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# EXAM PROJECT FOR PML 2022/2023

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## REPORT

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## 1 Density modeling

### 1.1 Implement a convolutional VAE

### 1.2 Alternative models

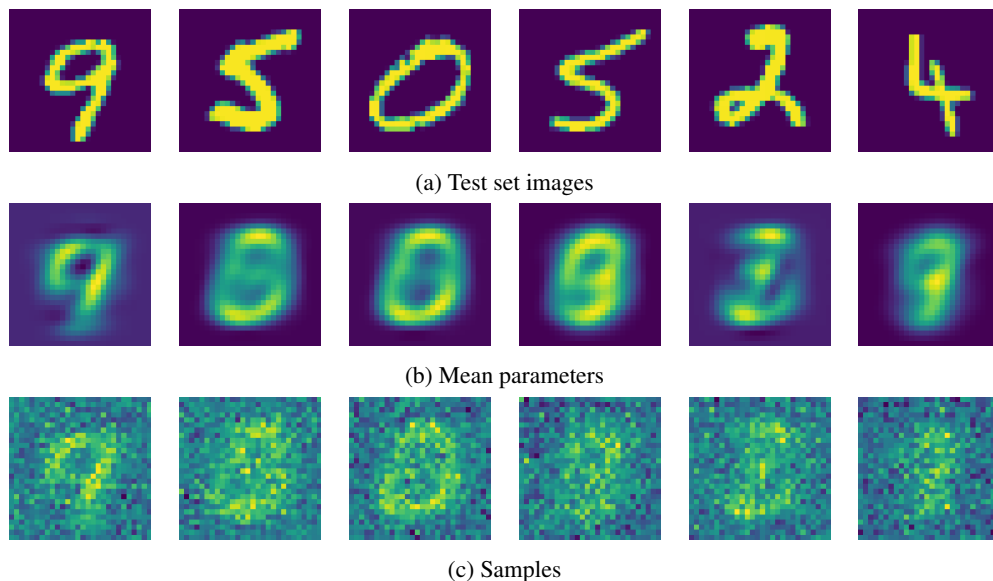
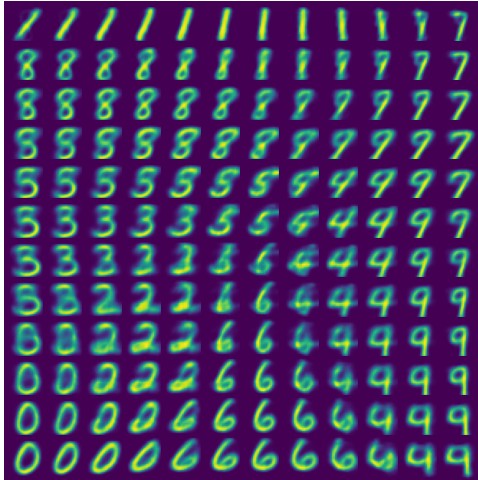
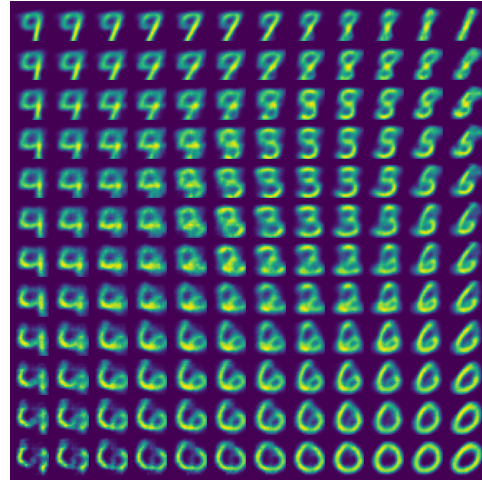


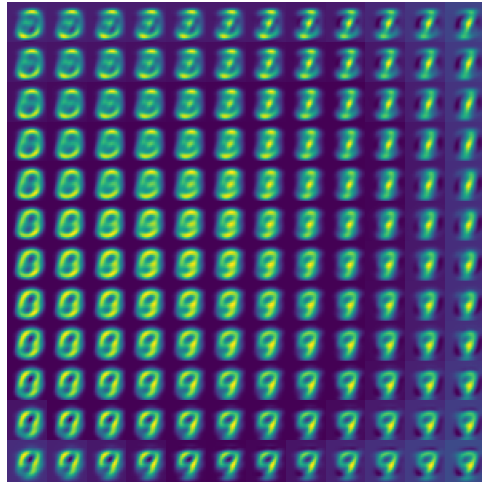
Figure 1: Comparison of MNIST test set images and corresponding mean parameters and sampled reconstructed generated by trained PPCA model.



