1086-05-1607 **Dorit S Hochbaum*** (hochbaum@ieor.berkeley.edu), Department of IEOR, UC Berkeley, Berkeley, CA 94720. *Markov Random Fields: Complexity, versatility and algorithms.*

Continuous models have been commonplace in image segmentation, denoising and smoothing are shown here to have discrete analogs as various special cases of MRF. Continuous techniques include PDE methods, variational methods, gradient iterative methods, eigenvectors techniques and heuristics for models that include total variations, Mumford Shah, level sets and others. The well known classical discrete optimization model of Markov Random Fields (MRF) is shown here to formulate these, and other, continuous models. MRF was shown to be efficiently solvable for convex penalty functions, and NP-hard for non-convex functions, with algorithms that are fastest possible, or within a logarithmic factor to being fastest possible (Hochbaum 2001). Therefore the discrete version of total variation, binary Mumford Shah and others, are solved optimally and efficiently with MRF algorithms. This provides substantial improvement over the use of continuous techniques, not only in running time, but also in quality of results. We describe here how the MRF framework model applies to these continuous models and thus solves efficiently many well studied image segmentation and denoising problems. This demonstrates the power of discrete techniques over that of continuous methods for these problems. (Received September 23, 2012)