Supplementary Information for:

Flexible and Cost-Effective Deep Learning for Fast Multi-Parametric Relaxometry using Phase-Cycled bSSFP

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Supplementary Figures

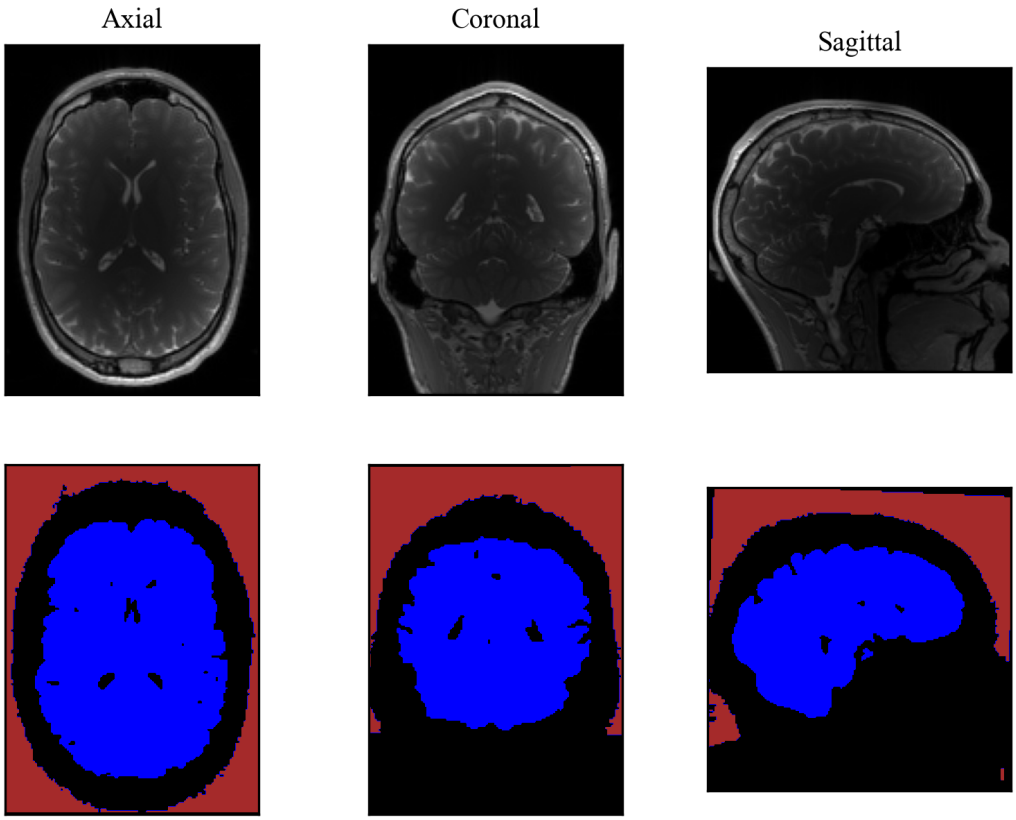

Figure 1. Representative axial, coronal, and sagittal slices of one of the three subjects used for SNR determination based on the acquired in vivo pc-bSSFP data. The magnitude of the complex sum (F_0) (first row) was used for calculating the average signal (S) within the brain mask (blue mask in second row). The noise (N) was calculated as the standard deviation within the background mask (red mask in second row). The final $SNR = S/N$ was pooled over all three subjects.

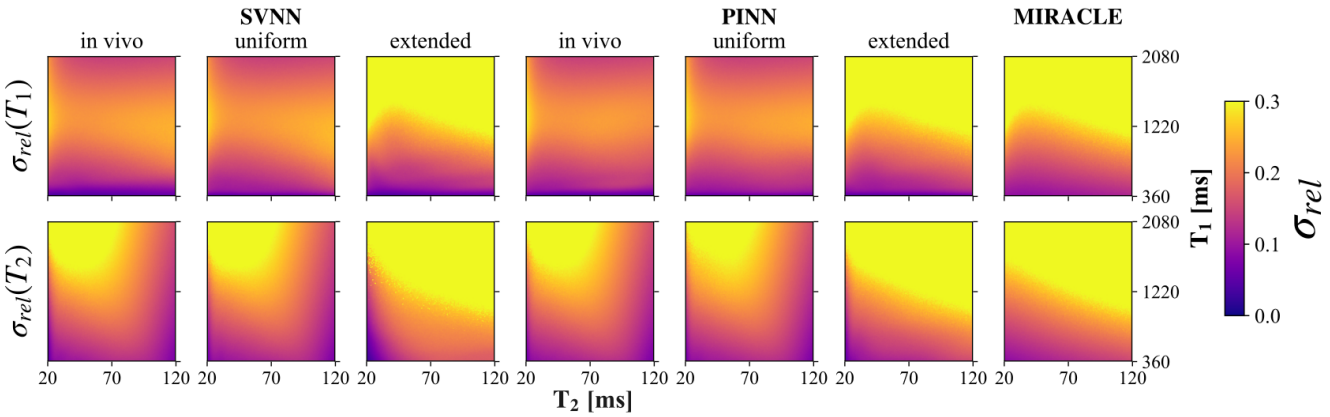

Figure 2. Influence of training data distribution on precision of investigated DNNs versus MIRACLE in silico. The precision of T_1 and T_2 quantification is evaluated by MC sampling with an **SNR level of 10**, applied to an in silico linear test grid with T_1 in the range 360 to 2080 ms and T_2 in the range 20 to 120 ms. The relative standard deviation $\sigma_{rel} = \sigma_{\mathrm{MC}}/\mu_{\mathrm{MC}}$, with μ_{MC} and σ_{MC} corresponding to the mean and standard deviation of the MC simulation is plotted for all three frameworks (SVNN, PINN, MIRACLE) and in case of the DNNs for all three trained data distributions. All DNNs were trained without additional noise applied to the training data (SNR = inf).

