

IEEE Transactions on Pattern Analysis and Machine Intelligence

Call for Papers

Special Issue on Probabilistic Graphical Models in Computer Vision

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Topic Description and Justification

An exciting development over the last decade has been the gradually widespread adoption of probabilistic graphical models (PGMs) in many areas of computer vision and pattern recognition. Many problems in computer vision can be viewed as the search, in a specific domain, for a coherent global interpretation and understanding from local, uncertain, and ambiguous observations. Graphical models provide a unified framework for representing the observations and the domain-specific contextual knowledge, and for performing recognition and classification through rigorous probabilistic inference. In addition, PGMs readily capture the correlations and dependencies among the observations, as well as between observations and domain or commonsense knowledge, and allow systematic quantification and propagation of the uncertainties associated with data and inference.

Graphical models can be classified into directed and undirected models. The directed graphs include Bayesian Networks (BNs) and Hidden Markov Models (HMMs), while the undirected graphs include Markov Random Fields (MRFs) and Conditional Random Fields (CRFs). Both directed and undirected graphical models have been widely used in computer vision. For example, HMMs are used in computer vision for motion analysis and activity understanding, while MRFs are extensively used for image labeling, segmentation, and stereo reconstruction. The latest research uses BNs in computer vision for representing causal relationships such as for facial expression recognition, active vision, visual surveillance, and for data mining and pattern discovery in pattern recognition. CRFs provide an appealing alternative to MRFs for supervised image segmentation and labeling, since they can easily incorporate expressive, non-local features. Another emerging trend is to use graphical models to integrate context and prior knowledge with visual cues in vision and multimedia systems.

Despite their importance and recent successes, PGMs' use in computer vision still has tremendous room to expand in scope, depth, and rigor. Their use is especially important for robust and high level visual understanding and interpretation. This special issue is dedicated to promoting systematic and rigorous use of PGMs for various problems in computer vision. We are interested in applications of PGMs in all areas of computer vision, including (but not limited to):

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| 1) image and video modeling | 6) motion estimation and tracking |
| 2) image and video segmentation | 7) new inference and learning (both structure and parameters) theories for graphical models arising in vision applications |
| 3) object detection | 8) generative and discriminative models |
| 4) object and scene recognition | 9) models incorporating contextual, domain, or commonsense knowledge |
| 5) high level event and activity understanding | |

Tentative Timelines

16 August 2008	Submission deadline
25 October 2008	Notification of acceptance
18 April 2009	Camera-ready manuscript due
1 October 2009	Targeted publication date

Paper submission and review

The papers should be submitted online through *TPAMI's* Manuscript Central site, with a note/tag designating the manuscript to this special issue. All submissions will be peer-reviewed by at least 3 experts in the field. Priority will be given to work with high novelty and potential impacts. We will return without review submissions that we feel are not well aligned with our goals for the special issue.