



Exploiting Saliency for Segmenting Objects from Image Level Labels

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Task & Motivation

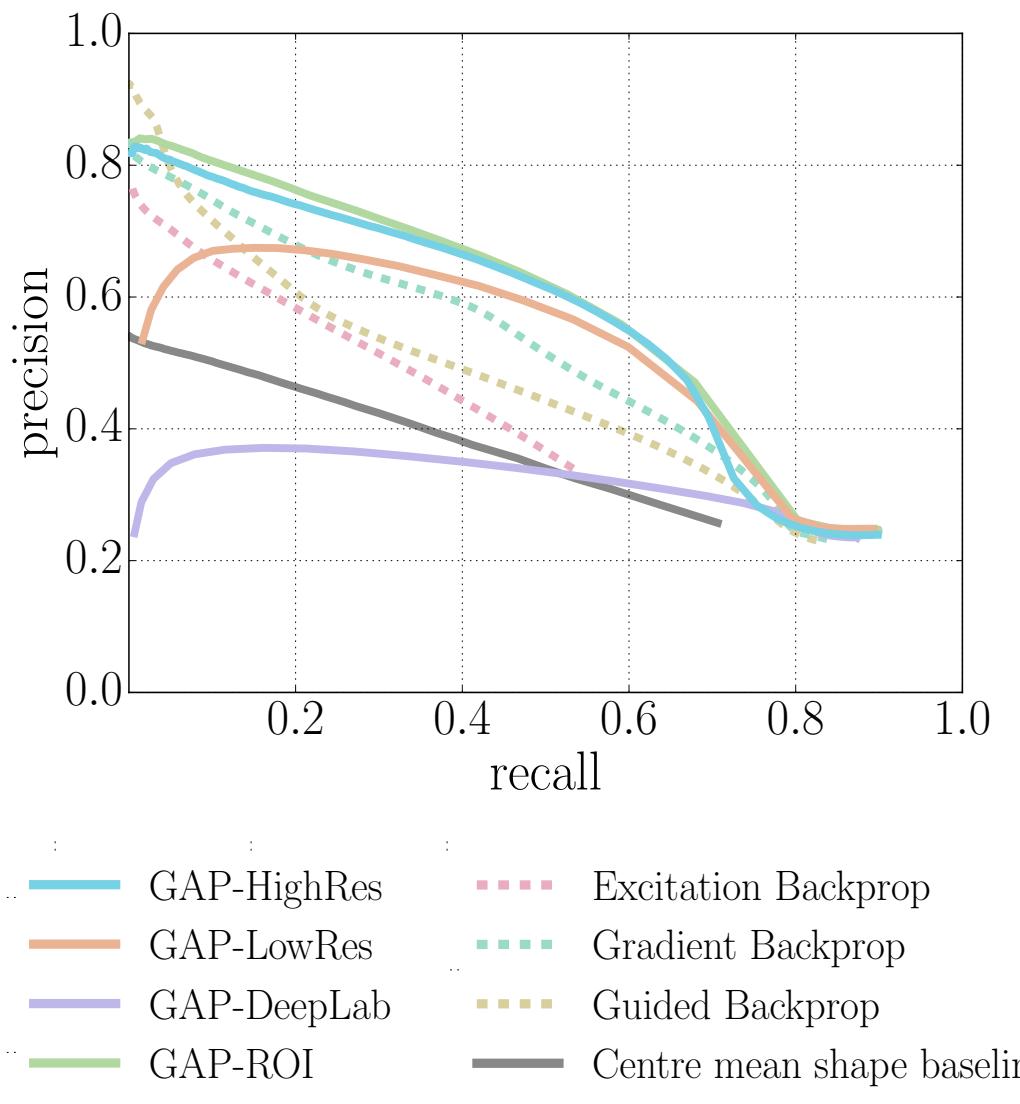
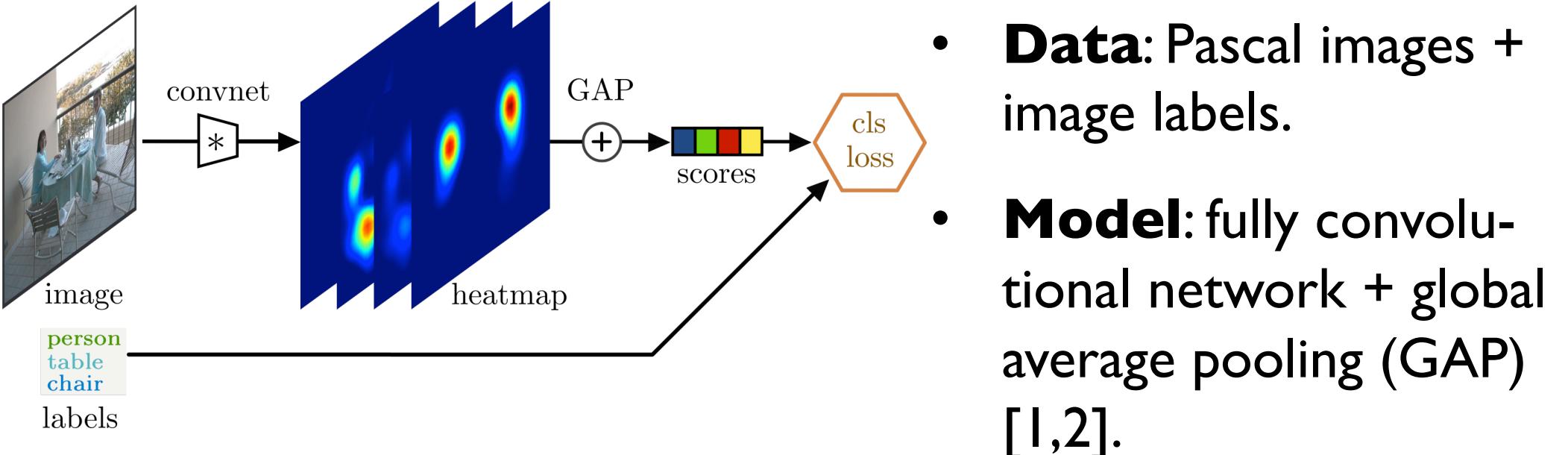
Learning to segment objects from image label annotations.

