

# IMAGE ANALYSIS WITH PARTIALLY ORDERED MARKOV MODELS

by

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## ABSTRACT

Statistical approaches to image analysis, such as image restoration, segmentation, object classification, and reconstruction often require specification of a distributional model for the variability of the pixel intensities around the true image and a prior distributional model for the true image itself. Spatial dependence (i.e., nearby values tend to be more - or less - alike than those far apart) is often modeled by assuming a Markov random field (MRF) for the prior model and sometimes for the pixel-intensity model. When dealing with MRFs, there is typically an unwieldy normalizing constant that can cause inference to be either inefficient or computationally intensive. In this article, we propose a class of models that are a subset of the class of MRFs but whose members have probability distributions that can be written in closed form. This class, called the partially ordered Markov models (POMMs), contains as a special case the Markov mesh models (MMMs) and has an impact on the modeling of statistical dependence that goes beyond that for images.