

# EFFICIENT ESTIMATION OF OPTIMAL SAMPLING PATTERNS FOR MRI

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In Sherry et al. 2020, a bilevel optimisation method was introduced for training optimal sampling patterns in Magnetic Resonance Imaging (MRI). While effective and grounded in theoretical concepts like variational regularisation, the bilevel optimisation approach faced challenges when applied to datasets with substantial sample sizes or high resolutions, which is desirable in big data inverse problems. In this work, we propose a more efficient alternative method based on estimating source condition elements. Source conditions play a pivotal role in regularisation theory, offering valuable insights into error estimation and convergence rates of variational regularisations for ill-posed inverse problems. We present a practical approach to compute source condition elements as solutions to convex minimisation problems, which can be efficiently solved using first-order algorithms capable of scaling effectively to larger and higher-dimensional datasets. We then demonstrate how estimating sparse source condition elements is identical to estimating optimal subsampling patterns, and conclude with a range of numerical experiments. This is joint work with Tatiana Bubba, Luca Ratti and Danilo Riccio.