Crowdsourced object segmentation with a game

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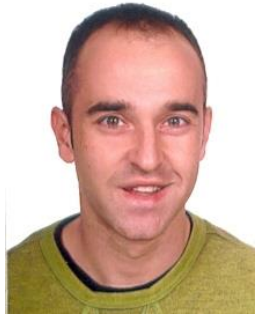
Crowdsourced object segmentation with a game

With Axel Carlier, Vincent Charvillat, Ogé Marqués and Xavi Giró-i-Nieto



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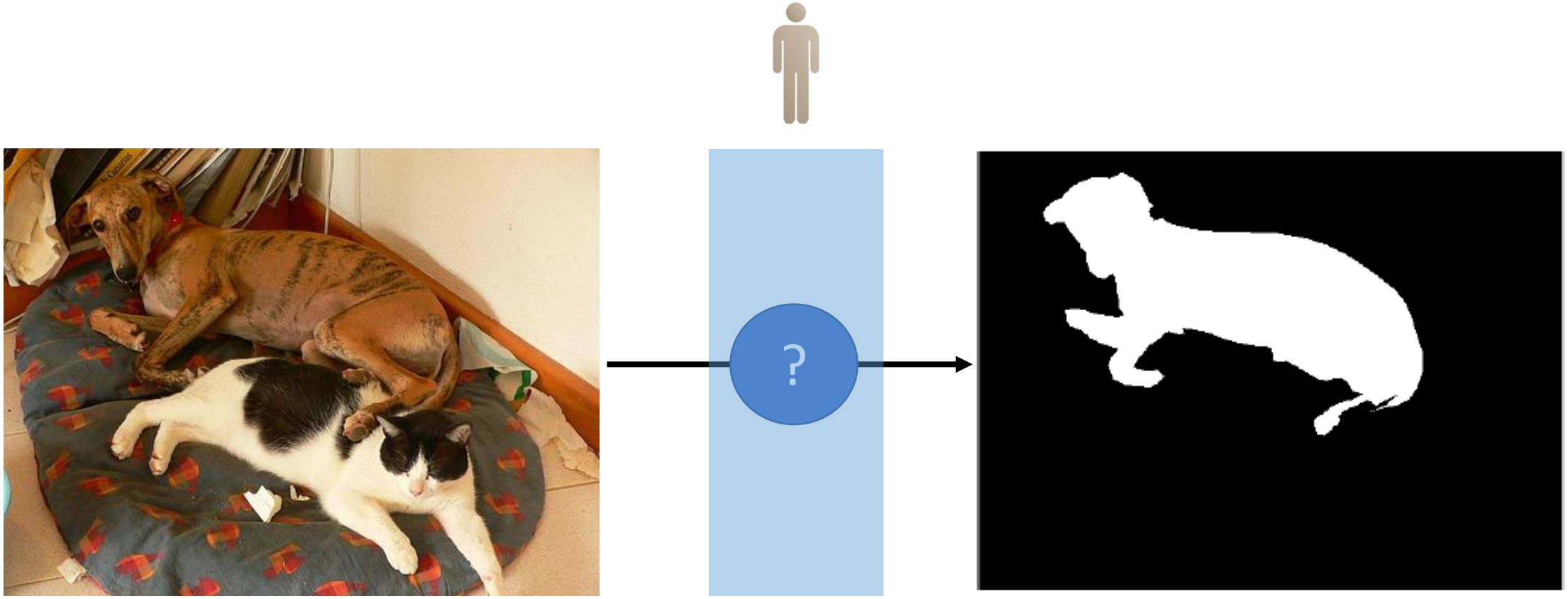
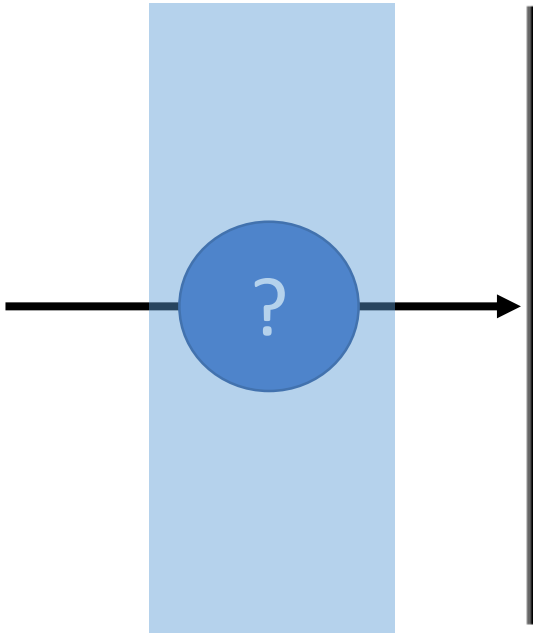
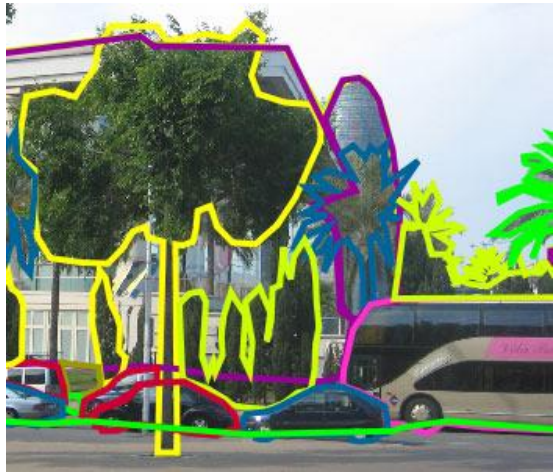
Motivation



