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Supplementary Material

Complex-Valued and State-Augmented Variational Networks for Accelerated 4D Flow MRI Reconstruction

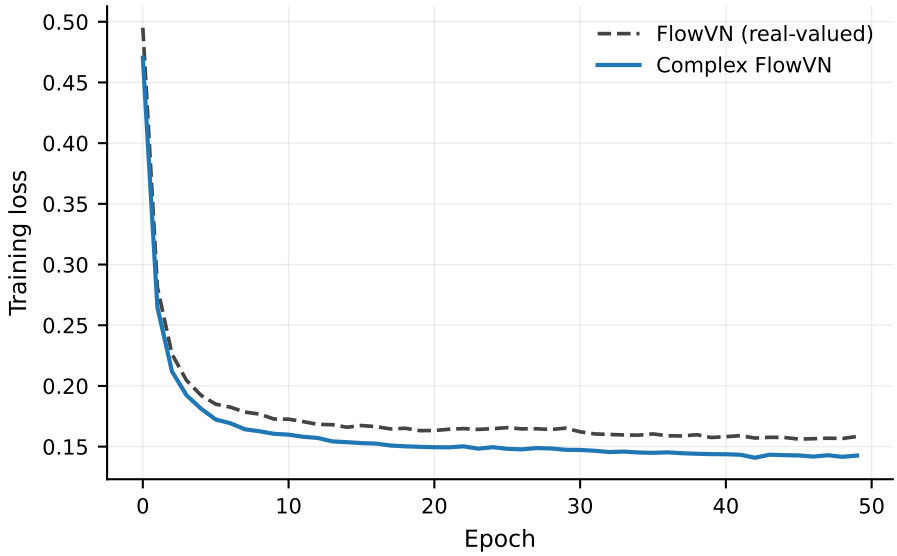


Fig. S1. Training loss over 50 matched epochs for real-valued FlowVN and Complex FlowVN. Both networks were trained from scratch on all 138 training subjects under an identical protocol. Complex FlowVN training loss is lower at every epoch and reaches the real-valued network's best training loss over the full run (0.1562) within the first 14 epochs. This is training loss on the training subjects and reflects optimization behavior, not reconstruction accuracy on validation data.

Training loss under matched training

Complex FlowVN and the real-valued FlowVN baseline were trained from scratch for 50 epochs each on all 138 training subjects, under an identical protocol differing only in the network variant. Figure S1 shows the training loss of both runs. Complex FlowVN is lower at every epoch, and the separation is present from the first epoch rather than emerging over training. Note that this is training loss and does not by itself establish a difference in reconstruction accuracy; the accuracy comparison is given in Table 1 of the main text.