Sparsity-promoting implicit priors using regularized Gaussian distributions

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In this talk, we will present a family of sparsity-promoting implicit priors inspired by both Bayesian and variational approaches to inverse problems. By combining the probabilistic effects of Gaussian distributions with the deterministic effects of sparsity-promoting regularization, we obtain probability distributions that are efficient to sample from. Unlike Bayesian hierarchical models based on conditional Gaussian distributions, using regularized Gaussian distributions results in sparse samples without needing large hierarchical models. We will introduce the concept of the regularized Gaussian distribution and discuss some of its fundamental properties. We then continue by showing how these distributions can be applied to Bayesian inverse problems, with a particular focus on hierarchical modelling and the flexibility of this implicit modelling approach.