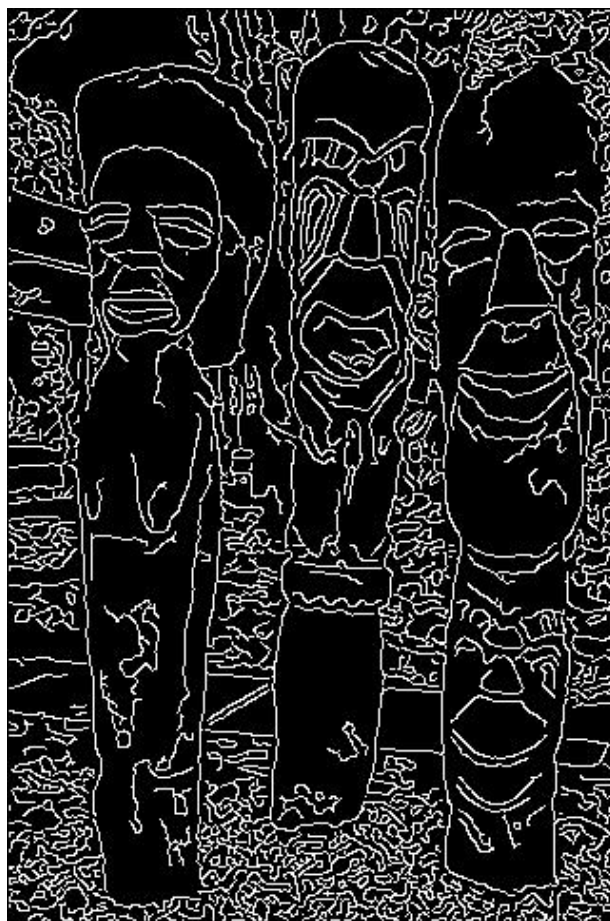


Edge Benchmark

Which edge detector is better?



Image

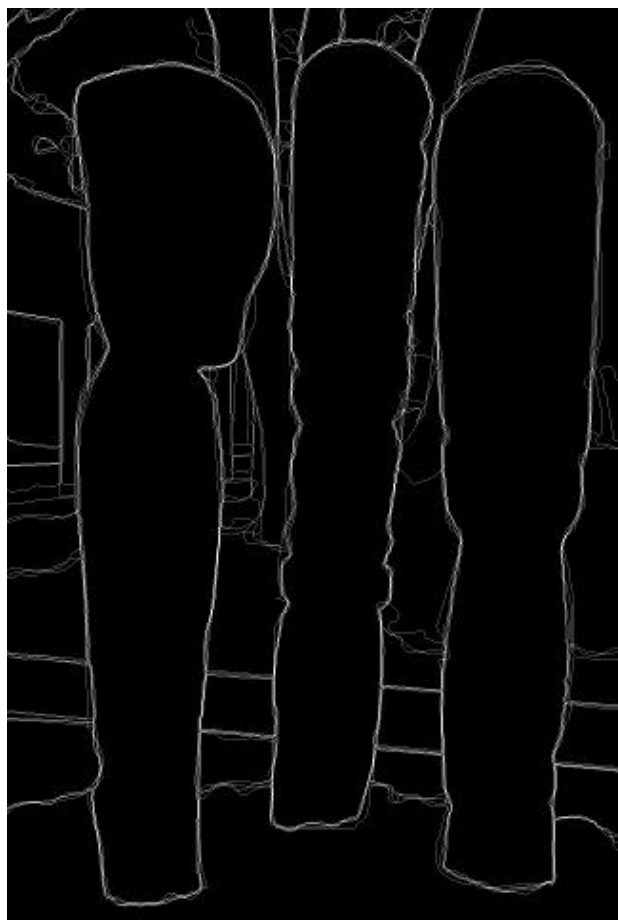


Canny [1]

