

# Structure-measure: A New Way to Evaluate Foreground Maps

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ICCV 2017 (Spotlight)

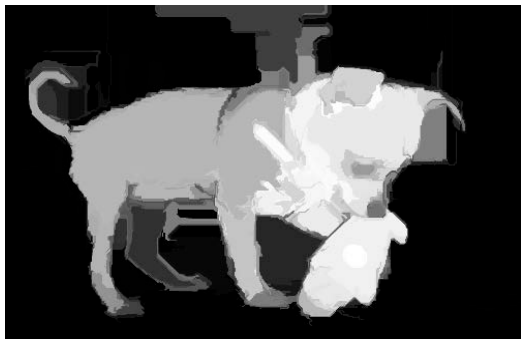
1



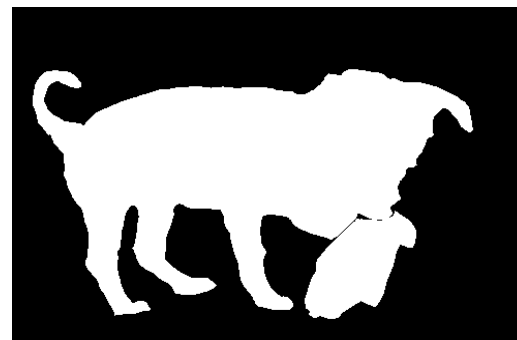
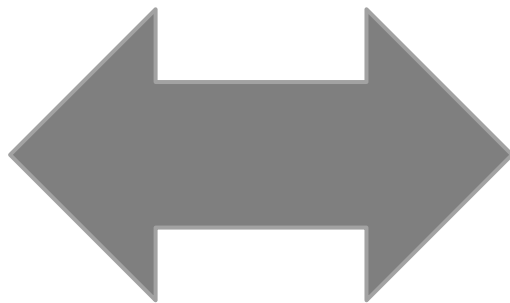
2



# Goal



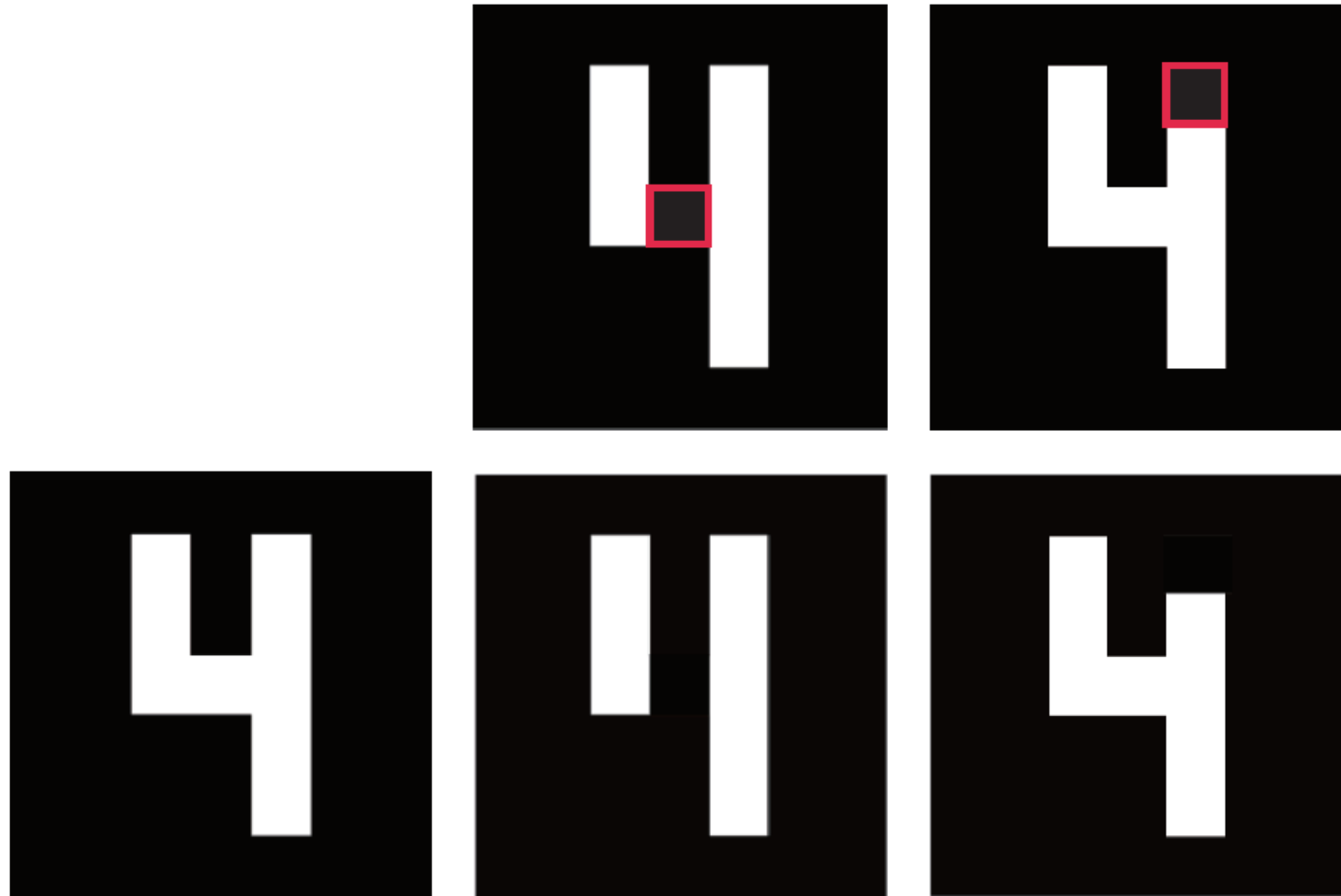
Similarity?



