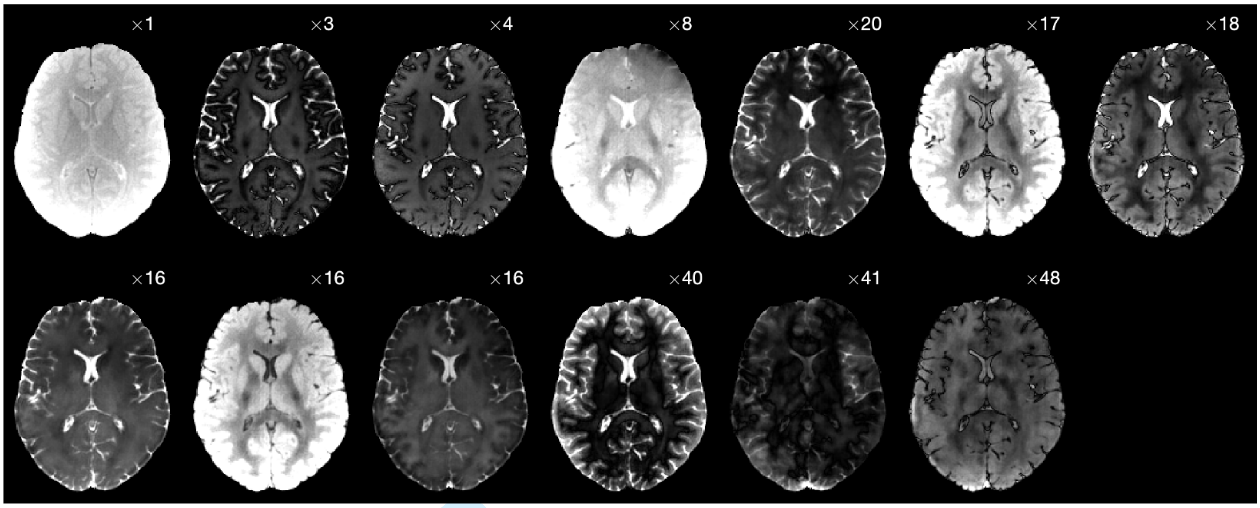
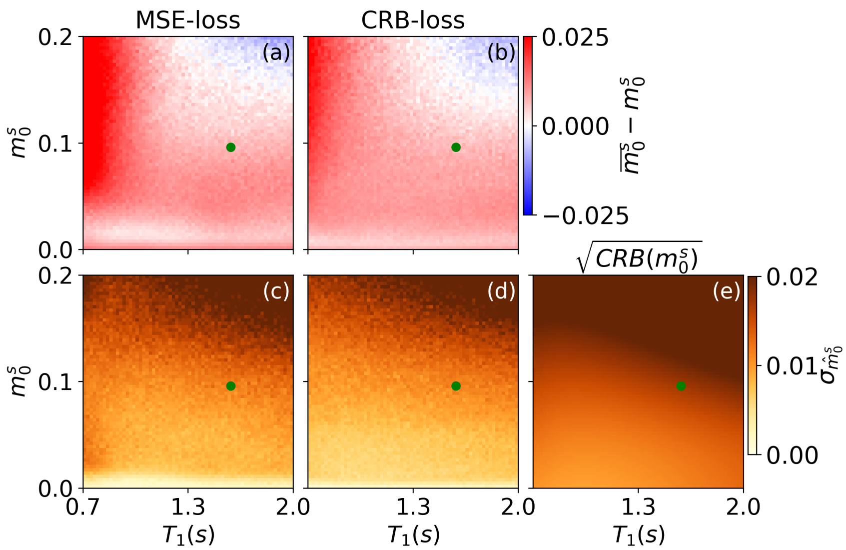
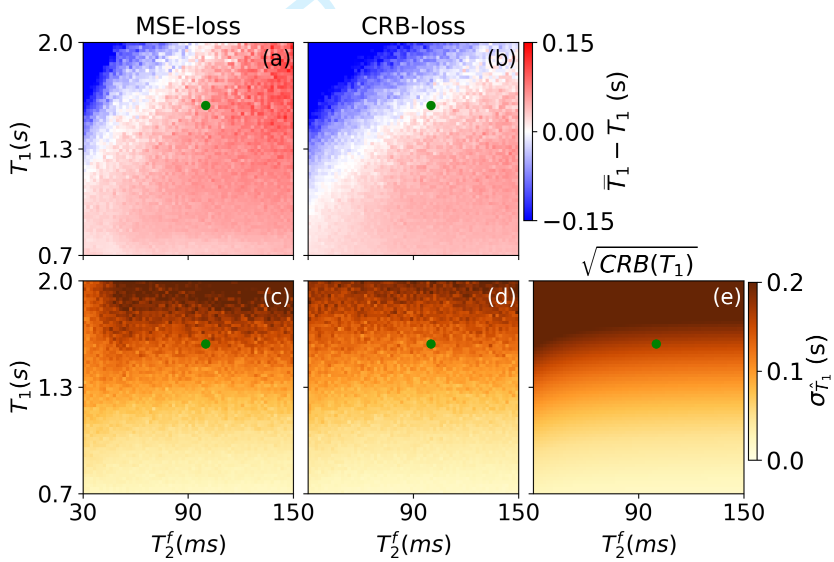
Supporting Information



Supporting Information Figure S1: Transversal slice of the 13 (3D) coefficient images that were reconstructed directly in this low-rank space with locally-low rank constraint. The space is spanned by the singular vectors that were calculated with an SVD of a dictionary containing simulated signals. Each coefficient image is scaled for better visualization, as indicated by the factor in the upper right corner.