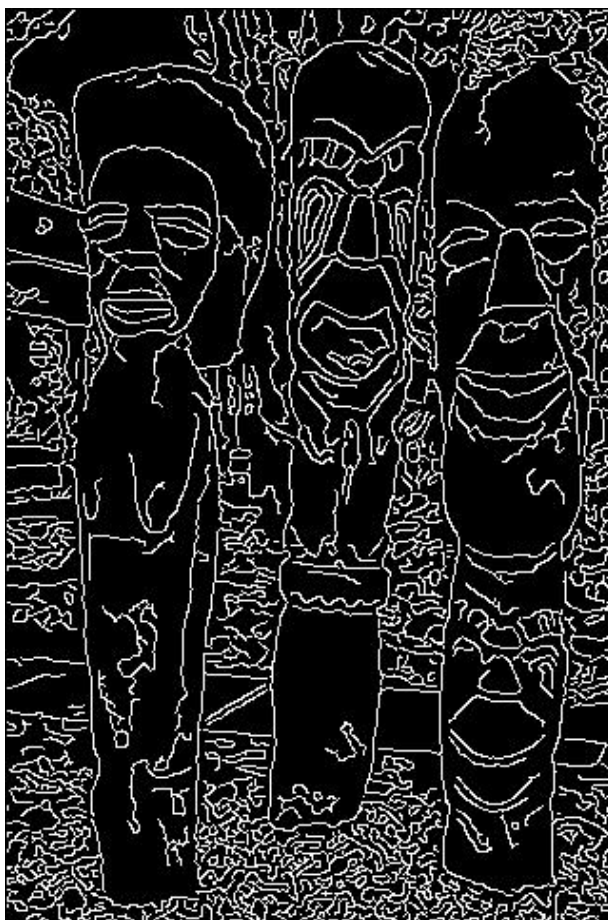


gPb [2]

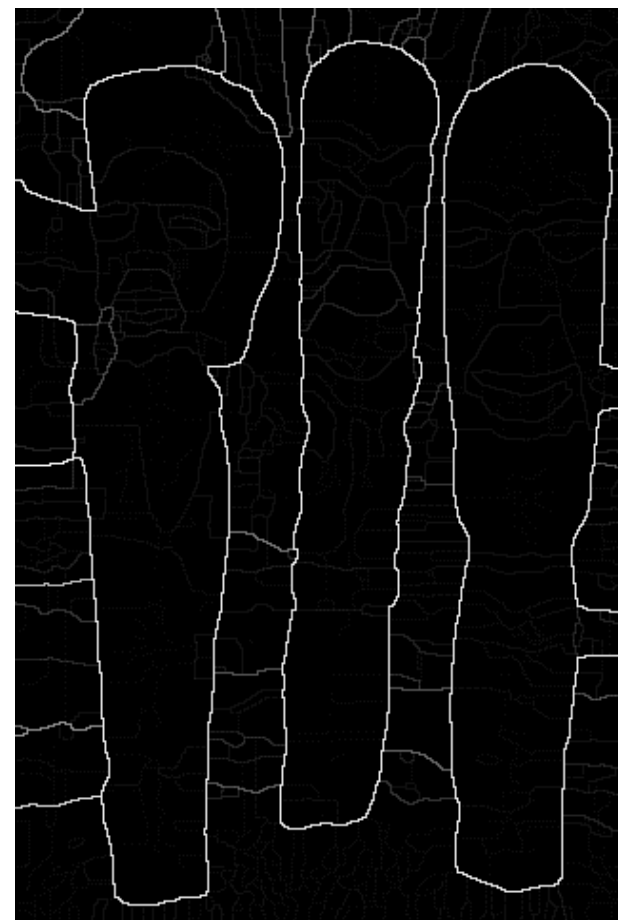
Which edge detector is better?



