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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

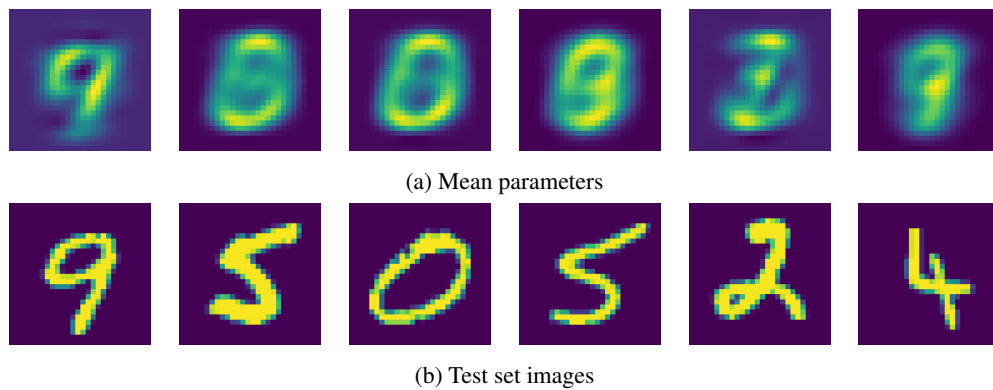


Figure 1: Comparison of MNIST test set images and corresponding mean parameters of the likelihood function in the trained PPCA model

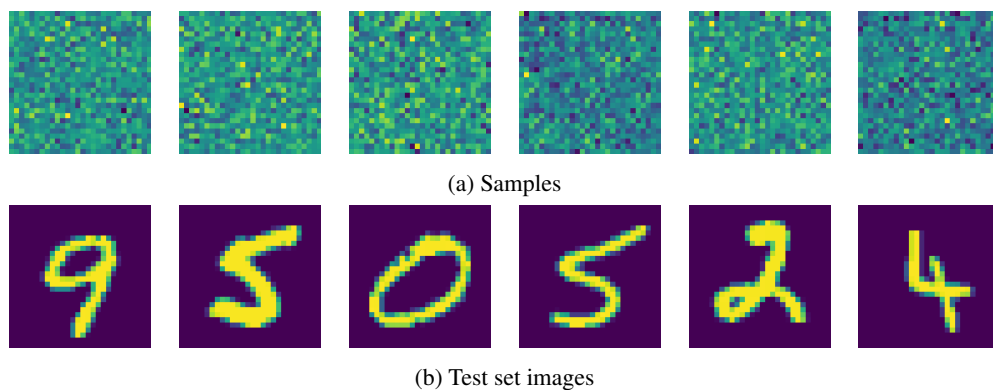
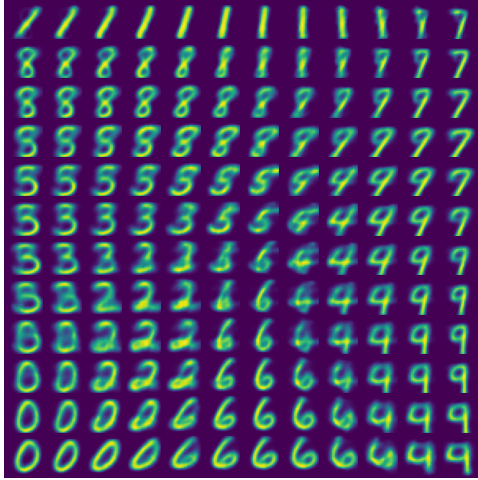
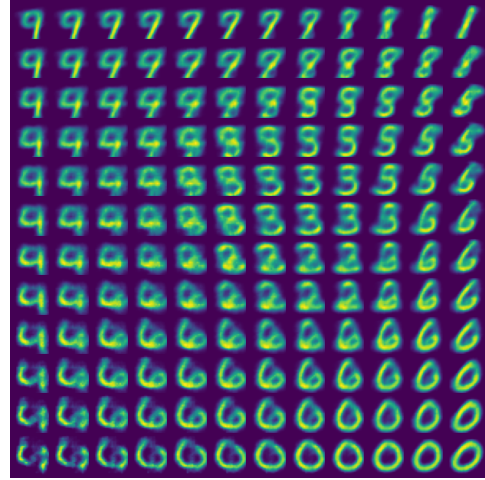