- Cheaper than full supervision.
- Humans can do.



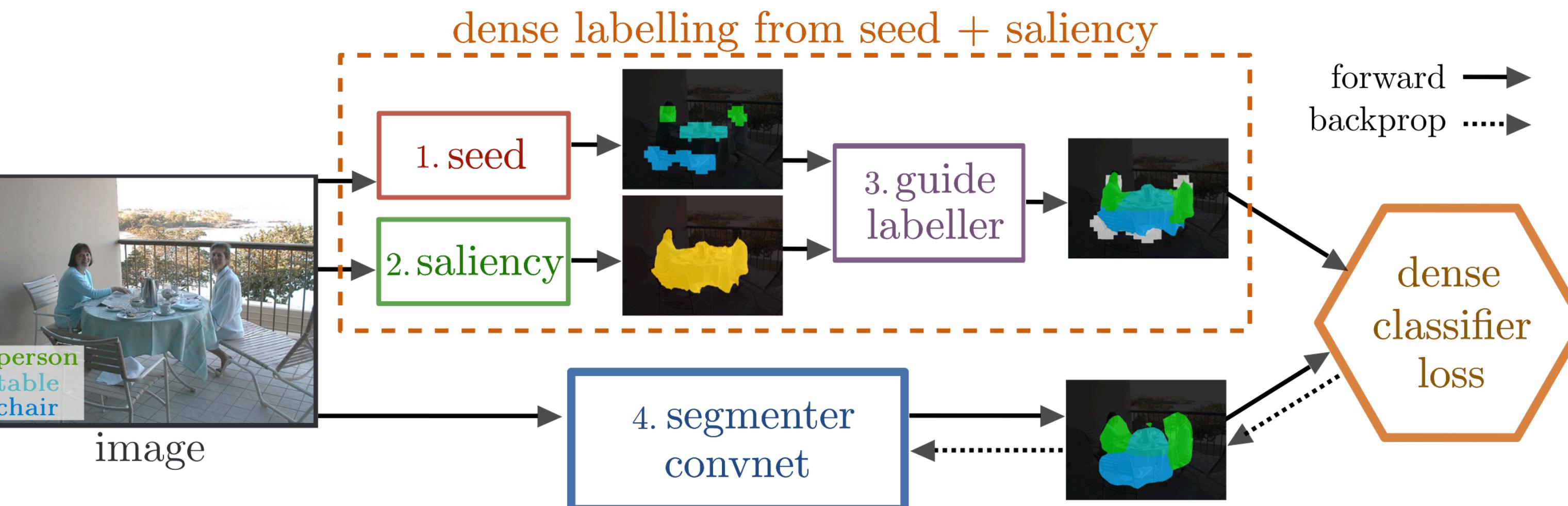
I. Seed : Encode Image Labels

Discriminative object locations from image-level classifiers.



