Exercise 10

Advanced Methods in Medical Image Analysis, Julia Wolleb

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Exercise 10: VAEs for Image Generation

Implement a Variational Autoencoder using CNNs for the MNIST data set. Follow the code snippet `variational-autoencoder.py`. For visualization, you can (but don't have to) use Tensorboard.

- Implement a suitable encoder-decoder architecture for the autoencoder.
- Assume $p(z) \sim N(0, I)$.
- As seen in the lecture, model $p(z|x)$ as a multidimensional Gaussian distribution. A good choice is if the predicted μ and σ of the encoder are of length 64. For this you need to apply a linear layer as last layer of the encoder.
- To ensure gradient flow, you need to implement the reparametrization trick.
- Implement the Kullback Leibler divergence loss $\mathcal{L}_{KL}$ in the latent space, and correct loss function $\mathcal{L}_{rec}$for the reconstruction. Train your autoencoder with the combined loss function $\mathcal{L}_{KL} + \mathcal{L}_{rec}$.
- Generate new samples by sampling $z \sim N(0, I)$, and pass z through the decoder network.
- Hand in the loss curves, as well as the generated fake images.
- Hand in your code that does not throw exceptions.