Abstract: RinQ Fingerprinting

Recurrence-Informed Quantile Networks for Magnetic Resonance Fingerprinting

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Recently, Magnetic Resonance Fingerprinting (MRF) was proposed as a quantitative imaging technique for the simultaneous acquisition of tissue parameters such as relaxation times T_1 and T_2. Although the acquisition is highly accelerated, the state-of-the-art reconstruction suffers from long computation times: Template matching methods are used to find the most similar signal to the measured one by comparing it to pre-simulated signals of possible parameter combinations in a discretized dictionary. Deep learning approaches can overcome this limitation, by providing the direct mapping from the measured signal to the underlying parameters by one forward pass through a network. In this work, we propose a Recurrent Neural Network (RNN) architecture in combination with a novel quantile layer [1]. RNNs are well suited for the processing of time-dependent signals and the quantile layer helps to overcome the noisy outliers by considering the spatial neighbors of the signal. We evaluate our approach using in-vivo data from multiple brain slices and several volunteers, running various experiments. We show that the RNN approach with small patches of complex-valued input signals in combination with a quantile layer outperforms other architectures, e.g. previously proposed CNNs for the MRF reconstruction reducing the error in T_1 and T_2 by more than 80 %.

References

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