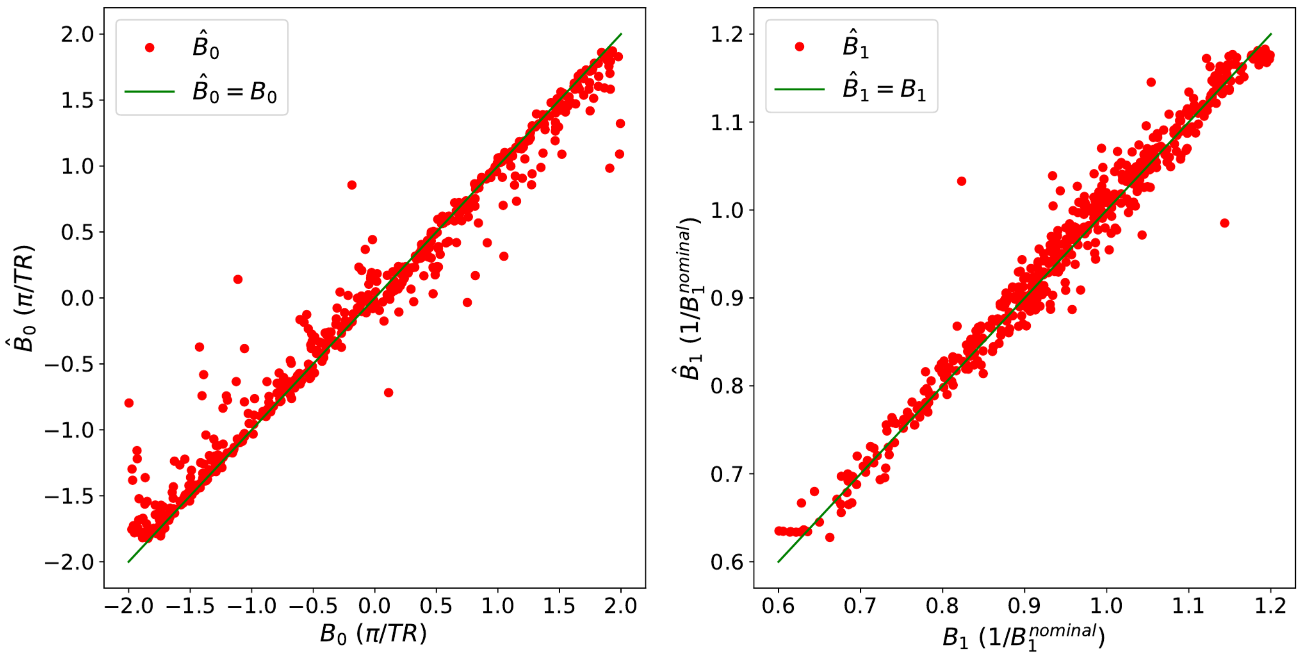


Supporting Information Figure S2: Bias (a,b) and standard deviation (c,d) of $\hat{m}_0^s$, estimated with the network trained with the MSE-loss and CRB-loss, respectively. The latter is compared to the square root of the Cramér-Rao bound (e), which provides a theoretical limit for an unbiased estimator. The green dots indicate the mean values of the corresponded parameters in the training dataset. The maps were generated with the test dataset #2.



Supporting Information Figure S3: Bias (a,b) and standard deviation (c,d) of $\hat{T}_1$, estimated with the network trained with the MSE-loss and CRB-loss, respectively. The latter is compared to the square root of the Cramér-Rao bound (e), which provides a theoretical limit for an unbiased estimator.The green dots indicate the mean values of the corresponded parameters in the training dataset. The maps were generated with the test dataset #2.

When using the network trained with the CRB-loss, the bias of the T_1 estimation (Supplementary Fig. S3b) with the CRB-based network is slightly larger (0.11 on average of absolute bias) than that of the MSE-based network (Fig. S3a; 0.07 on average), which is in line with the hypothesis that the MSE loss puts more emphasis on T_1. The bias of the m_0^s estimation with the CRB-based network in a slice spanned by m_0^s and T_1 (Fig. S2b) is slightly smaller (0.0053 on average of absolute bias) than that of the MSE-based network (Fig. S2a; 0.0065 on average). Overall, the two networks have similar performance in estimating m_0^s and T_1, while we do observe a substantial difference in the performance in estimating T_2^f.



Supporting Information Figure S4: Estimates of B_0 and B_1 with the proposed network on $1/10$ of the test dataset #1. This shows our network has the capability to be extended to estimate other parameters besides the reported m_0^s, T_1 and T_2^f in the paper.