

GrabCut - Interactive Foreground Extraction using Iterated Graph Cuts

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Project Presentation By
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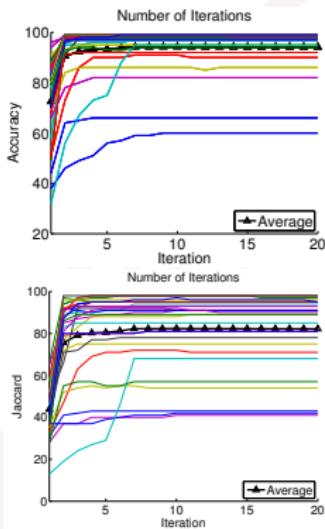
April 20, 2015

Outline

- ▶ Hyperparameter Tuning
 - ▶ Neighborhood Size
 - ▶ GMM Components
 - ▶ Iterations
- ▶ Tight vs Loose Bounding Box
- ▶ User Interaction
- ▶ Entropy-Based Gamma Optimization

Hyperparameter Tuning

Number of Iterations

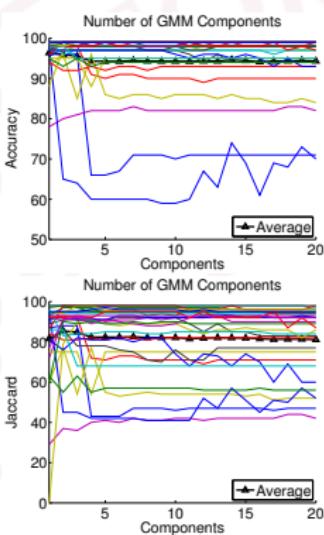


At 20 iterations:

Accuracy: 94.1 ± 9.4

Jaccard: 82.1 ± 17.9

GMM Components



At 20 components:

Accuracy: 94.3 ± 7.7

Jaccard: 81.1 ± 17.1

Neighborhood Size

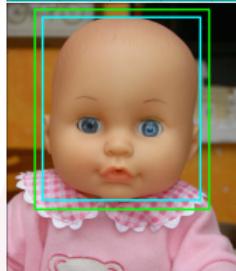
Four Neighbors

- ▶ Accuracy: 93.5 ± 9.2
- ▶ Jaccard: 80.0 ± 19.5

Eight Neighbors

- ▶ Accuracy: 94.2 ± 9.45
- ▶ Jaccard: 82.3 ± 17.9

Tight vs Loose Bounding Box

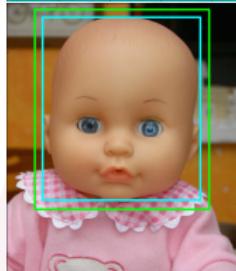


Tight vs Loose Bounding Box



▶ Cross

- ▶ Accuracy: 60%→**59%**
- ▶ Jaccard: 42%→**39%**



▶ Doll

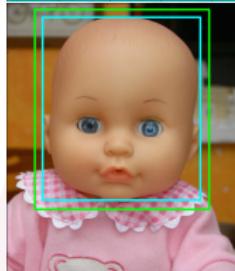
- ▶ Accuracy: 99%→99%
- ▶ Jaccard: 98%→98%