(a) VAE



(b) CVAE



(c) PPCA

Figure 2: Interpolating images from latent space variables using trained density models.

	Log-Likelihood/ELBO	MSE
<b>VAE</b>	-145.122048	0.000305
<b>CVAE</b>	-157.241749	0.000352
<b>PPCA</b>	-4329.655559	3629.099862

Table 1: Model performance metrics

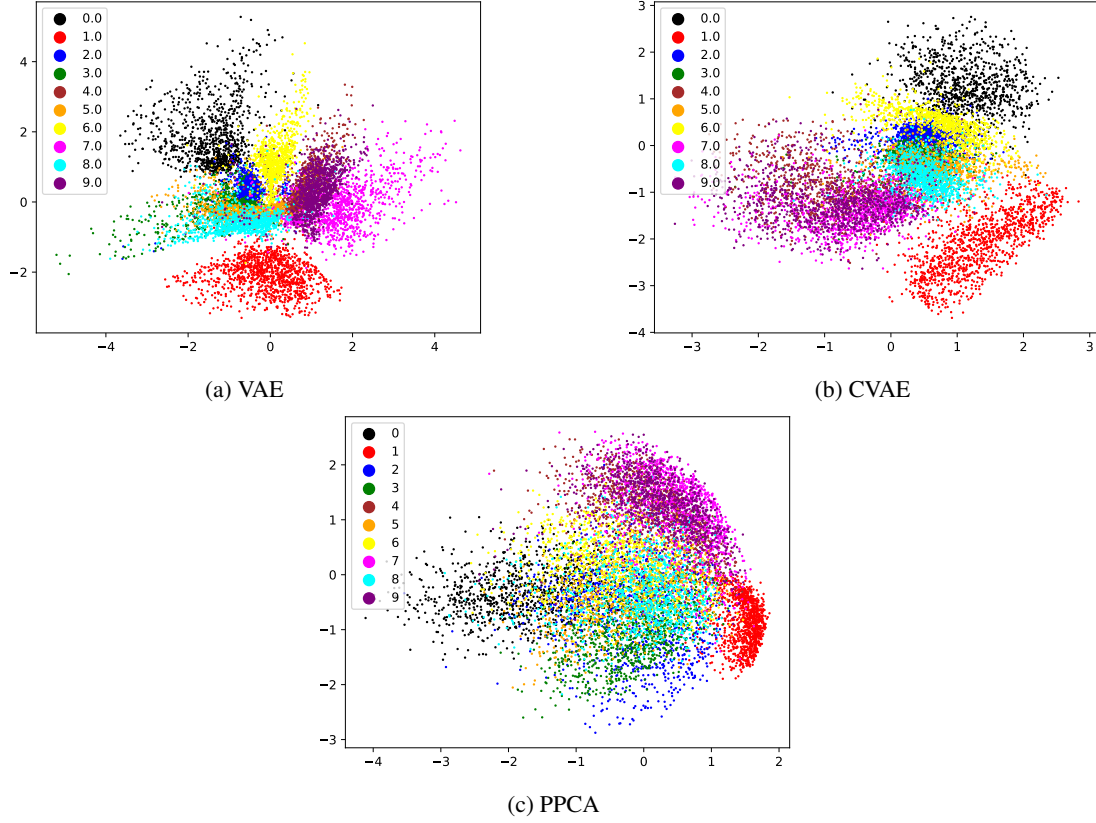


Figure 3: Clustering on MNIST test (projection to latent space) using trained density models.

[Bishop and Nasrabadi, 2006]

## 2 Bibliography

Christopher M Bishop and Nasser M Nasrabadi. *Pattern recognition and machine learning*, volume 4. Springer, 2006.