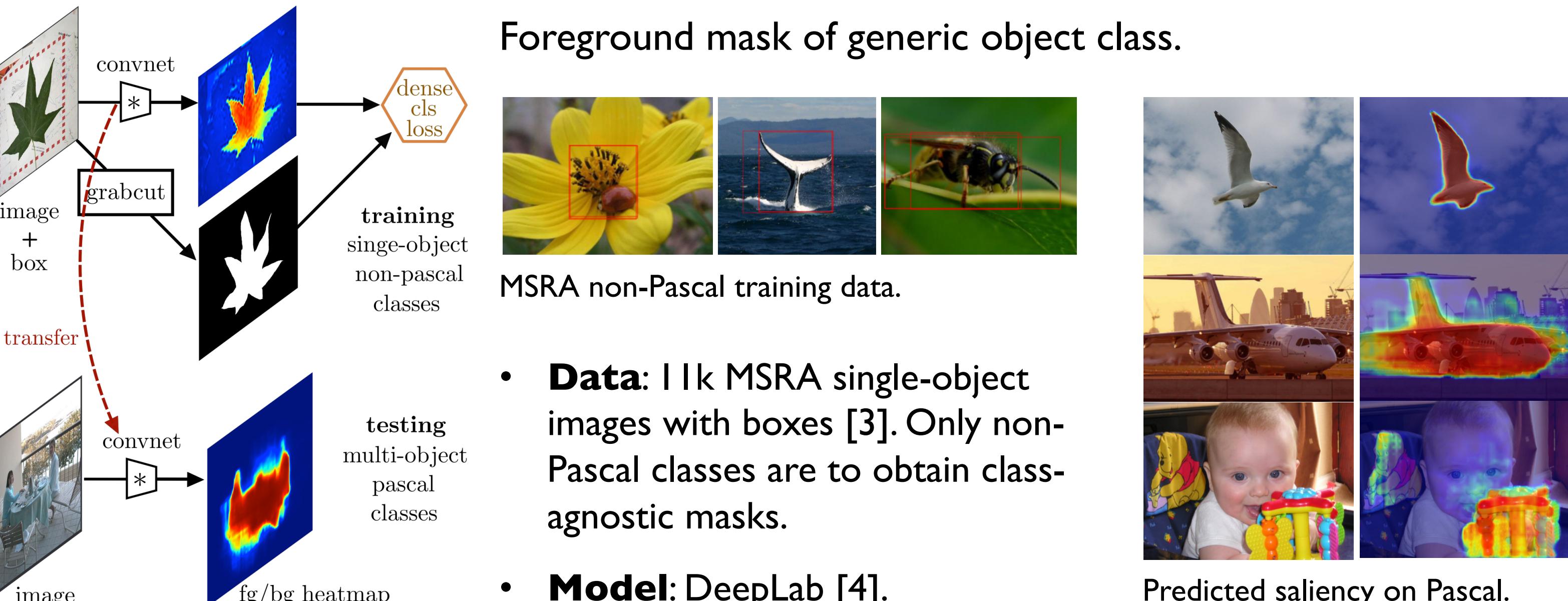
Qualitative results for different GAP types.

