SPACE-VARIANT REGULARIZATION FOR IMAGE RESTORATION PROBLEMS

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Ill-posed problems arise in many areas of science and engineering. Their solutions, if they exist, are very sensitive to perturbations in the data. Regularization aims to reduce this sensitivity. Typically, regularization methods replace the original problem by a minimization problem with a fidelity term and a regularization term. Image restoration is a typical ill-posed problem, which deals with the recovery of the original image from its degraded version by blur and noise. Regularizers for imaging problems can often be derived from a Bayesian framework and determined through a statistical point of view. In this talk we will discuss recent space-variant and directional variational regularization terms for image restoration problems based on explicit statistical assumptions on the gradients of the target image. In particular, starting from the classical TV regularizer, we will introduce several space-variant and also anisotropic generalizations based on sophisticated probabilistic assumptions. Compared to TV, the new regularizers are much more flexible and their several space-variant parameters are automatically computed. The numerical solution of the corresponding image restoration models will be presented and discussed.