Discriminatively Trained Sparse Code Gradients for Contour Detection

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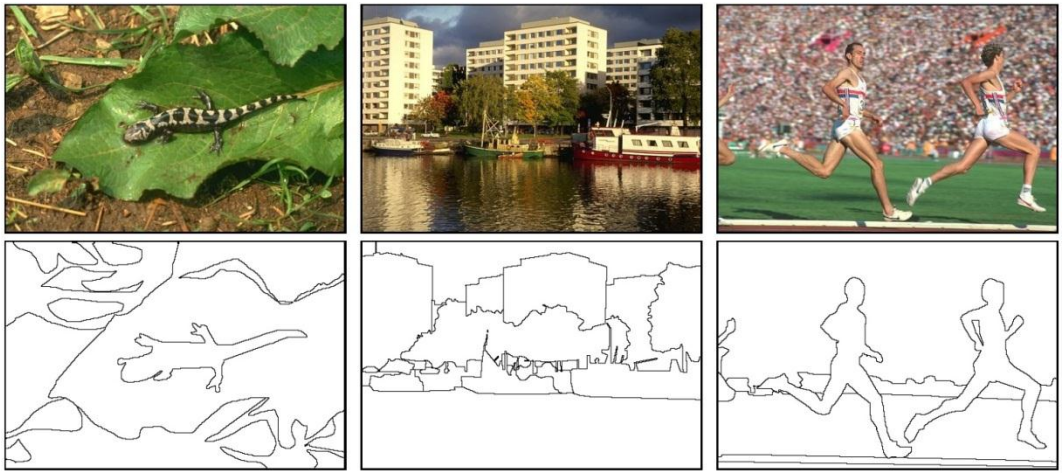
Contour detection fundamental to many tasks: segmentation, recognition, …

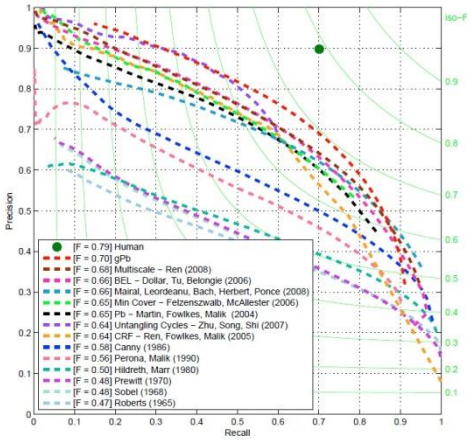


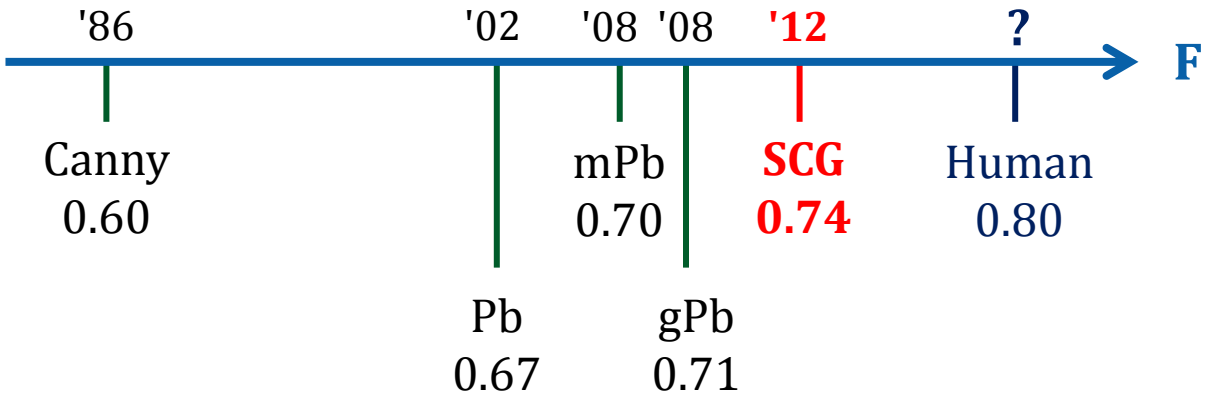
Berkeley Segmentation Dataset

Highly varied natural images

Groundtruth by (many) humans

Sparse Code Gradients (**SCG**): large improvement over gPb, 1/3 gap to human

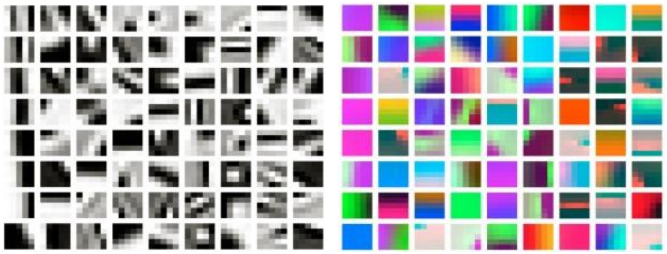




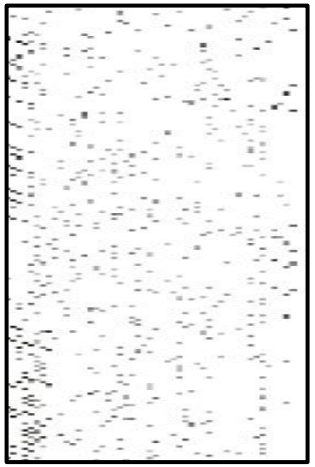
High-quality contours are crucial for many vision tasks.

Learned Sparse Representation + Oriented Gradients

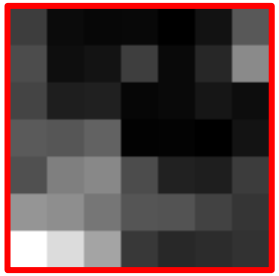
Dictionaries learned w/ K-SVD



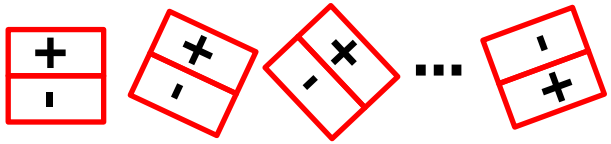
Per-Pixel Sparse Codes



Patch: gray, ab



Greedy Sparse Coding w/ Orthogonal Matching Pursuit



Multi-scale Pooling
Oriented Gradients

Mystery Transform

Linear SVM (per orientation)

Needs **efficient** classification:
every pixel, every orientation

Capturing Both Fine-Scale & Large-Scale Contours

gPb
F=0.71

SCG
F=0.74

Multi-scale (oriented) pooling leads to high precision at all scales.

Learning Scalable Features to Chase the Moore's Law

A balance of **design** and **learning** of local image representation

- ✓ Efficiently capture local contour contrast with oriented gradients
- ✓ Easily scale up with larger dictionaries (and larger patches)
- ✓ Easily adapt to **RGB-D** with learned dictionaries of depth / surface normal

Lots of results and analysis available at the poster. Come and chat!

Feature dimension

$\propto$

Processor speed