Ground Truth (GT)

Foreground map (FM)

# Pixel-wise based measures (AP, AUC)



(a) GT

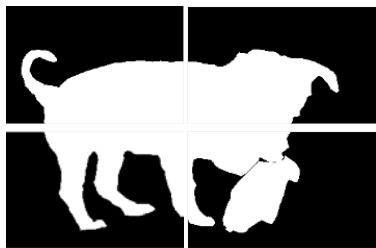
(b) FM1

(c) FM2

# Motivation



- **Region**  
structure consistency  
of **object-parts**;



- **Object**  
**uniformly** distributed;  
**contrast** sharply;



# Region-Level

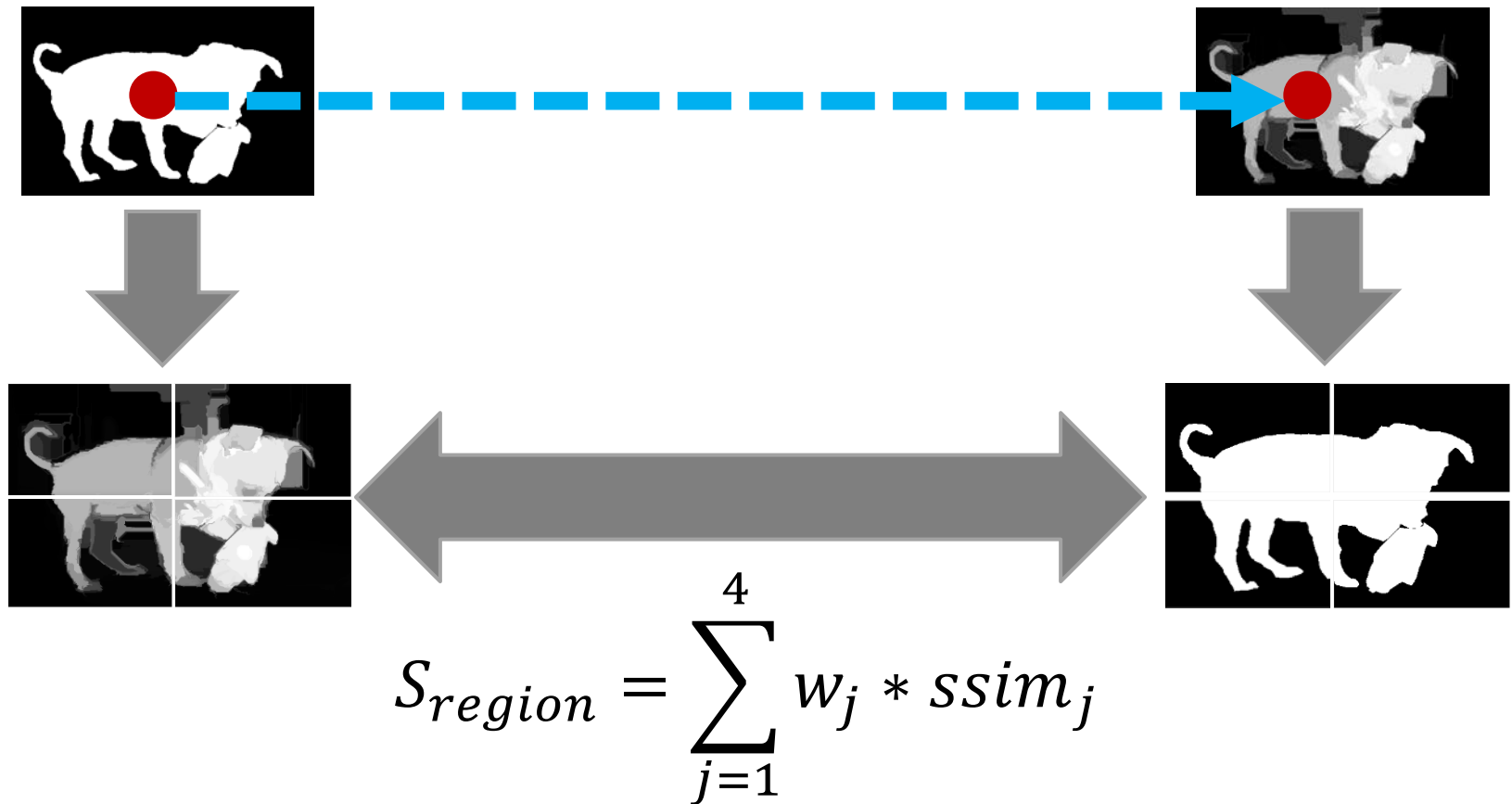
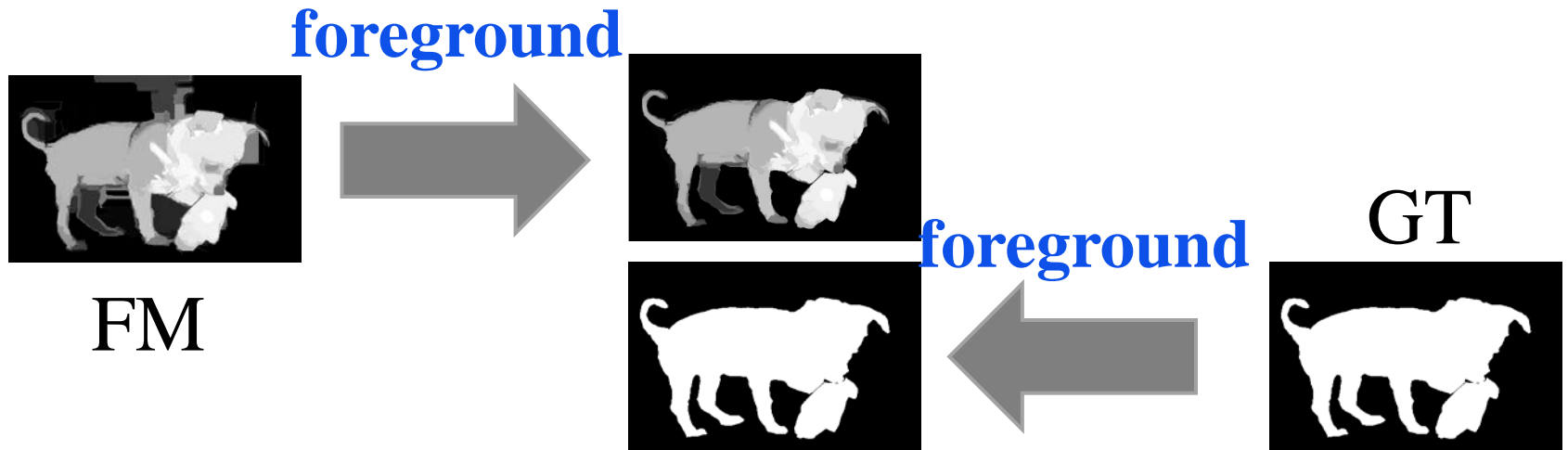


Image quality assessment: from error visibility to structural similarity ,  
IEEE TIP 2004, Z Wang, AC Bovik et. al.