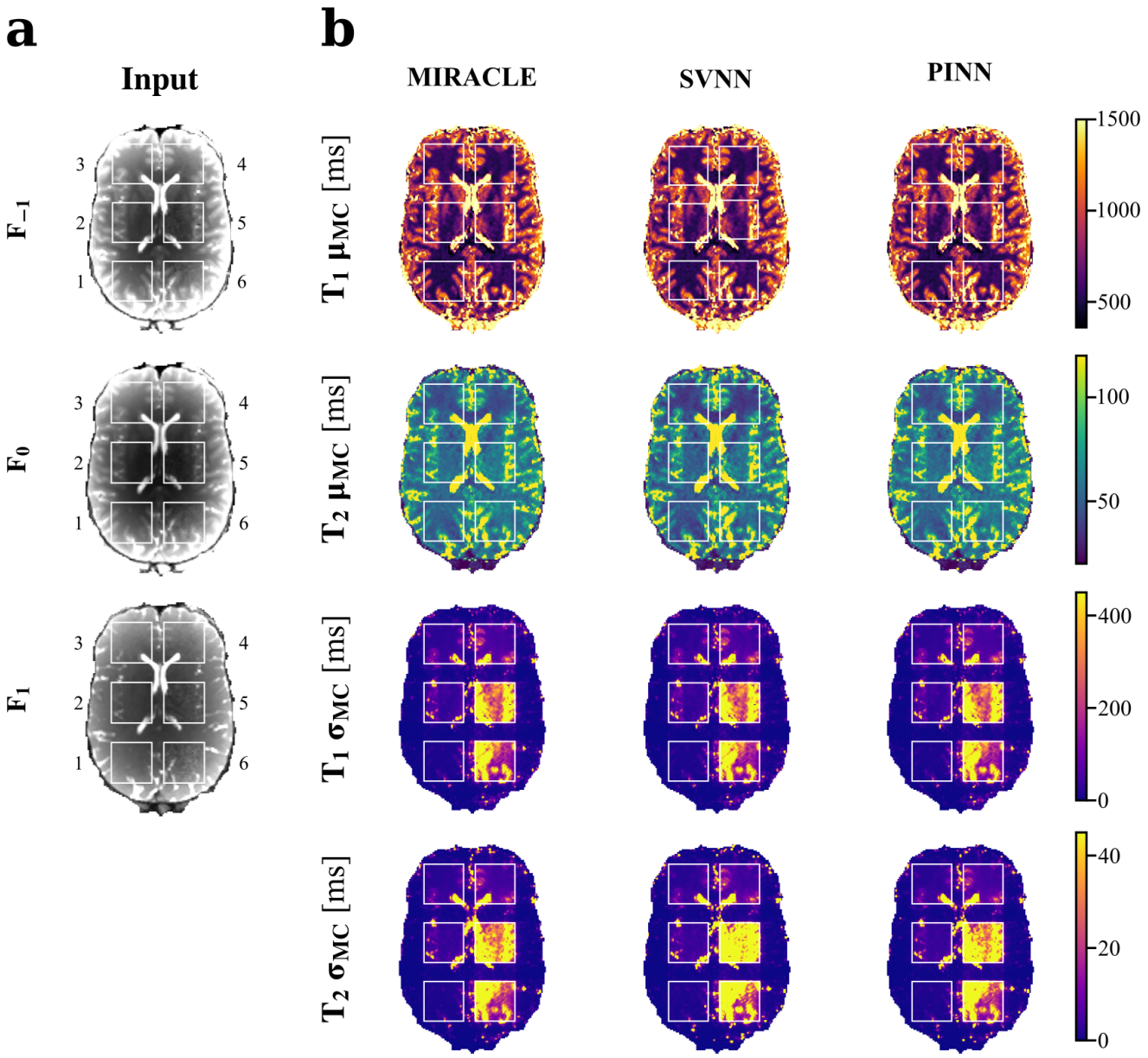

Figure 3. Robustness in the presence of noise-corrupted in vivo test data of SVNN and PINN versus MIRACLE, illustrated for a representative axial slice of an unseen test subject. (**a**) The multi-contrast input for quantification of the relaxation parameters, i.e. the magnitude of F_{-1}, F_0, and F_1, for an individual MC noise sample. (**b**) The mean (μ_{MC}, rows 1+2) and standard deviation (σ_{MC}, rows 3+4) of the in vivo MC parameter predictions. The displayed results refer to DNNs trained on in silico data with the **uniform extended distribution** and no additional noise (SNR = inf). In addition to the existing noise of the in vivo test data, noise sampled from a Gaussian distribution with six different standard deviations ($\eta \in \{1, 2, 4, 8, 12, 16\}$ and respective in vivo SNRs $\in \{18, 14, 11, 7, 5, 4\}$) was added to the real and imaginary parts of the pc-bSSFP data in six different rectangular ROIs, labeled 1-6 in the order of increasing noise levels.