

DEEP LEARNING AND INVERSE PROBLEMS
SUMMER 2023

Lecturer: Reinhard Heckel

Problem Set 6

Issued: Tuesday May 23, 2023; Due: Tuesday June 6, 2023

Problem 1 (Noise2Noise vs. Supervised Learning). In this exercise, we compare the self-supervised Noise2Noise approach to supervised learning for image denoising. We reuse the setup from Homework 4, where we studied supervised denoising with a U-Net. Use the U-Net architecture and code from the solution of Homework 4 and train the model to denoise images with $\mathcal{N}(0, 0.015)$ Gaussian noise in a supervised way. Use 300 non-overlapping image chunks of shape 128x128 with pixel range $[0, 1]$ as training data and check the performance of your model on a suitable test set. Now implement the self-supervised Noise2Noise training method for denoising and find out how much more data you need in order to reach/surpass the performance of the supervised model on the test data.

Hint: Be sure to train all models until convergence, i.e. until the performance on the test set becomes (almost) stationary.