▶ Elefant

- ▶ Accuracy: 92%→**96%**
- ▶ Jaccard: 81%→**89%**

Tight vs Loose Bounding Box



- ▶ Cross

- ▶ Accuracy: 60%→**59%**
- ▶ Jaccard: 42%→**39%**

- ▶ Doll

- ▶ Accuracy: 99%→99%
- ▶ Jaccard: 98%→98%

- ▶ Elefant

- ▶ Accuracy: 92%→**96%**
- ▶ Jaccard: 81%→**89%**

- ▶ Original bouding boxes

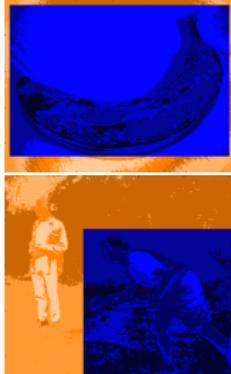
- ▶ Accuracy: 94%
- ▶ Jaccard: 82%

- ▶ Tighter bouding boxes

- ▶ Accuracy: 95%
- ▶ Jaccard: 84%

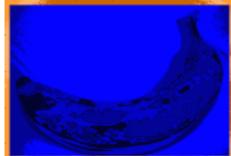
User Interaction

Iteration 0



User Interaction

Iteration 0

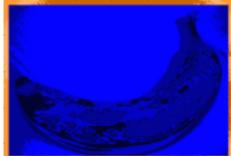


Iteration 1



User Interaction

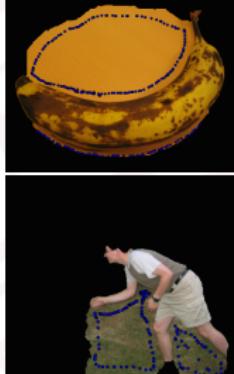
Iteration 0



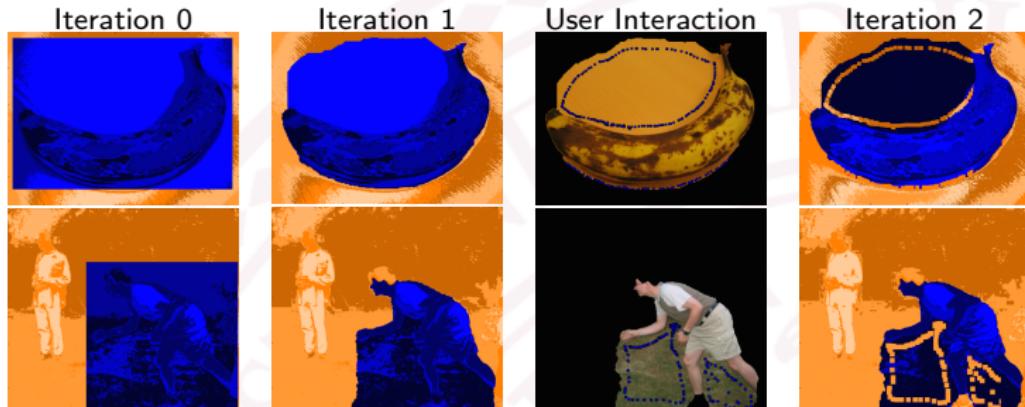
Iteration 1



User Interaction

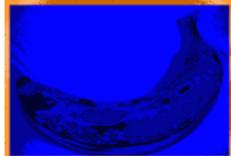


User Interaction



User Interaction

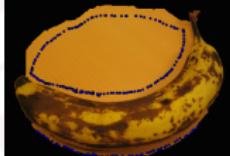
Iteration 0



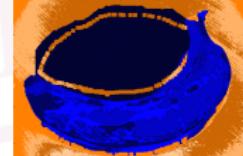
