

Object-based Segmentation

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Abbreviation: object-seg
Number of instances: 5
Number of variables: 68160
Number of labels: 4-8
Number of factors:
Order: 2
Function type: potts

Description The `object-seg` model enables the simultaneous detection, recognition, and segmentation of object classes in photographs. Every pixel of a photograph is associated with a discrete random variable that takes labels like `grass`, `tree`, or `sky`. The distribution over these variables is modeled as a Conditional Random Field (CRF) depending on image features. The final segmentation is obtained from the MAP configuration of the CRF.

Objective / Learning The problem is formulated in the energy domain modeling the distribution of the class labels \mathbf{c} given an image \mathbf{x} :

$$\begin{aligned} \log P(\mathbf{c}|\mathbf{x}, \boldsymbol{\theta}) = & \\ & \sum_i \psi_i(c_i, \mathbf{x}; \boldsymbol{\theta}_\psi) + \pi(c_i, \mathbf{x}_i; \boldsymbol{\theta}_\pi) + \lambda(c_i, i; \boldsymbol{\theta}_\lambda) \\ & + \sum_{(i,j) \in \mathcal{E}} \phi(c_i, c_j, \mathbf{g}_{ij}(\mathbf{x}); \boldsymbol{\theta}_\phi) - \log Z(\boldsymbol{\theta}, \mathbf{x}) \quad (1) \end{aligned}$$

The single-site potentials ψ_i , π , and λ model shape-texture, color, and location respectively. The pairwise potentials ϕ are contrast sensitive Potts models. Z is the partition function. The parameters $\boldsymbol{\theta}$ are learned using a boosting procedure with textons and shape filter features. We refer the reader to [1] for more details.

References

- [1] Jamie Shotton, John M. Winn, Carsten Rother, and Antonio Criminisi. *TextonBoost: Joint appearance, shape and context modeling for multi-class object recognition and segmentation*. In *ECCV (1)*, pages 1–15, 2006.