Graph-cut methods for joint reconstruction and labeling

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Many problems in science and engineering require the solution of inverse problems, wherein observed data must be inverted or reconstructed to produce usable imagery. Examples range from medical tomography, to scanning electron tomography, to baggage screening for security, to image deblurring. Often the ultimate goal is to produce a labeling or segmentation of the resulting image. Even when this is not the primary aim, if the observed data are limited or of poor quality it may make sense to constrain the resulting output to a limited set of values to obtain useful information. The traditional approach to obtaining such discrete outputs in inverse problems is to perform an ad hoc, decoupled set of processing steps consisting of conventional inversion (e.g. filtered back projection reconstruction) followed by some discretization of the resulting, often artifact-filled, real-valued image. In this talk I present recent results of extending popular and efficient graph-cut based discrete-label methods to linear inverse problems. I will show examples from tomography and deblurring.