Object detection with grammar models

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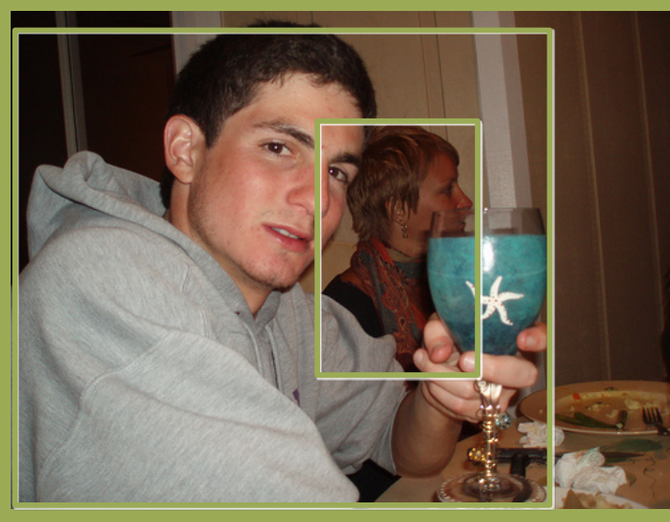
helmet,
occluded left side

ski cap, no face
truncated

pirate hat, dresses,
long hair



truncation, holding glass,
heavy occlusion

Objects from rich categories have diverse *structural* variation

THE UNIVERSITY OF CHICAGO
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TOYOTA TECHNOLOGICAL INSTITUTE CHICAGO
NIPS Neural Information Processing Systems Foundation

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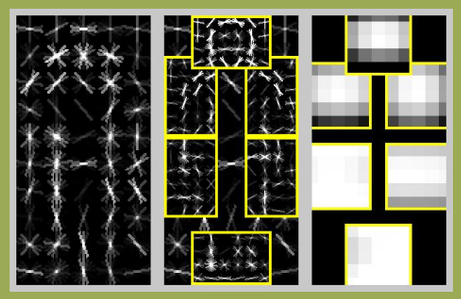
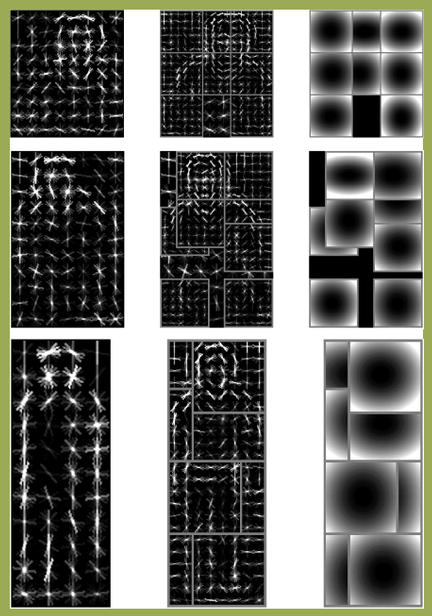
Dalal & Triggs
CVPR 2005
AP 0.12



Felzenszwalb, McAllester & Ramanan
CVPR 2008
AP 0.27

Felzenszwalb, Girshick,
McAllester & Ramanan
PAMI 2010
AP 0.36



Felzenszwalb, Girshick & McAllester
voc-release4
AP 0.42

More mixture components?

There are too many combinations!
Instead...

