ABSTRACT

A common objective in inverse problems and imaging is finding a solution that is itself sparse, or sparse under a some transformation. This task underlies the field of compressed sensing, for which there are general theoretical results guaranteeing the exact recovery of the underlying signal given certain sparsity assumptions. Classically, sparse solutions are computed using $\ell_1$ penalized least squares and an appropriate optimization algorithm such as ADMM. Bayesian hierarchical models provide a computationally efficient alternative for finding sparse solutions to linear inverse problems. In the first part of the talk, we develop this hierarchical model in which the sparsity is encoded via a conditionally Gaussian prior, with the prior variances following a generalized gamma distribution. We then introduce an iterative alternating sequential (IAS) algorithm for MAP estimation. We will briefly summarize a variety of theoretical results about the algorithm and the MAP estimate. The second part of the talk will present applications of the hierarchical model in supervised dictionary learning and classification problems.