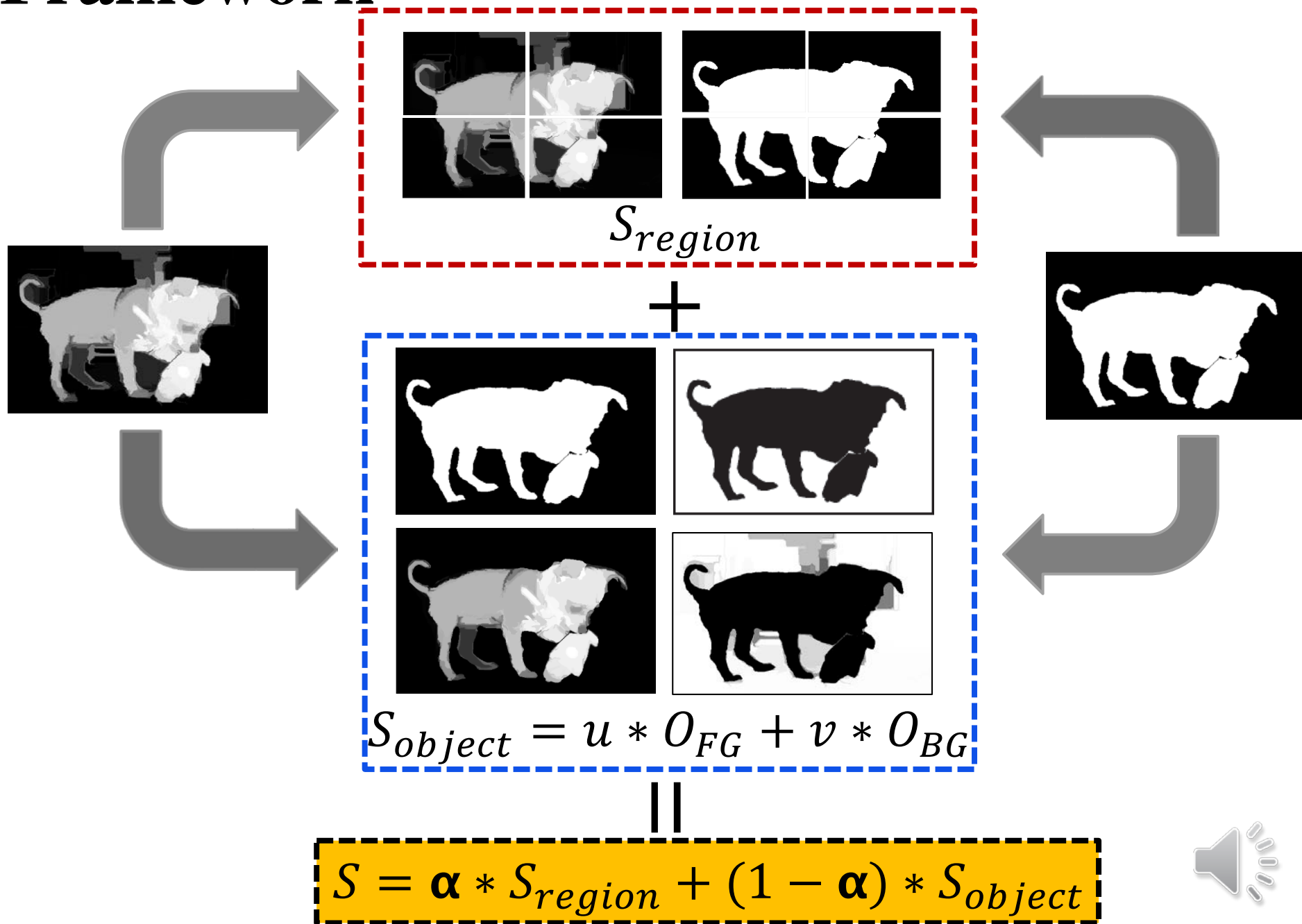
# Object-Level: foreground



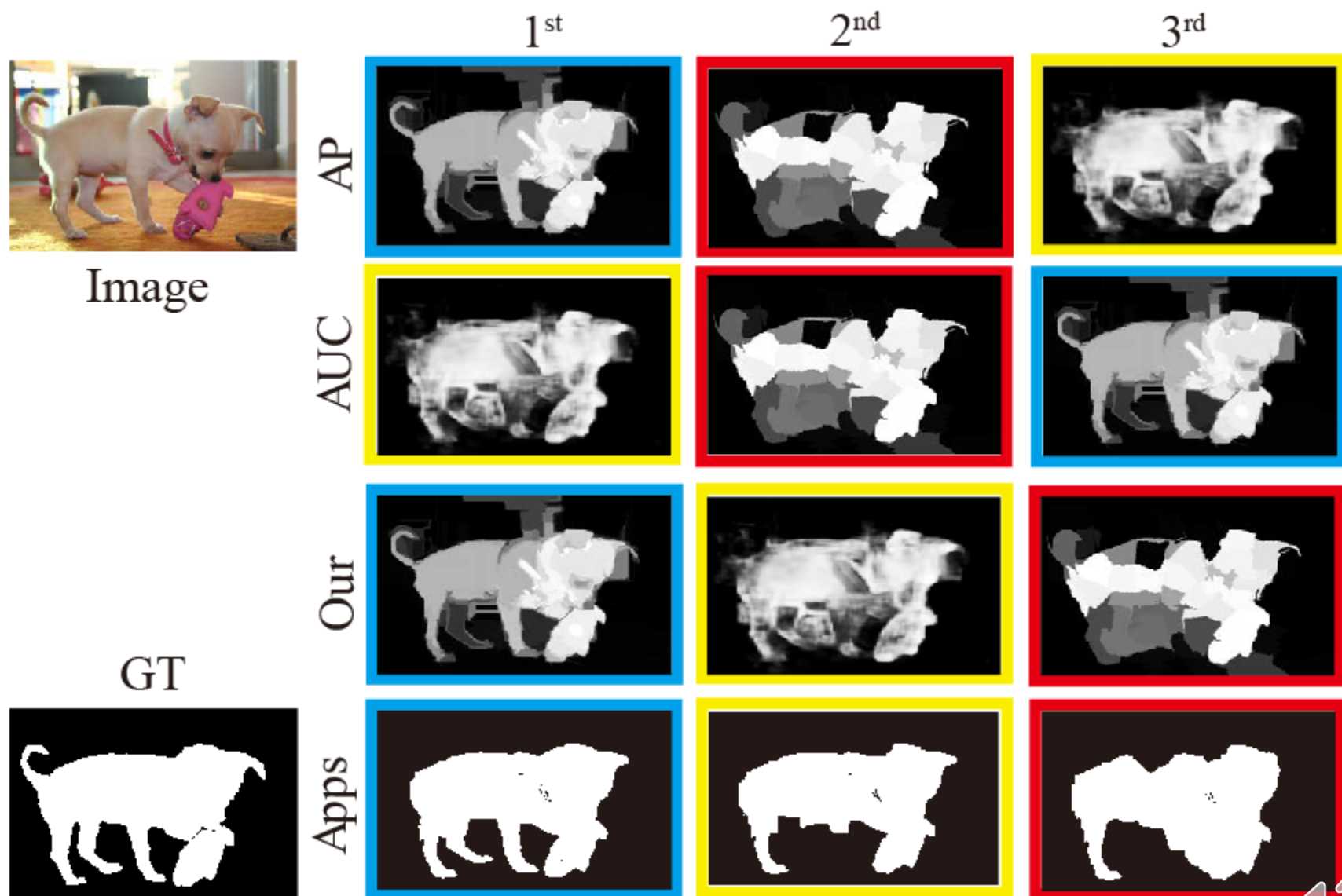
$$D_{FG} = \underbrace{\frac{(\bar{x}_{FG})^2 + (\bar{y}_{FG})^2}{2\bar{x}_{FG}\bar{y}_{FG}}}_{\text{contrast}} + \lambda * \underbrace{\frac{\sigma_{x_{FG}}}{\bar{x}_{FG}}}_{\text{uniform}}$$