Motivation



Semi-Supervised object segmentation

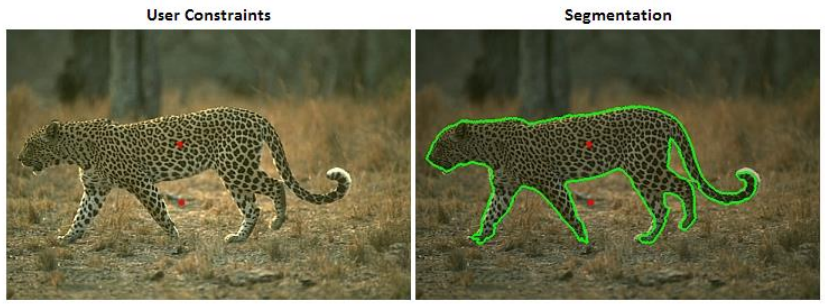


Rough segmentation

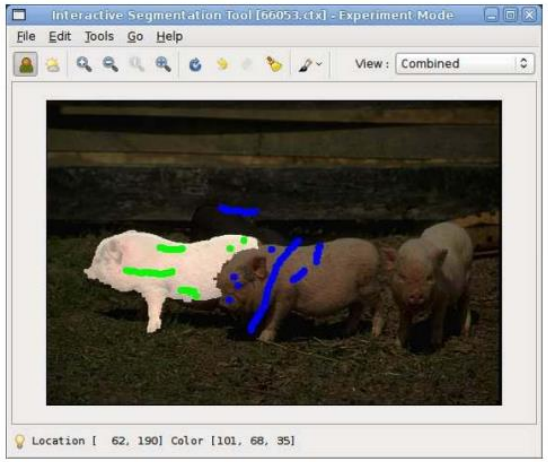
- B. C. Russell, A. Torralba, K. P. Murphy, and W. T. Freeman. Labelme: A database and web-based tool for image annotation. IJCV, 2008

Semi-Supervised object segmentation

1)



2)



- 1) P. Arbelaez and L. Cohen. Constrained image segmentation from hierarchical boundaries. In CVPR'08, 2008.
- 2) K. McGuinness and N. E. O'Connor. A comparative evaluation of interactive segmentation algorithms.

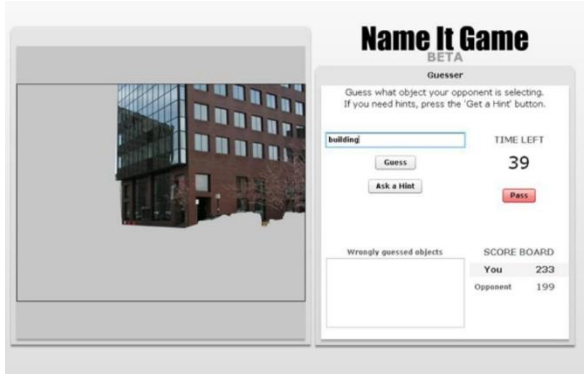
Semi-Supervised object segmentation

Boring task for users!