Approach : Guided Segmentation



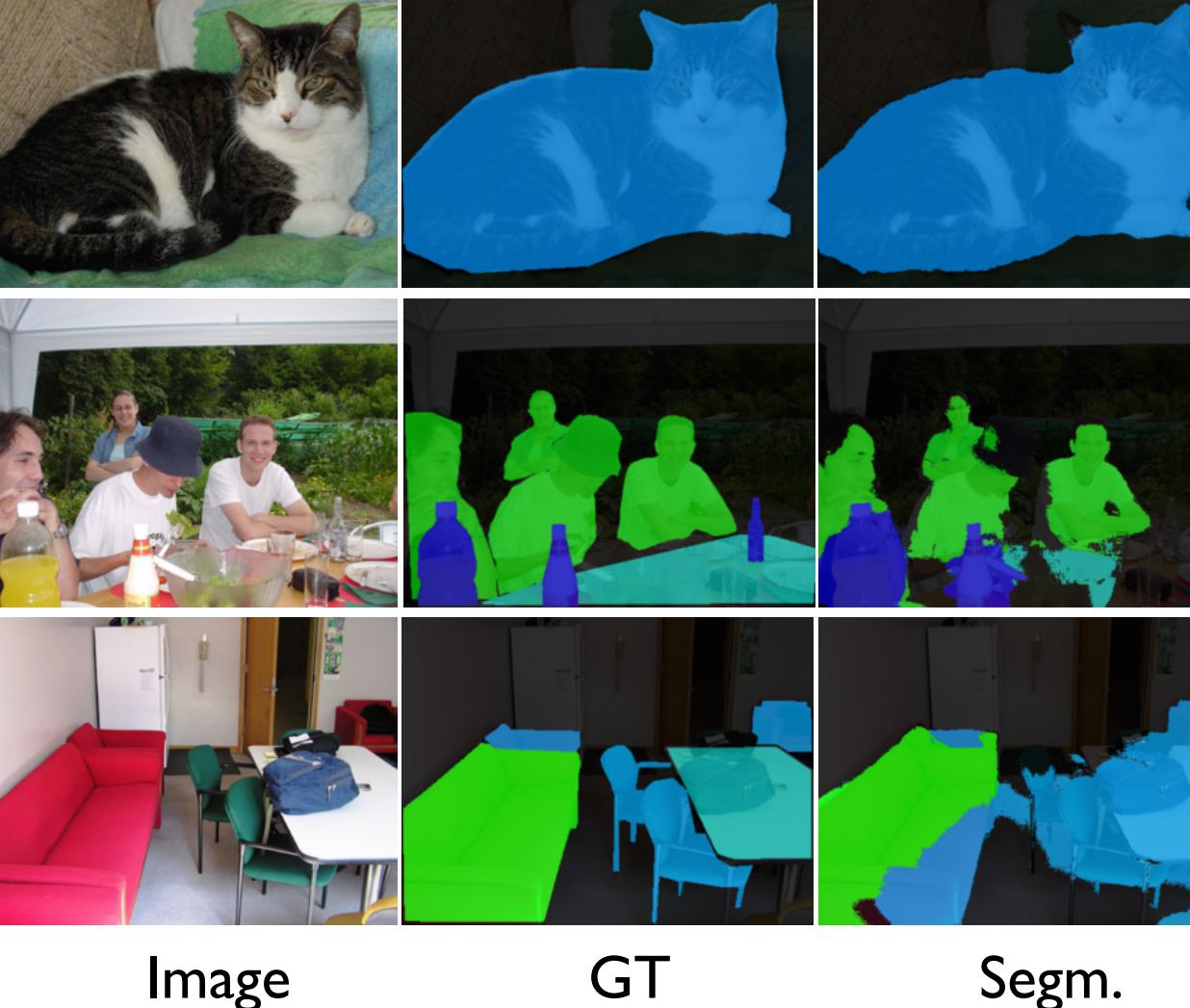
1. Get discriminative object locations from an image-level classifier [1,2] (**seed**).
2. Image labels alone do not give full object extent information (e.g. train and rail); we propose to exploit class-agnostic image-level saliency (**saliency**).
3. Combine the two sources of information (**guide labels**).
4. Refine the labelling by training a **segmenter** (e.g. DeepLab [4]) with the guide labels.

2. Saliency : Encode “Objectness” Prior



4. Segmentation Result & Comparison

Method	Data	Val mIoU	Test mIoU	FS%
MIL-FCN ICLRW'15	I+P	25.0	25.6	36.5
DCSM ECCV'16	I+P	44.1	45.1	64.2
SEC ECCV'16	I+P	50.7	51.7	73.5
STC arXiv'15	I+P+S+E _{40k}	49.8	51.2	72.8
CheckMask ECCV'16	I+P+ μ	51.5	-	-
MicroAnno BMVC'16	I+P+ μ	51.9	53.2	75.7
GuideLabeller	I+P+S	55.7	56.7	80.6
DeepLabv1 [4]	I+P _{full}	67.6	70.3	100



- Reach **80% of the fully supervised** performance.
- Better saliency model will further improve the result; oracle saliency gives 61.8 mIoU.

