Abstract
In this work, we investigate finding the supports of sparse signals via multiple measurement vectors (MMVs). MMV can be thought as a collection of single measurement vectors (SMVs), in which all the SMVs share the same sparsity pattern, referred to as joint sparsity in the literature. The term sparse is referred to the signals that have very few non-zero (active) elements. The SMV problem is essentially a computational problem related to compressive sensing (CS) with the core idea of providing the possibility of measuring and representing a sparse or compressible signal from a small set of non-adaptive linear measurements. Here, we first propose a hierarchical Bayesian model to solve the MMV problem in the presence of noise. Our model decouples the signal into two parts; the supports of the solution and the amplitudes of the non-zero elements in the solution. Supports of the signal are the location of non-zero elements in the solution. In some applications such as magnetoencephalography (MEG), the signal of interest is not only sparse but also exhibits a clustered sparsity pattern. For example, MEG investigates the locations where most brain activities are produced. The brain activities exhibit contiguity, meaning that they occur in localized regions. Such unknown clustered sparsity pattern can be considered as a prior information in our proposed model. For this purpose, we modify our model by incorporating a parameter that accounts for the measure of contiguity (number of transitions) in the supports of the solution. The emphasizing factor on the contiguity measure of the supports will also be learned in our algorithm. Based on the experimental results, we show that our model is capable of learning the unknown sparsity clustered pattern. In this case, we evaluate the performance of our algorithm via receiver operating curves (ROCs).