

1. Abstract

- We formulate the problem of joint visual attribute and object class image segmentation as a dense multi-labelling problem, where each pixel in an image can be associated with both an object class and a set of visual attributes labels.
- In order to learn the label correlations, we adopt a boosting-based piecewise training approach with respect to the visual appearance and co-occurrence cues.
- We use a filtering-based mean-field approximation approach for efficient joint inference. Further, we develop a hierarchical model to incorporate region-level object and attribute information.

Object class segmentation

- Assigning an object class label to each pixel

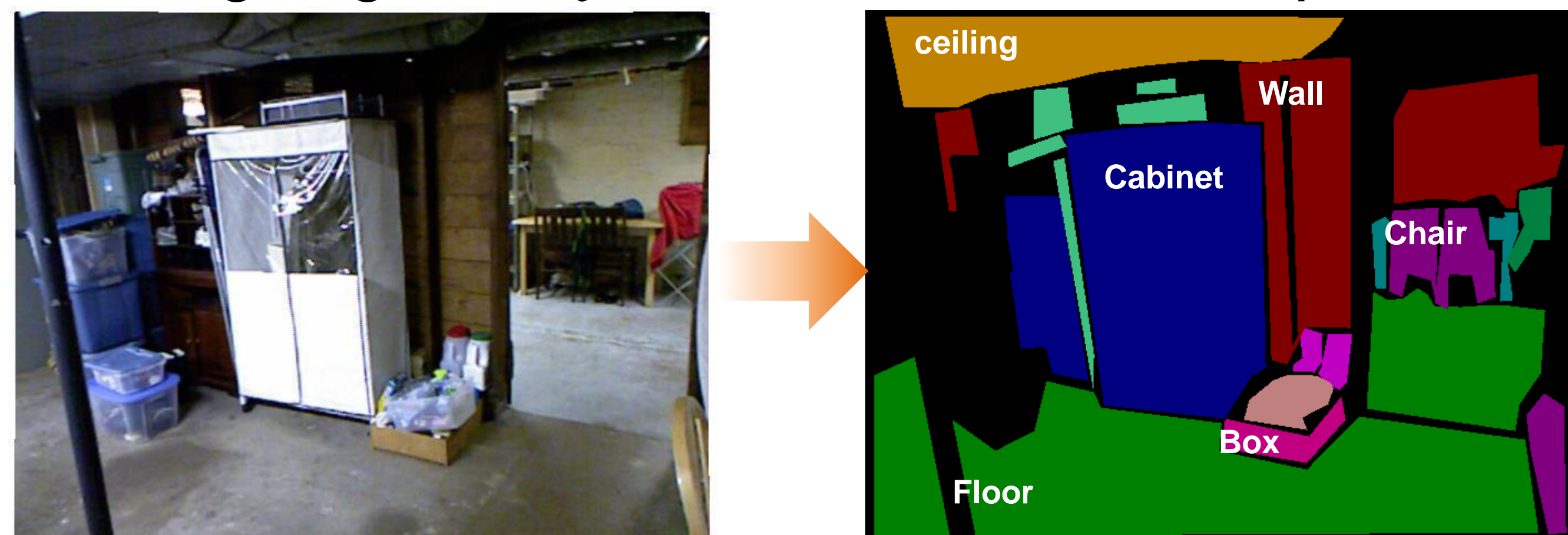
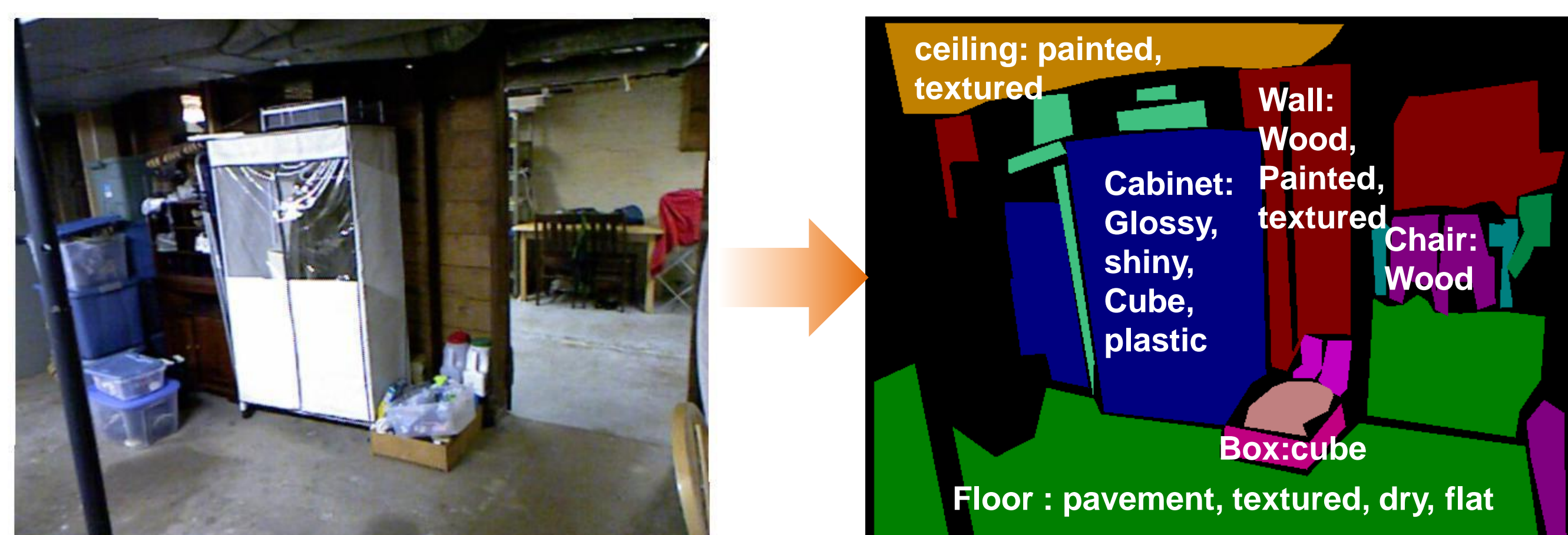
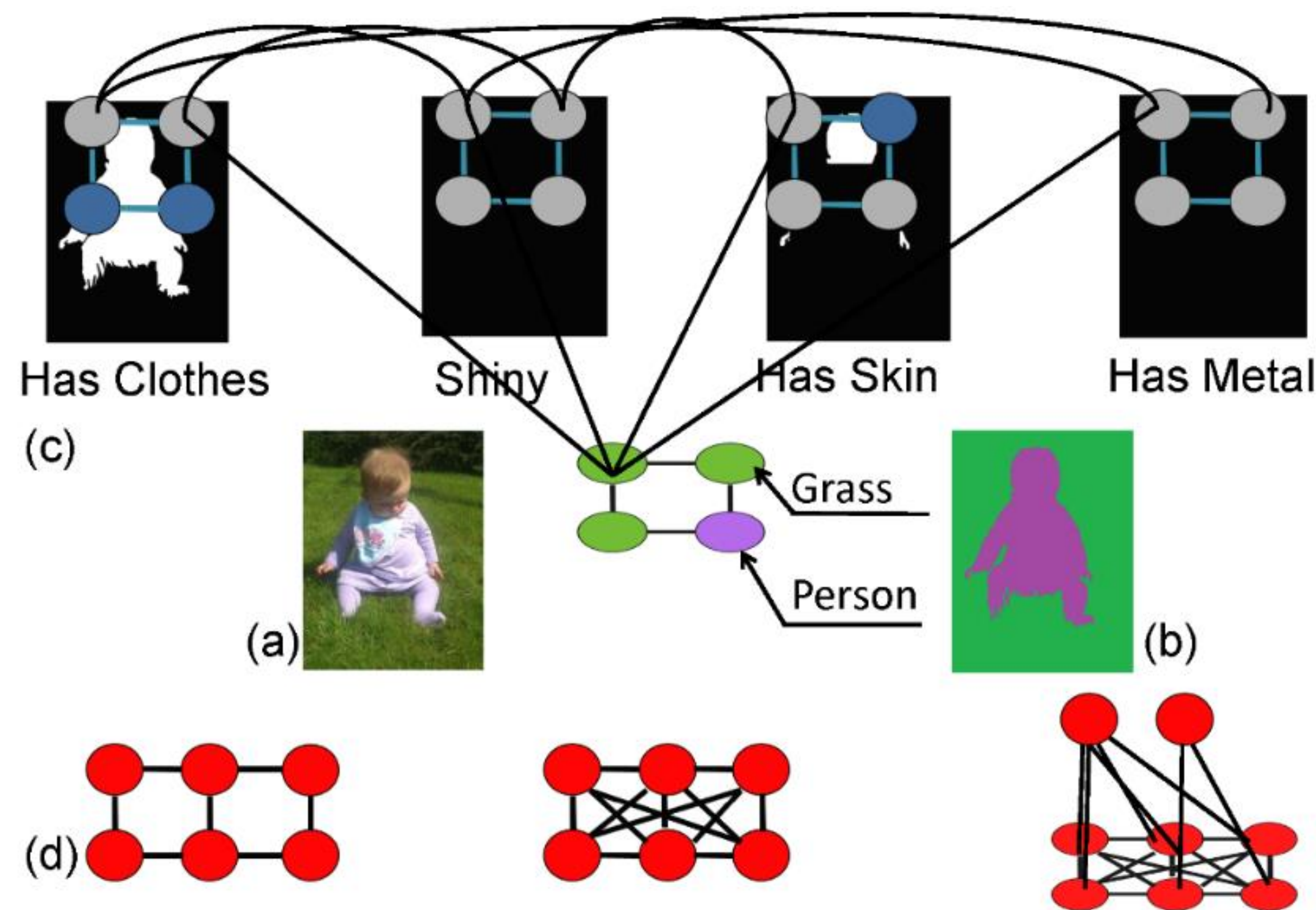