$$O_{FG} = \frac{1}{D_{FG}}$$

# Framework



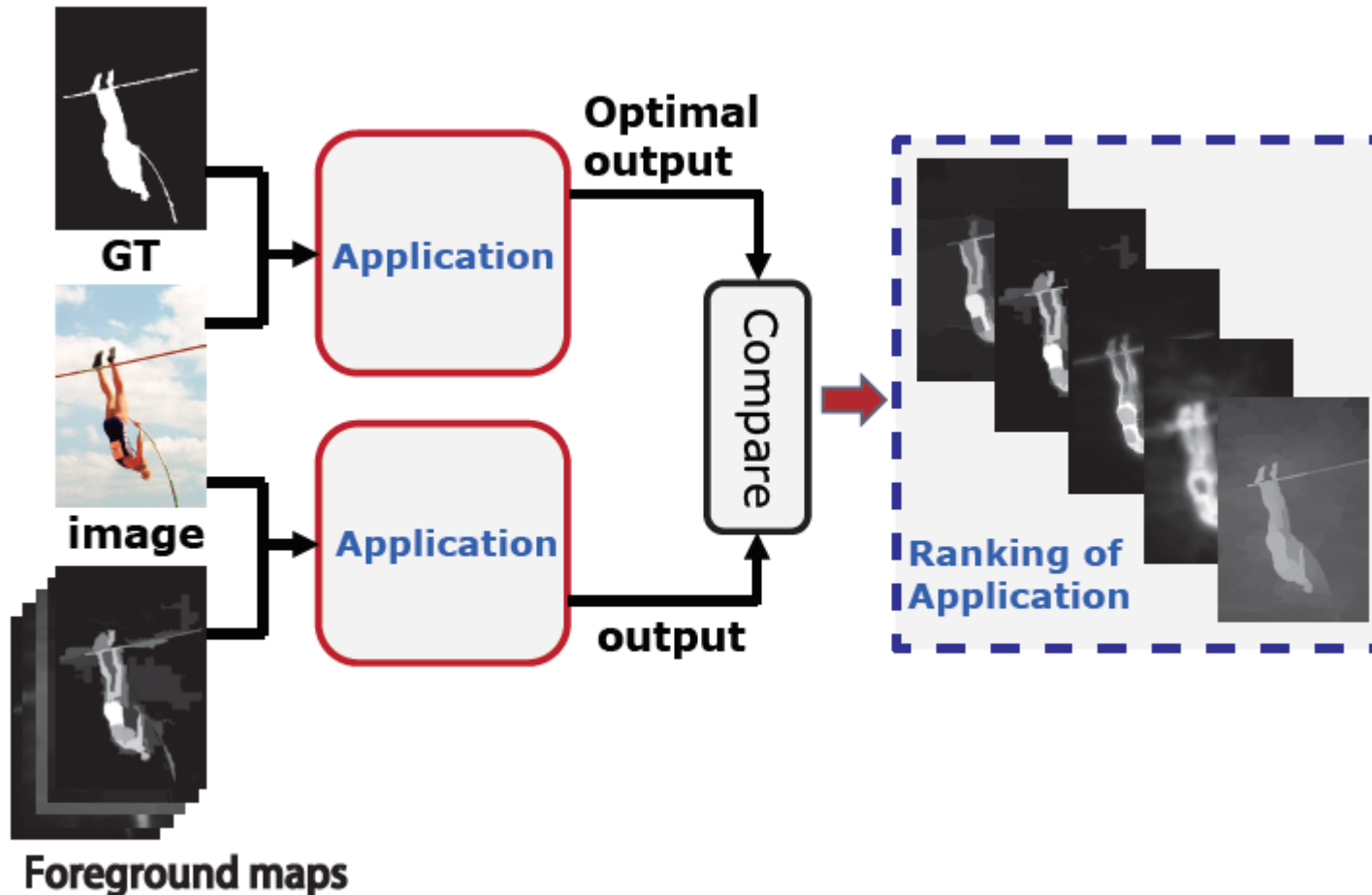
# Ranking example





# Meta-Measure1

- Agree with the **application**: Saliency Cut



# Meta-Measure-2

- ▶ Prefer a good result over an **Generic** result



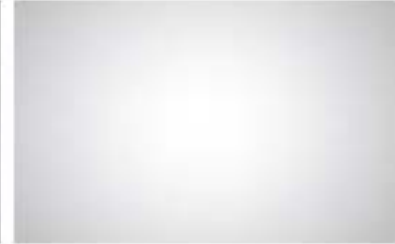
(a)Image