Iteration 1



User Interaction



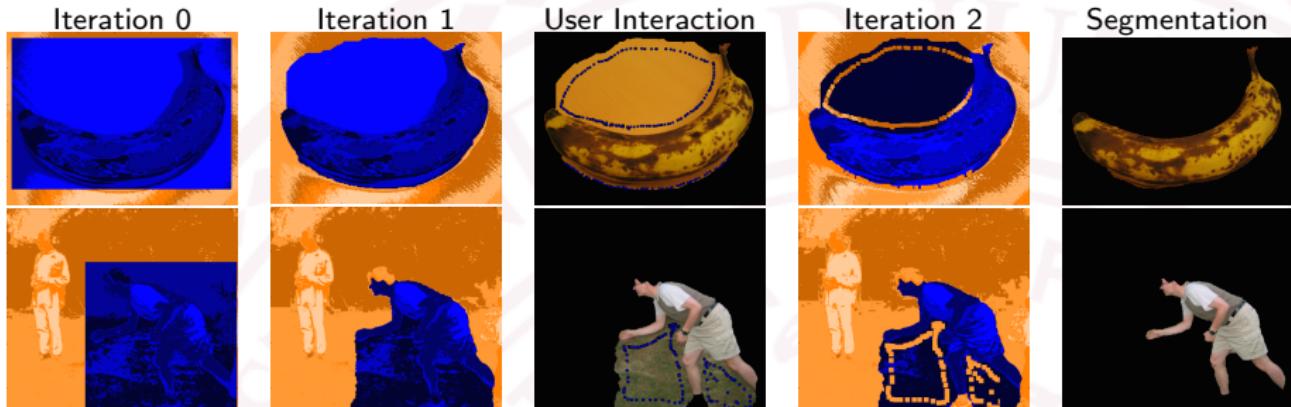
Iteration 2



Segmentation



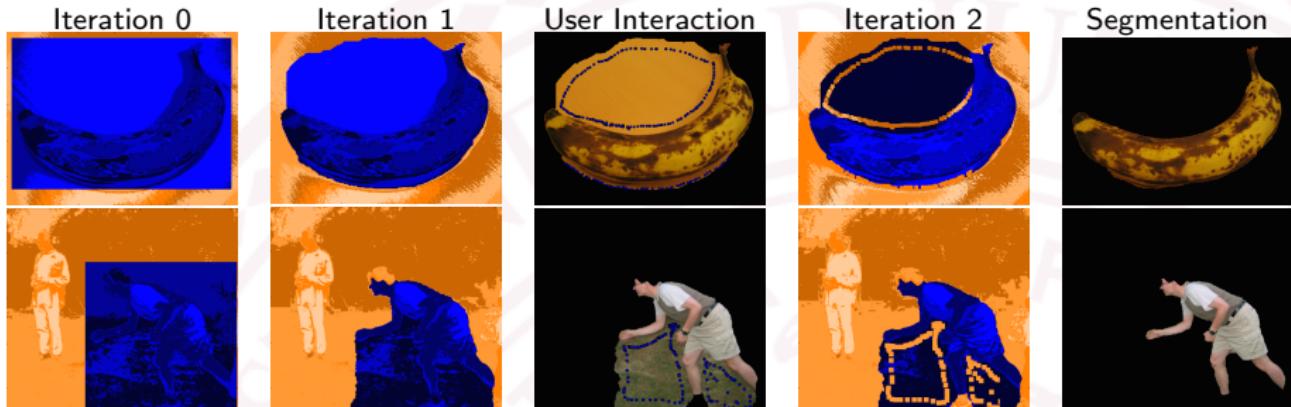
User Interaction



Before

- ▶ Banana1
 - ▶ Accuracy: 66%
 - ▶ Jaccard: 43%
- ▶ Bool
 - ▶ Accuracy: 82%
 - ▶ Jaccard: 41%

User Interaction



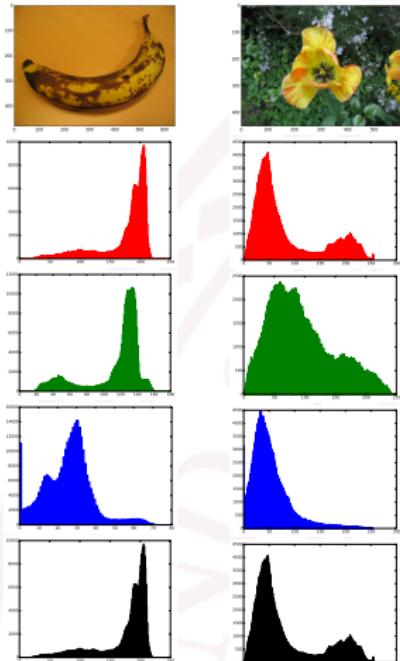
Before

- ▶ Banana1
 - ▶ Accuracy: 66%
 - ▶ Jaccard: 43%
- ▶ Bool
 - ▶ Accuracy: 82%
 - ▶ Jaccard: 41%

After (with user interaction)

- ▶ Banana1
 - ▶ Accuracy: 99%
 - ▶ Jaccard: 96%
- ▶ Bool
 - ▶ Accuracy: 98%
 - ▶ Jaccard: 87%

Entropy-Based Gamma Optimization



Motivation

- ▶ Color-skewed images (e.g. banana1)
- ▶ Unary energies capture color information better than pairwise
- ▶ Pairwise energies should be smaller
- ▶ Reduce gamma for color-skewed images

Experiments

- ▶ Reducing gamma results in better segmentation



- ▶ Next: Automate gamma selection based on entropy