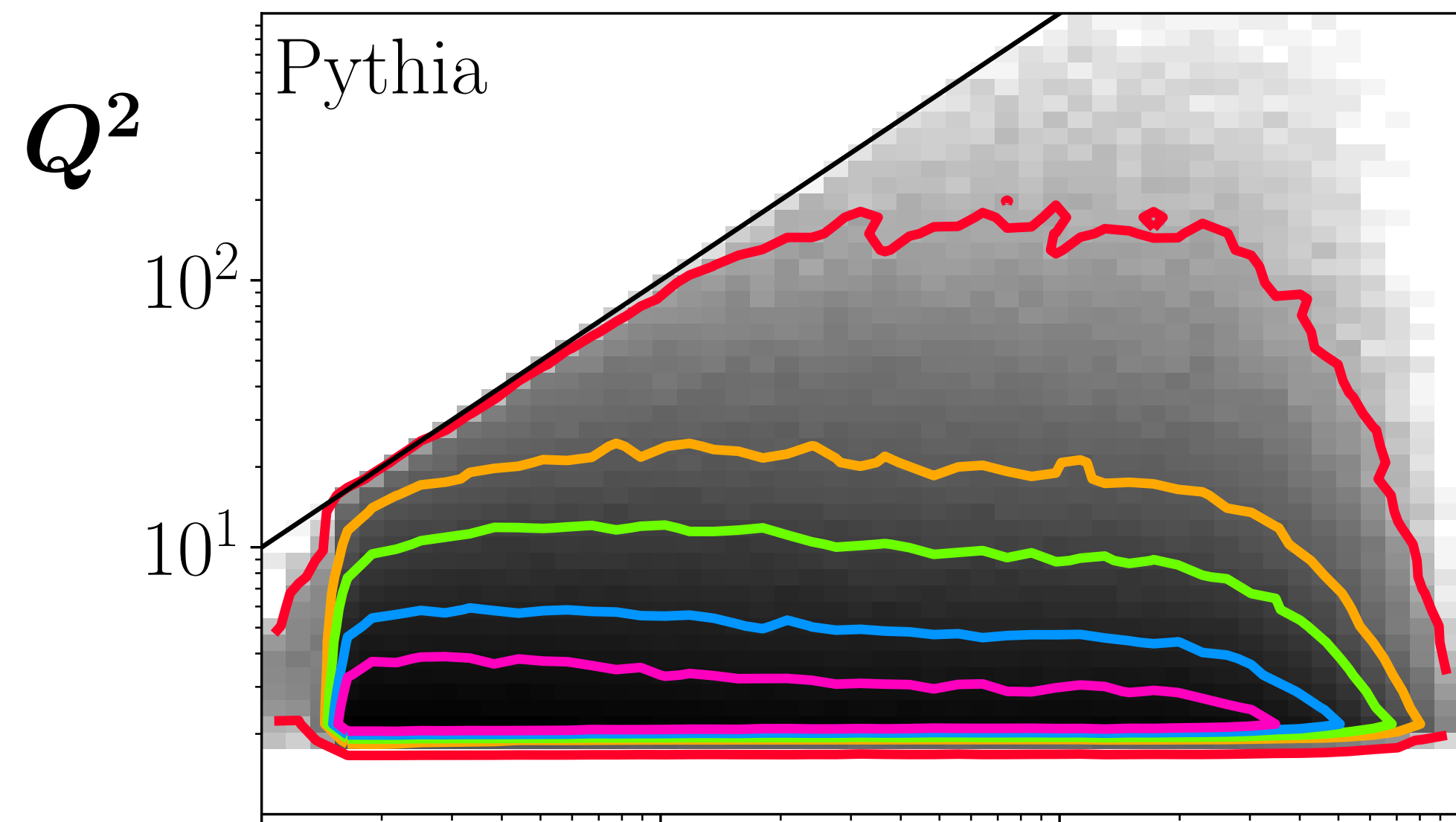
MMD: Critic loss:
batch distribution
matching











x_{bj}