GAMES

Games with a purpose

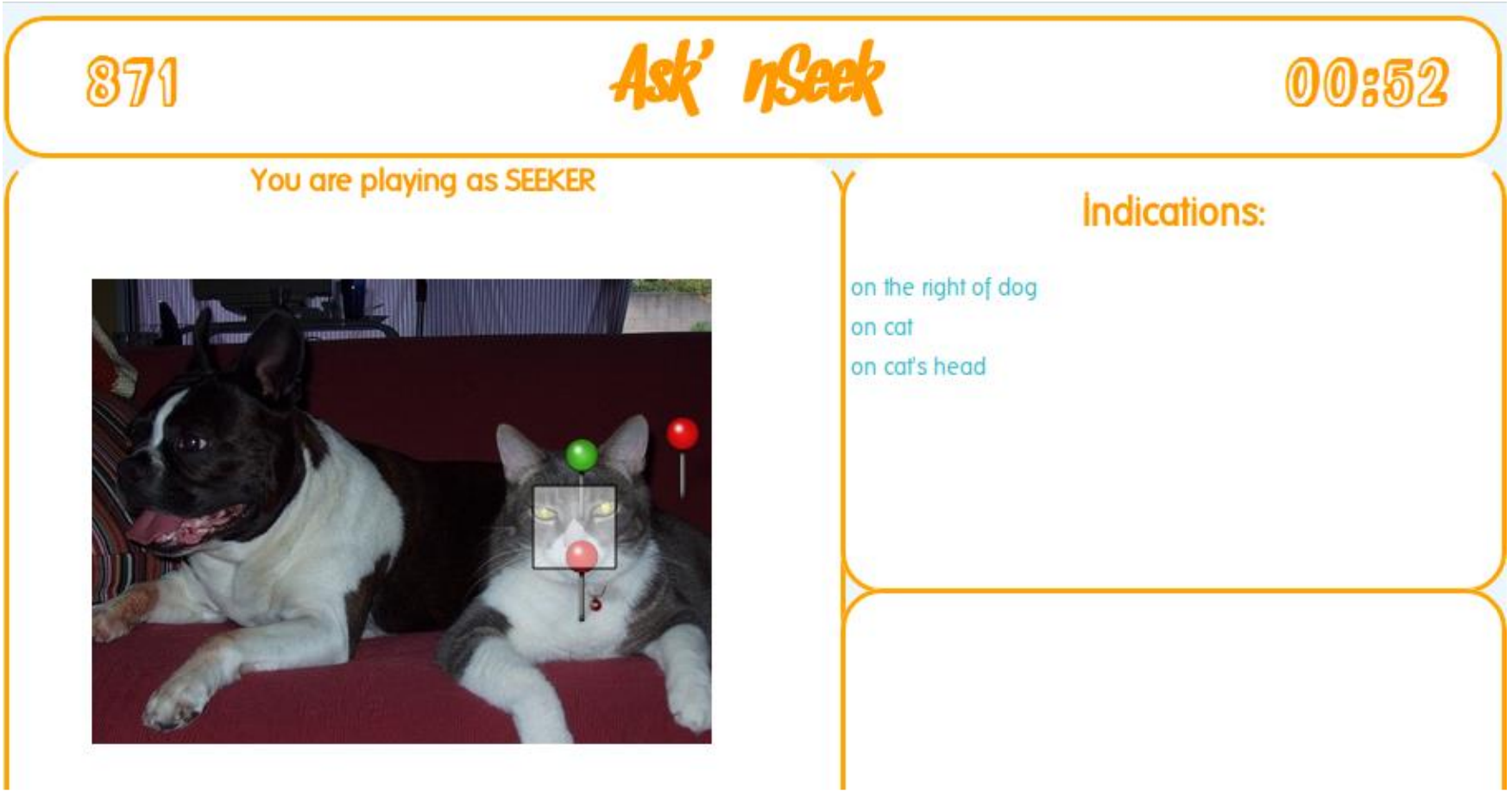
1)



