Paper Title: Phase prior characterization with untrained neural network in MR imaging

Authors: Congcong Liu (Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China); Zhuo-Xu Cui (Shenzhen Institute of Advanced Technology, China); Jing Cheng (Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China); Yuanyuan Liu (Shenzhen Institutes of Advanced Technology, Chinese Academy of Science, China); Haifeng Wang (Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China); Dong Liang (Shenzhen Institute of Advanced Technology, China, China)

Email: sober_235@163.com

Abstract

Parallel imaging techniques have made notable advancements to accelerate MR imaging by exploiting complex encoding strategies. Nevertheless, MR images often contain background phase distribution induced by system imperfections, such as RF or B0 inhomogeneity. Conventional parallel imaging encounter challenges in accurately estimating the background phase since they rely solely on acquiring low-frequency auto-calibration signals (ACS) from the center of k-space for calibration. This paper proposes a more precise background phase approximation method (named as V-iUNN), leveraging the implicit representation capabilities of untrained neural networks (UNN). Specifically, the robust signal generalization ability of the UNN plays a pivotal role in implicitly capturing low-lever statistical prior to the smoothness and compact support properties of the background phase. Numerical experiments demonstrate the superiority of the proposed methods over competing methods.