Ground Truth



Canny [1]



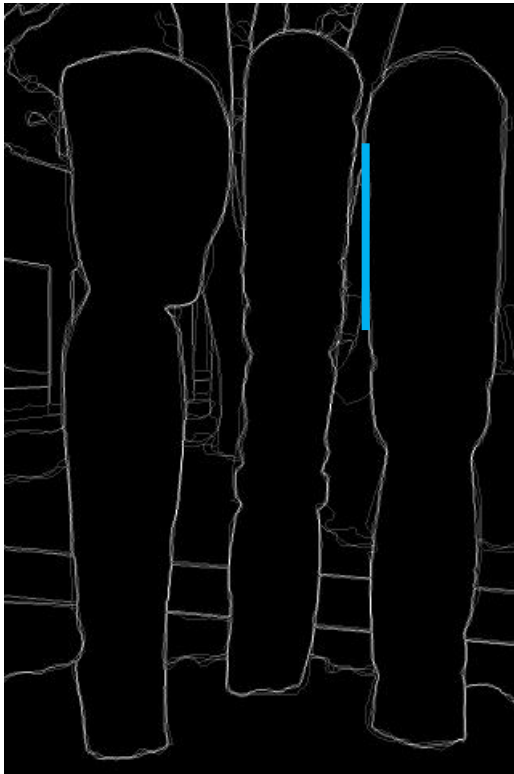
gPb [2]

Depends on what we want

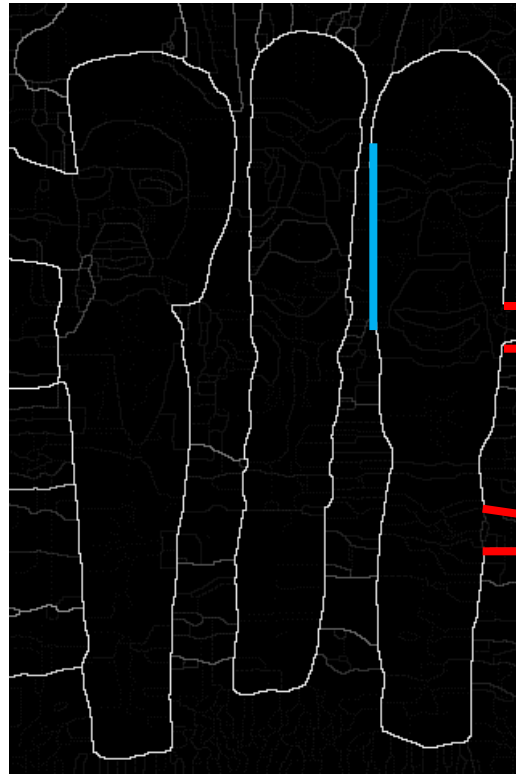
- Instruction for generating ground truth: [3]
 - Divide the image into some number of segments, where the segments represent “things” or “parts of things” in the scene. The number of segments is up to you, as it depends on the image. Something between 2 and 30 is likely to be appropriate. It is important that all of the segments have approximately equal importance.
- Edges are the boundaries where “things” or “parts of things” intersect

Precision

- **Precision** is the fraction of detections that are true positives rather than false positives [3]



Ground Truth



gPb [2]

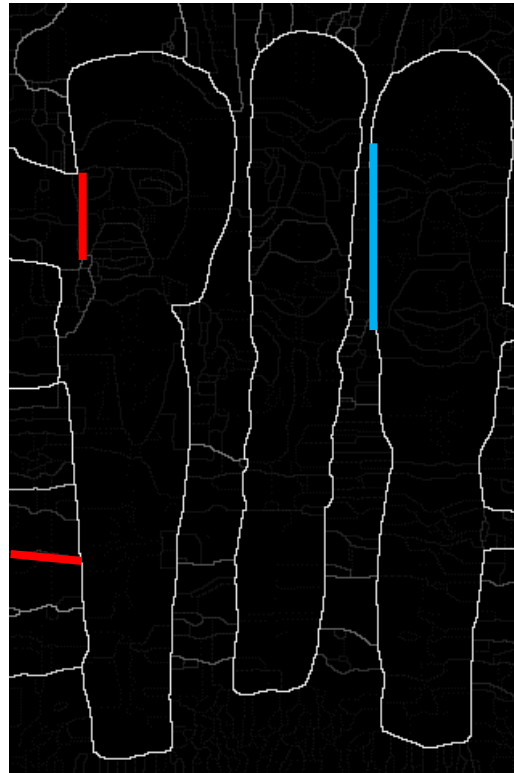
$$\frac{\text{True Positives}}{\text{True Positives} + \text{False Positives}}$$

