
Missing Data Recovery for High-dimensional Signals with Nonlinear Low-dimensional Structures

Abstract:

Motivated by missing data recovery in power system monitoring, we study the problem of recovering missing entries of high-dimensional signals that exhibit low-dimensional nonlinear structures. We propose a novel model, termed as “union and sums of subspaces”, to characterize practical nonlinear datasets. In this model, each data point belongs to either one of a few lowdimensional subspaces or the sum of a subset of subspaces. We propose convex-optimization-based methods to recover missing entries under this model. We theoretically analyze the recovery guarantee of our proposed methods with both noiseless and noisy measurements. Numerical experiments on synthetic data and simulated power system data are conducted to verify the effectiveness of the proposed methods.