(b)GT



(c)FM1



(d)Generic

# Meta-Measure-3

- ▶ **WRONG** ground-truth decrease score



(a)Image



(b)FM



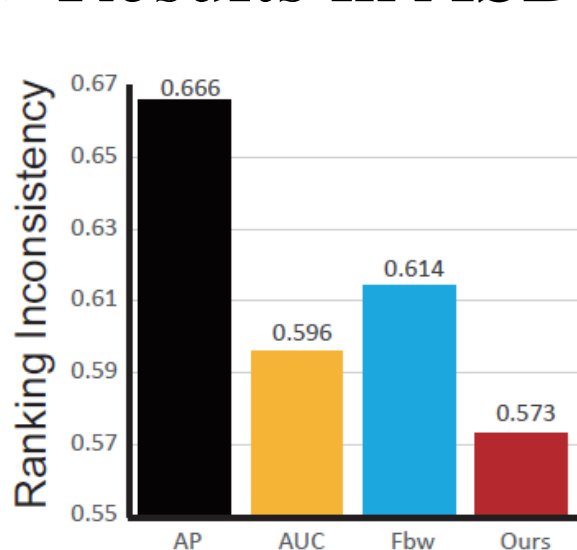
(c)GT



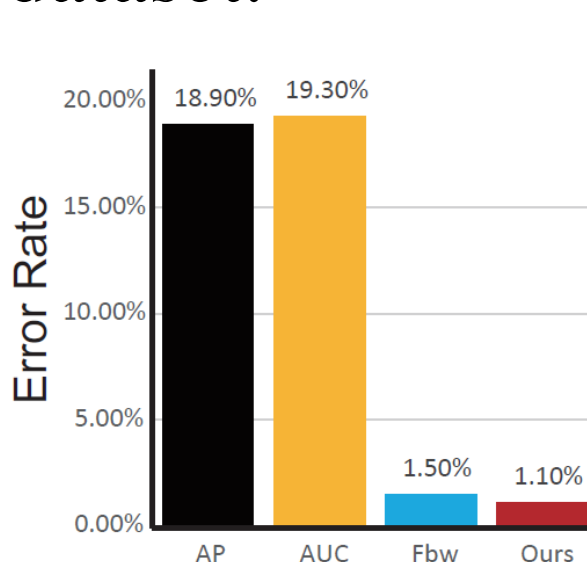
(d)WRONG GT

# Results

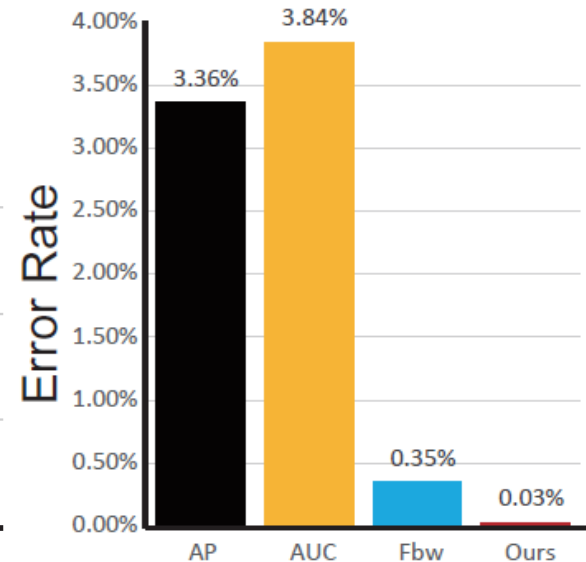
## ► Results in ASD dataset.



