

# Learning Markov Random Field Models for Low-Level Vision

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Markov Random Field (MRF) models are widely used in low-level vision problems such as image denoising and stereo. However the vast majority of these models are hand-tuned using small benchmark datasets, leaving open the question of how broadly applicable the models are in broader settings. A number of recent papers are beginning to address this problem both by learning clique potentials from labeled training data and by selecting among models with different graph structures.

We will present some of our recent investigations into learning clique potentials for both the problems of image denoising and stereo. In this work we examine both parametric and non-parametric models, as well as some techniques for evaluating a limited family of structural models. For image denoising, where there is a good generative model, we find that parametric representations such as the Lorentzian yield the best results. For stereo, where the generative process is less easy to capture, we find that non-parametric representations learned using structured SVM's are best. An important aspect of these latter models is that they are constrained to obey the monotonicity constraints of the stereo matching problem.

For both the denoising and stereo problems our learned models achieve comparable accuracy to the previous state of the art, but also show substantial generality as measured by cross-validation which is encouraging with regards to their broader applicability.

Talk or poster