Recall

- **Recall** is the fraction of true positives that are detected rather than missed [3]



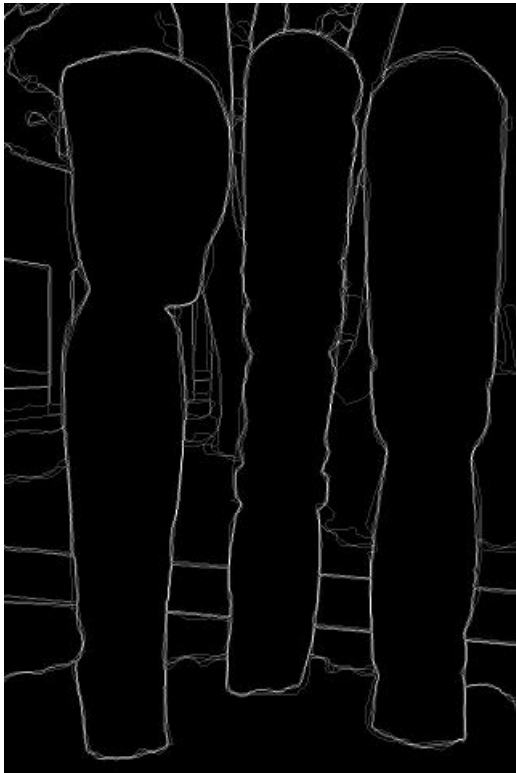
Ground Truth



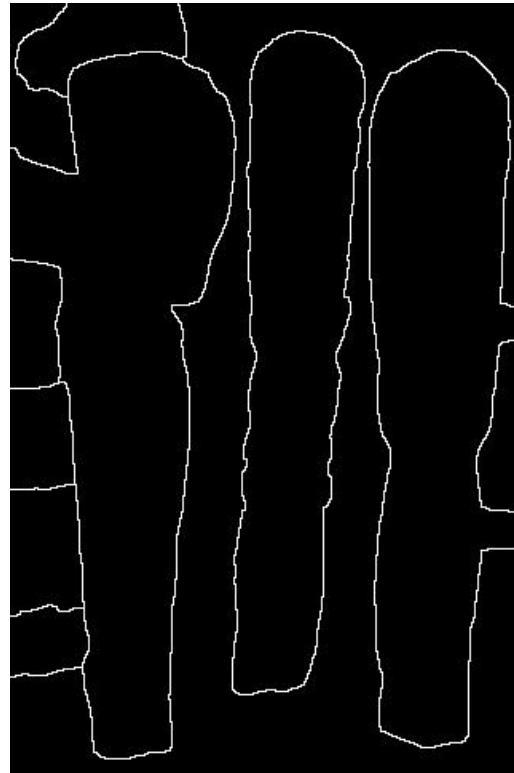
gPb [2]