(a)Meta-measure1



(b)Meta-measure2



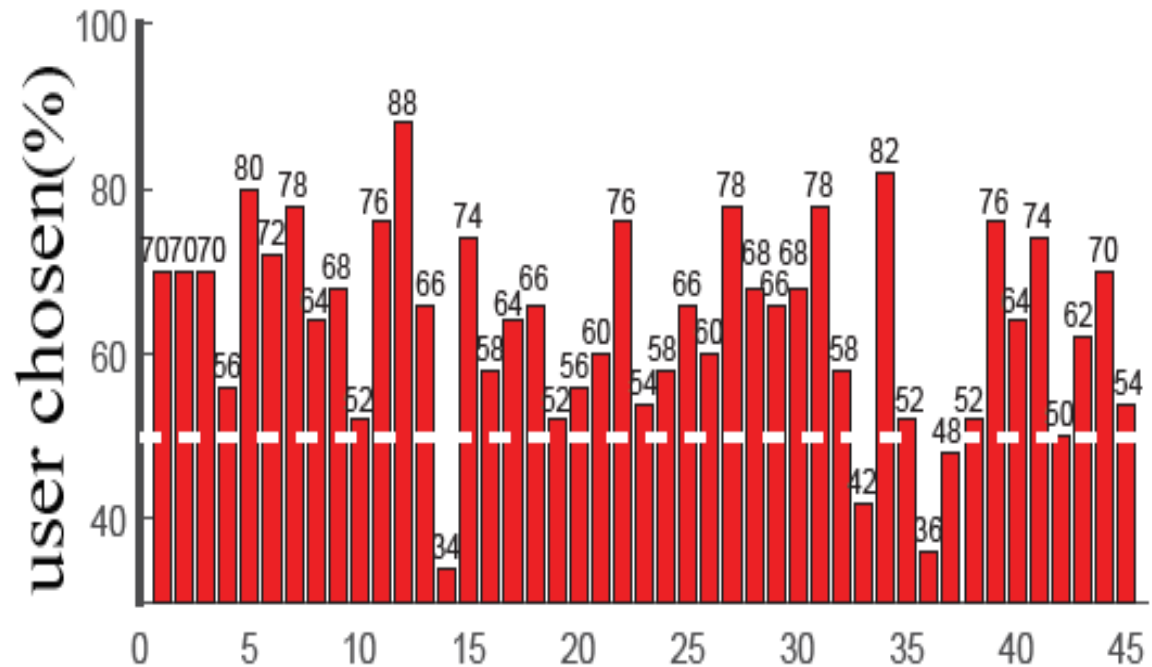
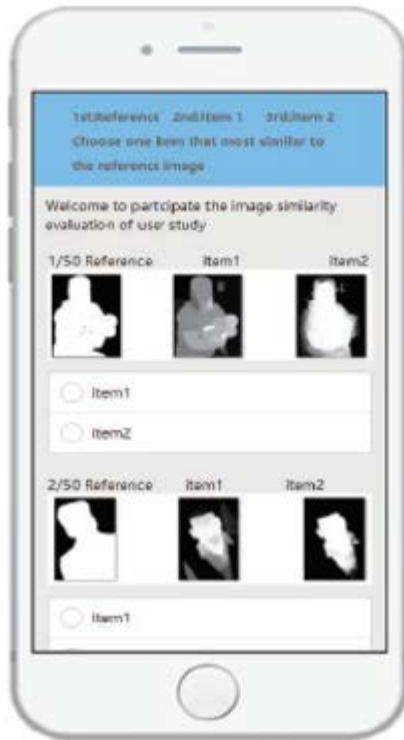
(c)Meta-measure3

## ► Results in other popular datasets.

	PASCAL-S [31]			ECSSD [47]			SOD [37]			HKU-IS [27]		
	MM1	MM2(%)	MM3(%)	MM1	MM2(%)	MM3(%)	MM1	MM2(%)	MM3(%)	MM1	MM2(%)	MM3(%)
AP	0.452	12.1	5.50	0.449	9.70	3.32	0.504	9.67	7.69	0.518	3.76	1.25
AUC	0.449	15.8	8.21	0.436	12.1	4.18	0.547	14.0	8.27	0.519	7.02	2.12
Fbw	0.365	7.06	1.05	0.401	3.00	0.84	0.384	16.3	0.73	0.498	0.36	0.26
Ours	0.320	4.59	0.34	0.312	3.30	0.47	0.349	9.67	0.60	0.424	0.34	0.08

# Meta-Measure 4

- Agree with the **human ranking**.



**~62% viewer preferred the map chosen by our measure.**



# Thanks!

<http://dpfan.net/smeasure/>

**S-measure**

