Ajil Jalal Title: Compressed Sensing using Generative Models: Theory and Applications

Abstract:
The goal of compressed sensing is to make use of image structure to estimate an image from a small number of linear measurements. This has applications in many areas, such as in MRI, where it can allow for smaller scan times while preserving scan quality (or in CSI where one can reconstruct a high-resolution license plate from an extremely blurry photo).

In classical compressed sensing, image structure is typically represented by sparsity in a well-chosen basis.We show how to achieve guarantees similar to standard compressed sensing but without employing sparsity at all -- instead, we suppose that vectors lie near the range of a generative model. We demonstrate our results using generative models from published variational autoencoder and generative adversarial networks, and show that our method can use 5-10x fewer measurements than Lasso for the same accuracy. This joint work with Ashish Bora, Eric Price, and Alex Dimakis appeared at ICML 2017.

The second part of the talk will generalize results from the first: we show that the Posterior Sampling estimator using a generative model achieves near-optimal recovery guarantees. Moreover, this result is robust to model mismatch, as long as the generative model's distribution is close to the true distribution in Wasserstein distance. Finally, we will discuss the empirical benefits of Posterior Sampling and its significant potential in MRI applications.