$$\frac{\text{True Positives}}{\text{True Positives} + \text{False Negative}}$$

High threshold



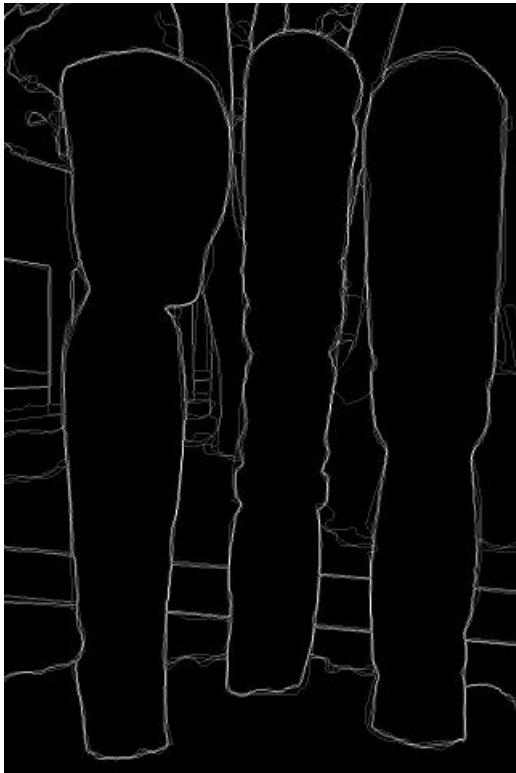
Ground Truth



gPb [2]

- Precision = 0.9580
- Recall = 0.7441
- F-measure = 0.8376
- High precision

Low threshold



Ground Truth



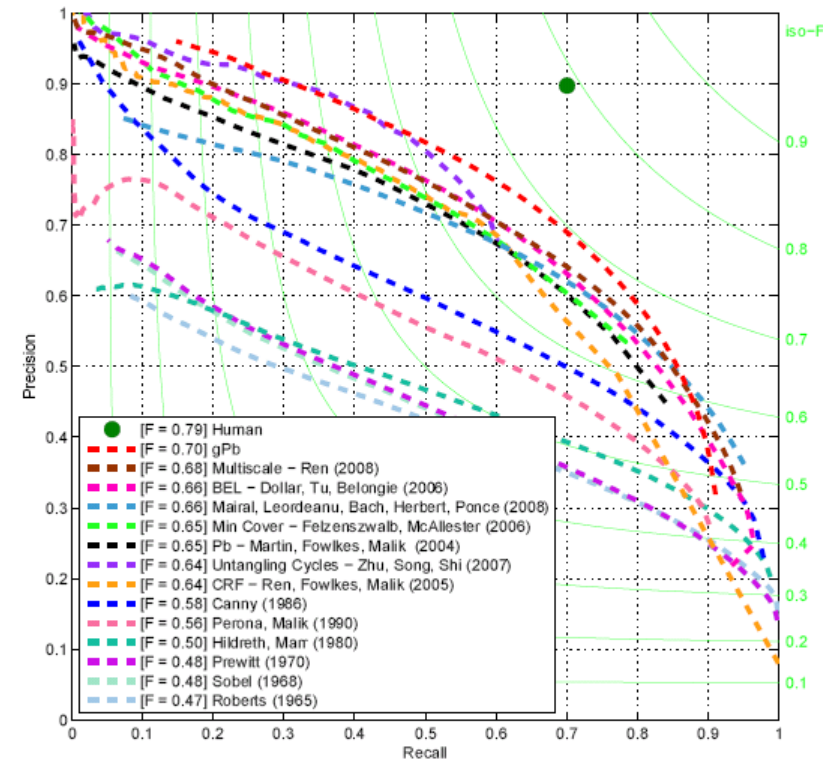
gPb [2]

- Precision = 0.6763
- Recall = 0.9539
- F-measure = 0.7915
- High recall

F-measure & PR Curve

- We could plot **P-R curve** over different threshold
- The edge detector that generates the **most top-right** curve is the best
- **F-measure** captures the trade off between P and R:

$$F = 2 \frac{PR}{(P + R)}$$



PR Curve on BSDS500 [2]

Reference

- [1] J. Canny, “A computational approach to edge detection,” *PAMI*, 1986.
- [2] P. Arbelaez, M. Maire, C. Fowlkes, and J. Malik, “Contour detection and hierarchical image segmentation,” *PAMI*, 2011
- [3] D. Martin, C. Fowlkes, and J. Malik, “Learning to detect natural image boundaries using local brightness, color and texture cues,” *PAMI*, 2004.