

Comparison of Optimized Random Gaussian and Partial Random Fourier Measurement in Compressive Sensing

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Endra Oey

Abstract

Compressive sensing is the recent technique of data acquisition where perfect reconstruction of signal can be made from far fewer samples or measurement than traditional Shannon-Nyquist sampling theorem. Compressive sensing exploits the sparsity of signal that is signal can be represented with a few non-zero coefficients by using a suitable basis. Compressive sensing requires a small mutual coherence between measurement matrix and the basis in order to achieve high quality of reconstructed signal from a small number of samples. A small mutual coherence can be achieved by optimizing the measurement matrix and usually random Gaussian matrix is used for the optimization. In this paper, we proposed optimized partial random Fourier matrix and compare to optimized random Gaussian matrix. The optimized measurement matrix was done by using gradient-descent method. Both of the optimized measurement matrix are used to encode sparse signal with various number of measurement. The encode signal was reconstructed by using Iteratively Reweighted Least Squares- -minimization algorithm to measure the performance of both measurement matrix. The numerical results shows that optimized sensing matrix provided better performance than the unoptimized one and the partial random Fourier matrix provided almost the same performance as the random Gaussian matrix, so it can be used as an alternative measurement matrix in compressive sensing.

Keywords :

Compressive sensing, sparsity, random Gaussian, partial random Fourier, optimized