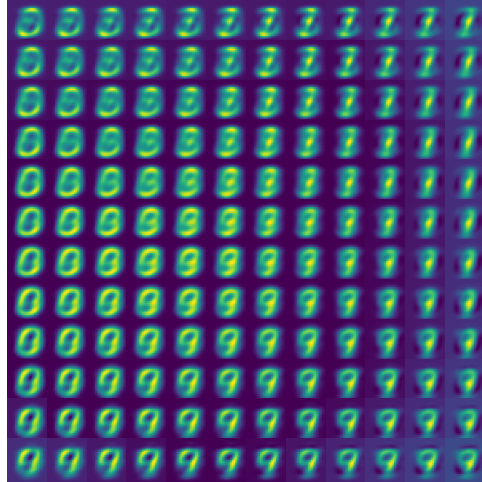
Figure 2: Comparison of MNIST test set images and corresponding reconstructions sampled from the PPCA model



(a) VAE



(b) CVAE



(c) PPCA

Figure 3: Interpolating images from latent space variables using trained density models

	Mean Log Likelihood	MSE
VAE	-138.723551	0.000305
CVAE	-151.654277	0.000352
PPCA	-1110.173882	3620.035365

Table 1: Model performance metrics

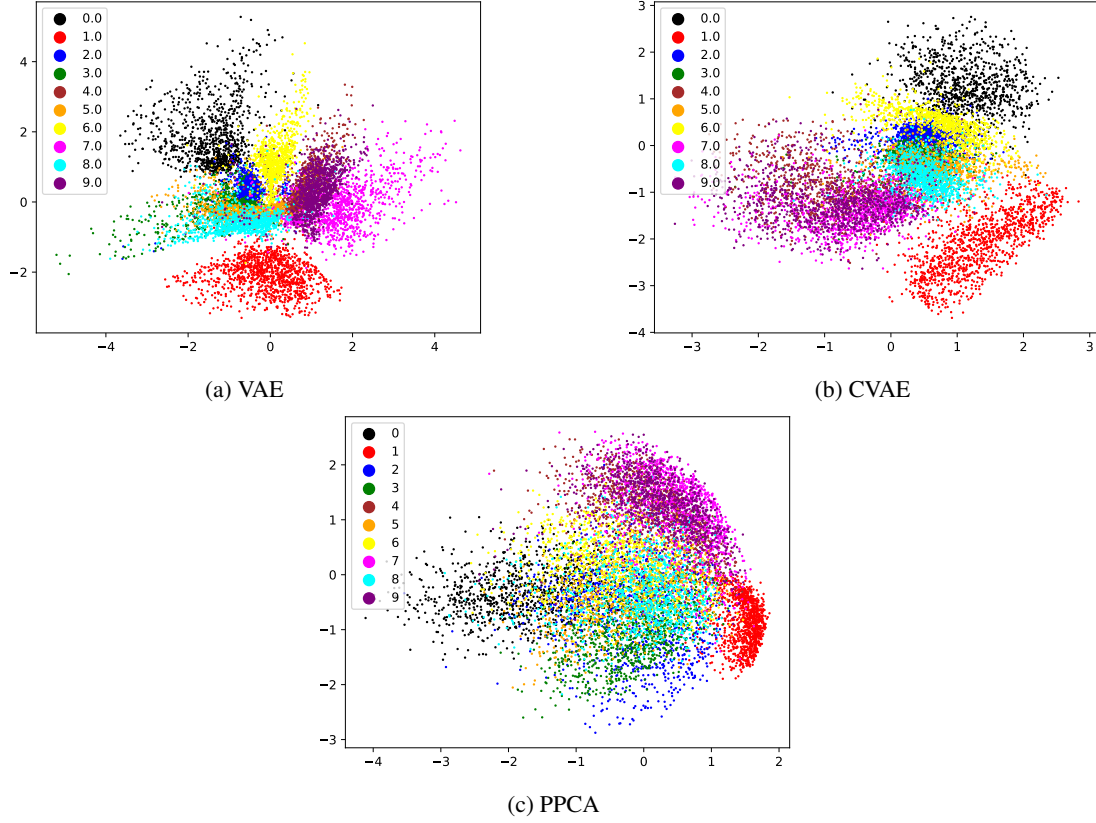


Figure 4: Clustering on MNIST test (projection to latent space) using trained density models

<sup>1</sup> [Bishop and Nasrabadi, 2006]

## 2 Bibliography

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

<sup>1</sup> A test