... compositional models defined by grammars

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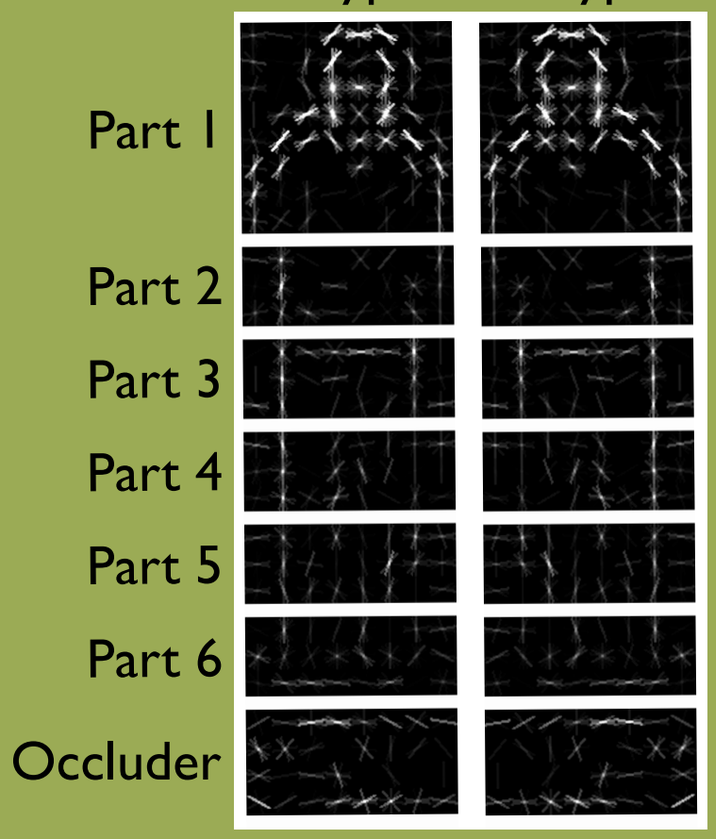
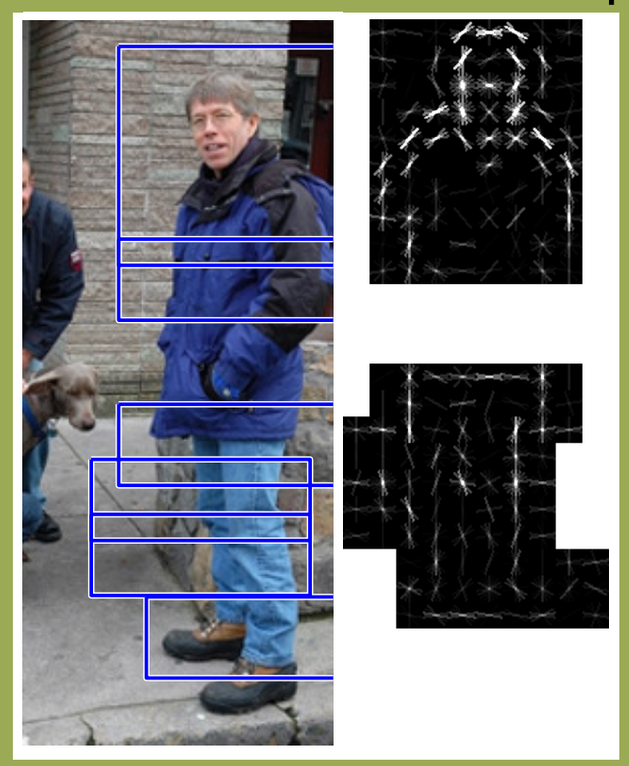
Localizing people with an object detection grammar

