Pull the Plug? Predicting If Computers or Humans Should Segment Images

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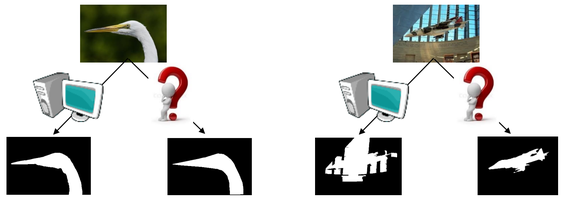
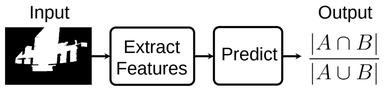
Foreground Object Segmentation



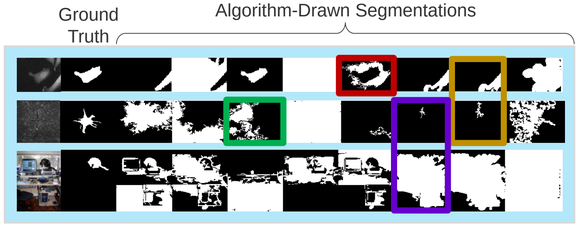
Previous Assumption: *always* or *never* involve humans.
Idea: predict if human or computer should segment image.

Predict Segmentation Quality

Linear Regression System: Predict similarity of algorithm-drawn segmentation to the unobserved ground truth.



Predictive Cues of Failures from 8 Algorithms:



- Object Boundary, Compactness, & Location
- Image Coverage

Cross-Dataset Evaluation:

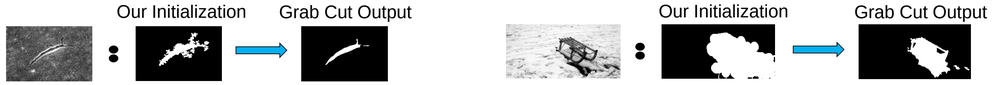
	Weizmann		IIS		BU-BIL	
	CC	MAE	CC	MAE	CC	MAE
Ours:	**0.64**	**0.24**	**0.68**	**0.22**	**0.61**	**0.31**
CPMC [CVPR 2010]:	0.61	0.32	0.67	0.31	0.36	0.33
AlexNet features [NIPS 2012]:	-0.1	26.7	-0.01	45	-0.01	3.22

Top performance on everyday & biomedical images!

Task 1: Which Algorithm (or Human) Should Initialize Segmentation Tool?

Given a batch of images, create **initial coarse segmentations** that segmentation tools refine.

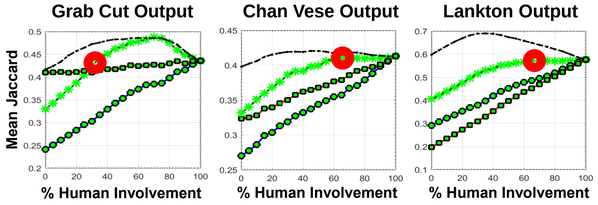
Example Results:



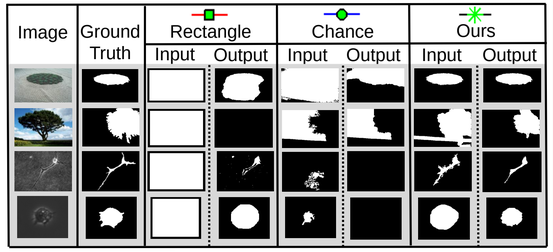
Novel Initialization System: Predicts which algorithm is best-suited for a given image and when to enlist human effort

Task 1: System Evaluation

Initialization for Three Segmentation Tools:



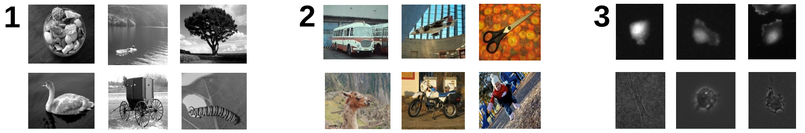
Comparison with Baselines (Grab Cut Results):



On average, for three tools, eliminates human involvement for 44% of images with no quality loss!

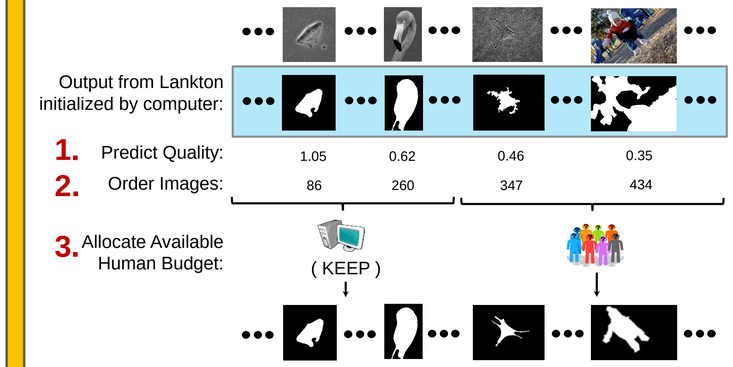
Datasets

1. Weizmann (100 Images)
2. IIS (151 Images)
3. BU-BIL (271 Images)



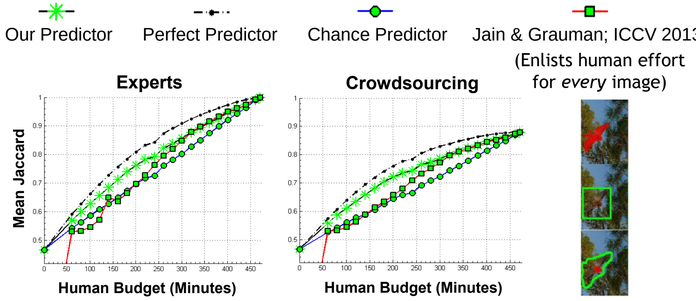
Task 2: Where is Human Effort Needed Most?

Given a batch of images, create high quality, **final segmentations**.



Interactive Segmentation: Predicts which images to enlist human effort

Task 2: System Evaluation



Our system typically achieves state-of-art performance (J & G) while saving up to 60 minutes of crowd effort!

Website & Code

http://vision.cs.utexas.edu/HybridAlgorithmCrowdSystems/PullThePlug