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Generative compressed sensing with Fourier measurements

In the recent years, it has been established that Deep Generative Models (DGMs) can be used as priors in inverse problems such as denoising, inpainting, medical and seismic imaging, and more. One inverse problem of tremendous interest since 2005 is compressed sensing (CS) – acquisition and provable recovery of sparse signals (or signals with low complexity) from a few, non-adaptive measurements. Recently DGMs have been proposed to replace the sparse signal model in CS, leading to theoretical guarantees and practical performance that improves on "classical compressed sensing" for classes of signals that can modelled well using DGMs when the measurement matrix and/or network weights follow a subgaussian distribution. We move beyond the subgaussian assumption, to measurement matrices that are derived by sampling rows of a unitary matrix (including subsampled Fourier measurements as a special case). Specifically, we construct model-adapted sampling strategies and prove restricted isometry guarantee for generative compressed sensing with subsampled isometries, leading to recovery bounds with nearly order-optimal sample complexity.