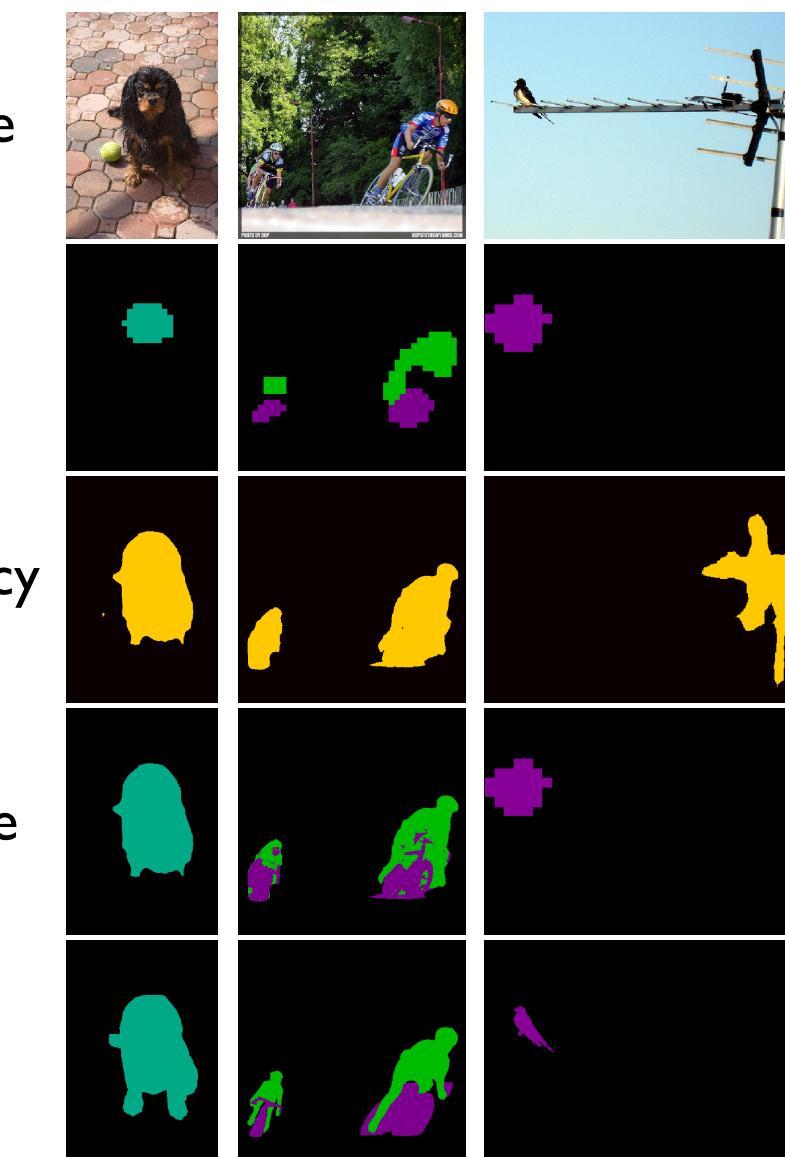
3. Guide Labels : Seed + Saliency

Combination algorithm:

- i. Break seed and saliency into connected components.

- ii. If seeds touch saliency: diffuse seeds inside saliency with dense CRF.

- iii. If seed is alone, label as FG; If saliency is alone, label as BG.



References

- [1] Zhou et al. Learning Deep Features for Discriminative Localization. CVPR'16.
- [2] Kolesnikov et al. Seed, Expand, Constrain: Three Principles for Weakly-Supervised Image Segmentation. ECCV'16.
- [3] Cheng et al. Global Contrast Based Salient Region Detection. TPAMI'15.
- [4] Chen et al. Semantic Image Segmentation with Deep Convolutional Nets and Fully Connected CRFs. ICLR'15.

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