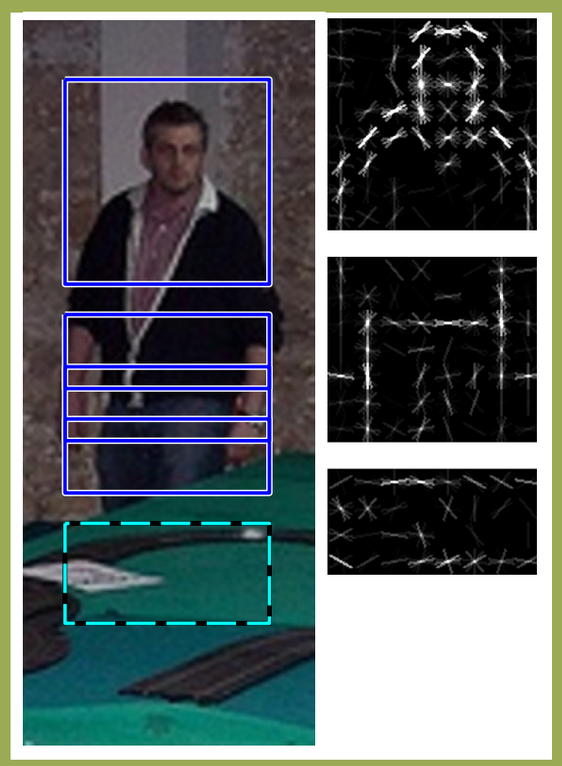


AP 0.47

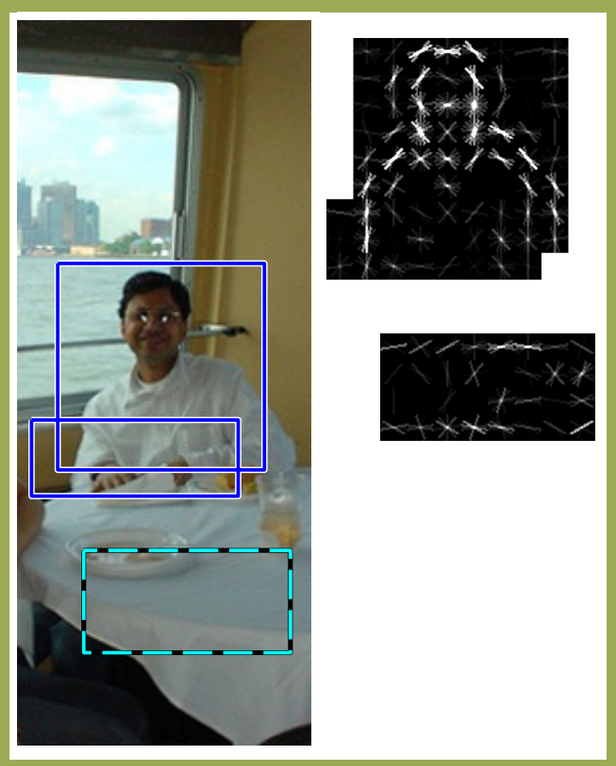
Example detections and derived filters



Parts 1-6 (no occlusion)



Parts 1-4 & occluder



Parts 1-2 & occluder

- Fine-grained occlusion
- Part sharing
- Non-trivial model of the *stuff* that causes occlusion
- Part subtypes
- Subparts at multiple resolutions

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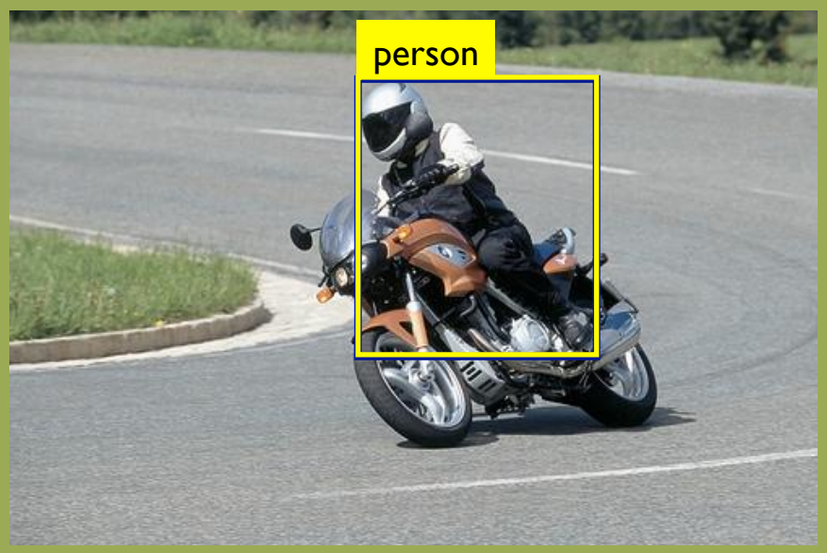
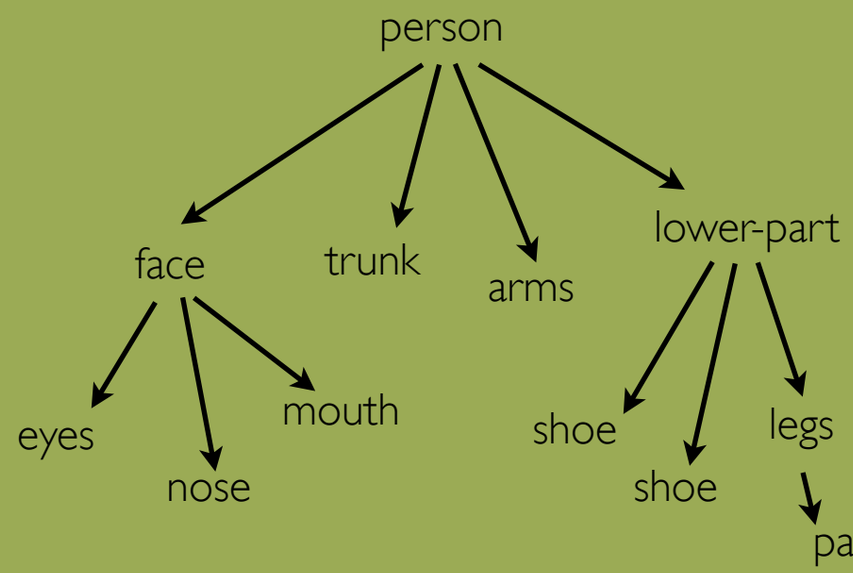
Discriminative training when the label space != output space



label



output

Weak-label structural SVM
Generalizes latent structural SVM

Top performance on PASCAL VOC 2010 'person'