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Deep Learning (SoSe 2024)
2. Sheet

Start: Thursday, 02.05.2024.
End: The worksheets should be solved using Python, in groups of 3 people and will be presented in the Tutorials.
Discussion: Thursday, 23.05.2024 in den Tutorien.

Information

The worksheets and necessary toolboxes will be made available in the Lernraum "392221 Deep Learning (V) (SoSe 2024)". Worksheets will usually be released every two weeks on Thursday, and discussed during the exercises on Thursday two weeks later. In order to successfully finish the course, 50% of the available points have to be obtained and each participant has to present his/her results at least once. The Wednesday and Thursday in between the release and discussion of the sheet will be used to discuss the implementation of the various algorithms presented in the lecture, as well as go deeper into the relevant material.

Exercise 1:

(*10 Points*)

Objective: Understand the fundamentals of VAEs by implementing one from scratch.

(a) *(2 Pts.)* Implement a basic VAE in a deep learning framework like TensorFlow or PyTorch. You will have to explain your code.

(b) *(4 Pts.)* Use the FashionMNIST datasetc 1 for training the VAE and document the training process, do you observe any difficulties, how do generated images look during the process.

(c) *(2 Pts.)* Visualize the latent space using PCA, t-SNE or UMAP.

(d) *(2 Pts.)* Discuss how changes in the latent dimension size (try at least 3 different options) affect the model's performance and output quality.

(e) *(bonus 2 Pts.)* What would you have to change from a VAE to a Diffusion Model. List all the parts that need to be removed/added.