Adaptive convolutional neural networks for accelerating magnetic resonance imaging via k-space data interpolation

Supplementary data

We have also evaluated our method with two more undersampling trajectories, including 1D sampling and 2D spiral sampling, as illustrated in Figure S1, on the Stanford dataset with same experimental settings as detailed in the manuscript. All experiments were carried out with 3 input slices. Particularly, the 1-D sampling has a sampling rate of 24.31%, the Cartesian sampling has a sampling rate of 23.27%, the spiral sampling has a sampling rate of 25.00%, and the radial sampling has a sampling rate of 23.44%. For the spiral and radial sampling, non-uniform fast Fourier transform (NUFFT) (Beatty et al., 2005; Fessler and Sutton, 2003) was adopted to generate spiral and radial coordinate k-space data. Kaiser-Bessel gridding (Duda, 2011) was then used to perform the regridding to the Cartesian coordinate with a square shape of 256 × 256 for both datasets.

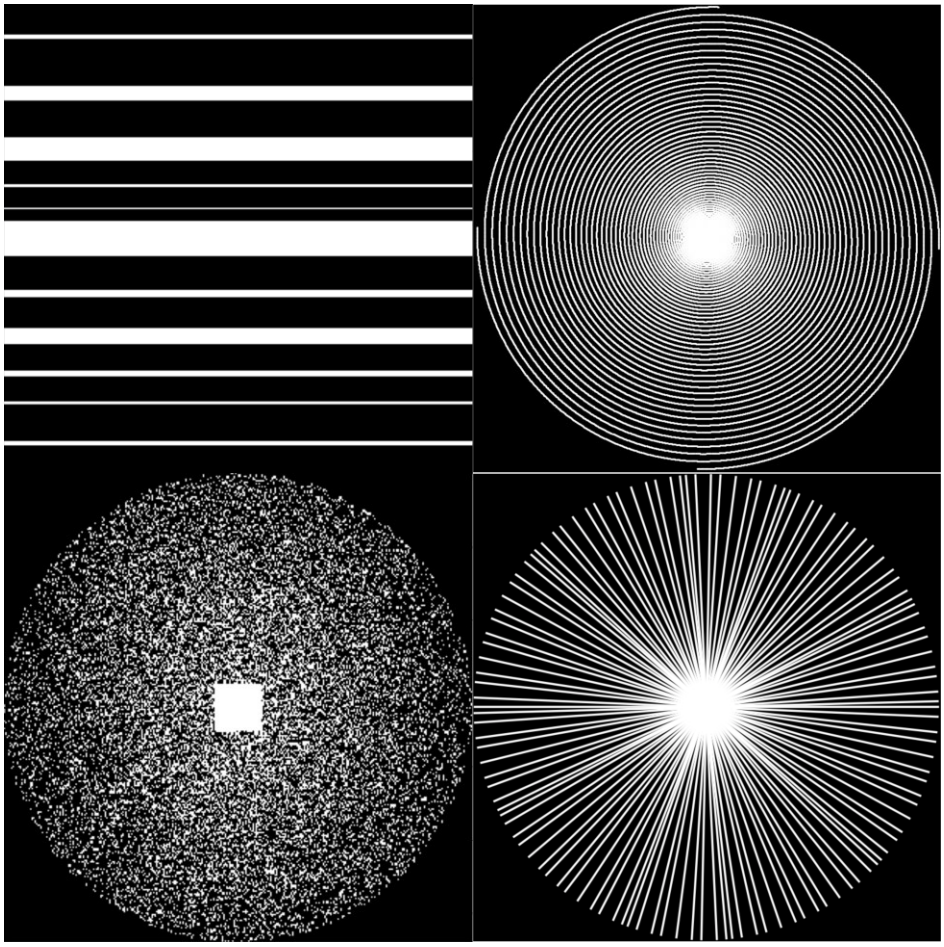

Figure S1. Undersampling trajectories, including 1-D sampling trajectory (top left), spiral trajectory (top right) Cartesian trajectory (bottom left), and radial trajectory (bottom right).

Table S1 summarizes the image reconstruction performance of our method obtained with four different undersampling trajectories. Although the sampling rate of all the undersampling trajectories was similar (~25%), the radial and spiral undersampling trajectories led to better

performance than the other two. Such a discrepancy merits further investigation.

Table S1. Performance of our method with different sampling patterns on the Stanford dataset.

Sample patterns	NMSE ($\times 10^{-3}$) ↓	PSNR ↑	SSIM ($\times 10^{-2}$) ↑
1-D sampling	12.23±0.02	35.08±2.32	91.28±0.04
Cartesian sampling	11.11±0.01	35.55±1.86	92.25±0.03
Spiral sampling	10.99±0.01	35.60±1.79	92.64±0.03
Radial sampling	10.90±0.01	35.62±1.82	92.73±0.03

We have carried out one more ablation experiment on the loss function, in which L1 loss and L2 loss were compared on the Stanford dataset with Cartesian sampling at a sampling rate of 23.27%. As summarized in Table S2, L1 loss and L2 loss yielded similar performance.

Table S2. Performance of our method with L1 Loss and L2 loss on the Stanford dataset.

Loss function	NMSE ($\times 10^{-3}$) ↓	PSNR ↑	SSIM ($\times 10^{-2}$) ↑
ACNN-k-space L1	11.18±0.01	35.51±1.73	92.19±0.03
ACNN-k-space L2	11.11±0.01	35.55±1.86	92.25±0.03