Image Segmentation with Objects and Attributes

- Assigning an object class label and a set of visual attribute labels to each pixel



2. Hierarchical Multilabel CRF framework

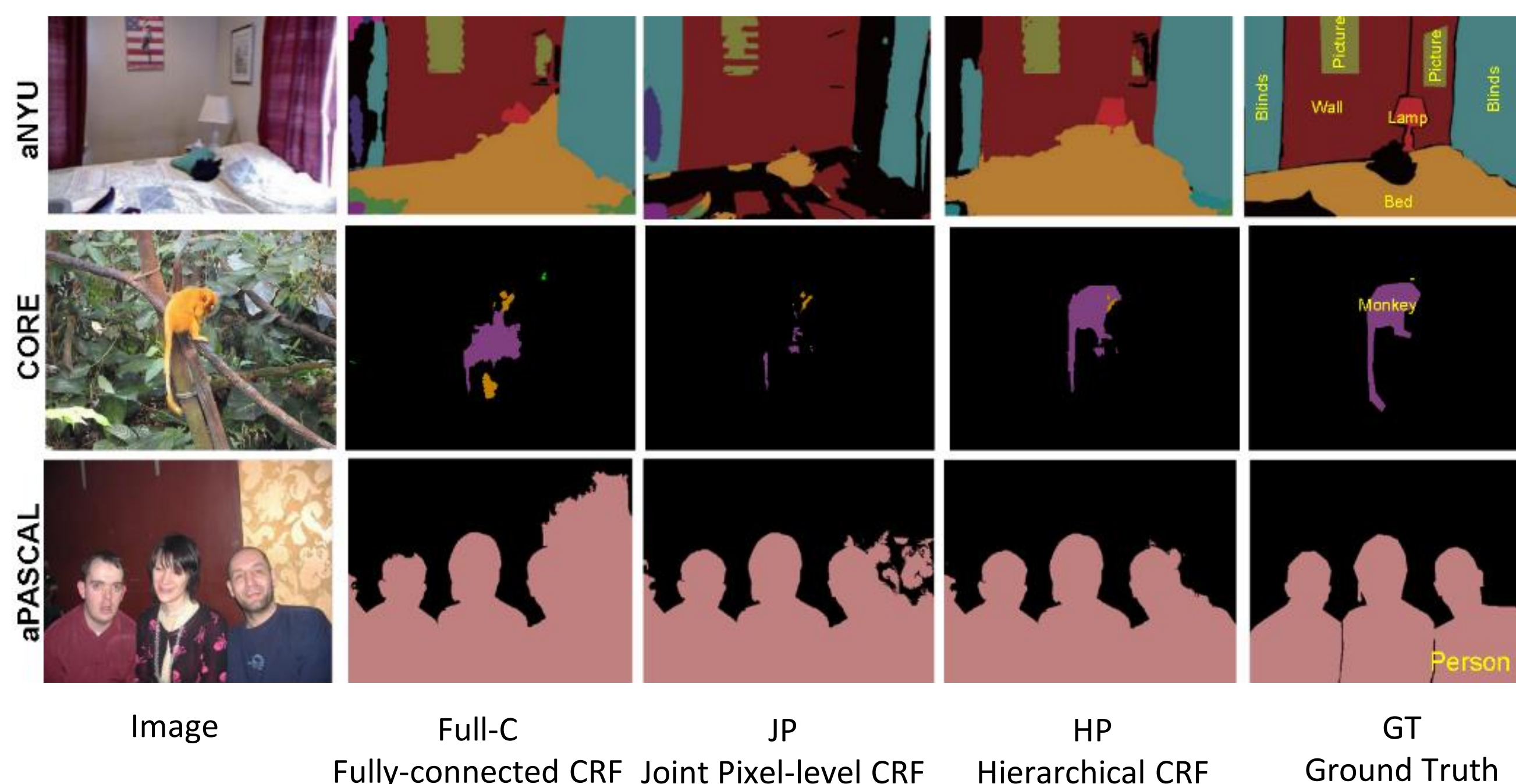


$$\sum_{i \in \mathcal{V}_{pix}} \psi_i^j(z_i) + \sum_{\substack{(i,j) \in \mathcal{E}, \\ i,j \in \mathcal{V}_{pix}}} \psi_{ij}^j(z_i, z_j) + \sum_{i \in \mathcal{V}_{reg}} \psi_i^{j'}(z_i) + \sum_{\substack{(i,j) \in \mathcal{E}, \\ i \in \mathcal{V}_{pix}, j \in \mathcal{V}_{reg}}} \psi_{ij}^{j'}(z_i, z_j)$$

Joint pixel-level unary for object-attribute Joint region-level unary for object-attribute

Joint pixel-level pairwise term for object-attribute Joint region-level pairwise term for object-attribute

3. Evaluation on Three Datasets



4. Attribute-augmented NYU dataset



Following the CORE dataset, we augment the attribute annotations for NYU V2 dataset. Above figure shows the annotations for aNYU dataset. Below figure demonstrate the annotation of CORE dataset and aPASCAL dataset.

5. Acknowledgement

This project is supported by EPSRC EP/I001107/2, ERC HELIOS 2013-2018 Advanced Investigator Award.

- [1] Dense semantic image segmentation with objects and attributes. CVPR, 2014.
- [2] ImageSpirit: Verbal Guided Image Parsing, ACM TOG 2014.
- [3] Efficient Inference in Fully Connected CRFs with Gaussian Edge Potentials. NIPS 2011.

<http://kylezheng.org/densesegattobj/>