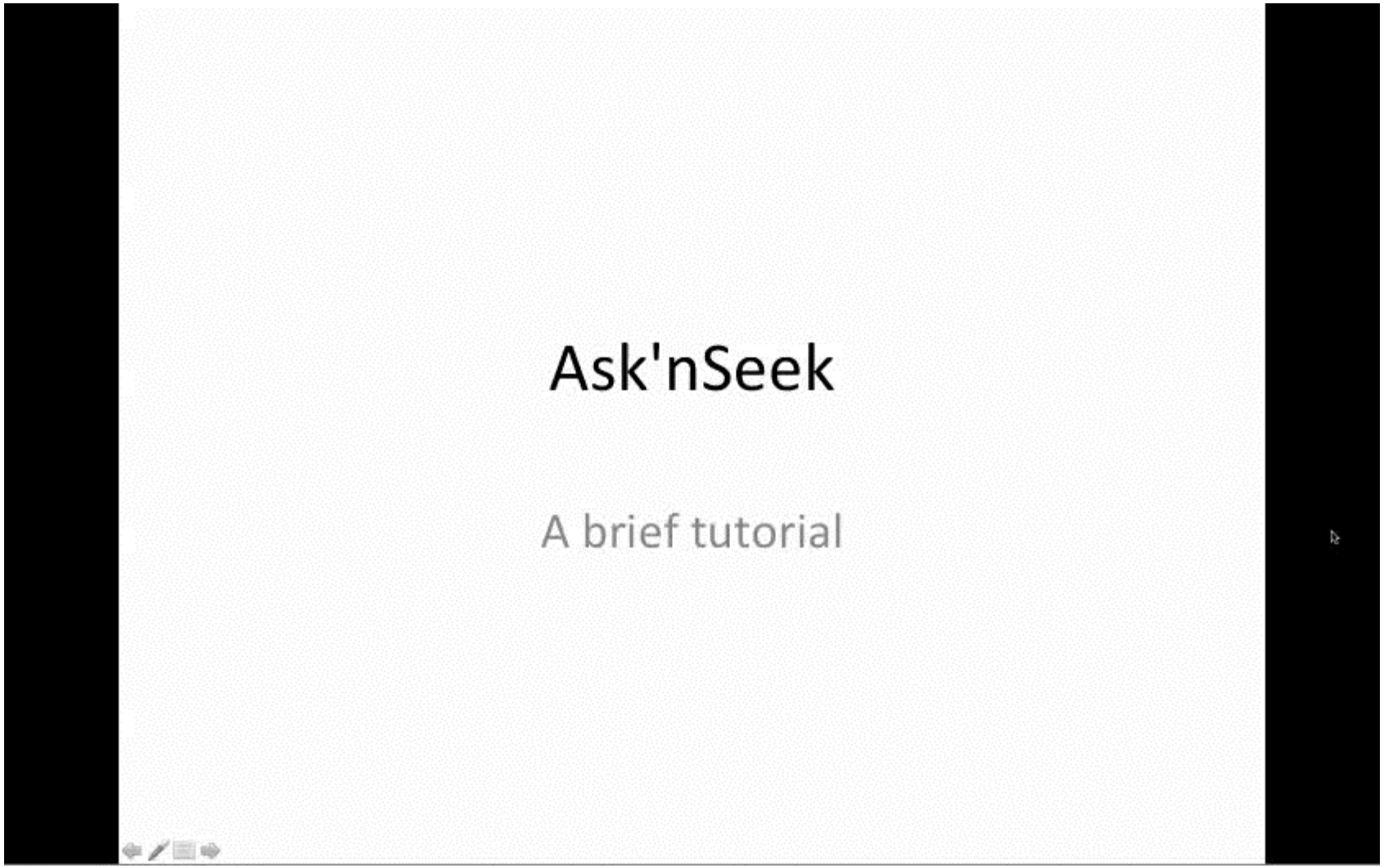
2)

- 1) J. Steggink and C. Snoek. Adding semantics to image-region annotations with the name-it-game. Multimedia Systems, 2011.
- 2) L. von Ahn, R. Liu, and M. Blum. Peekaboom: a game for locating objects in images. In CHI'06, 2006.

Ask’nSeek



A. Carlier, O. Marques, and V. Charvillat. Ask'nseek: A new game for object detection and labeling. In ECCV'12 Workshops 2012.


Ask'nSeek
A brief tutorial

Motivation

Ask' nSeek

?

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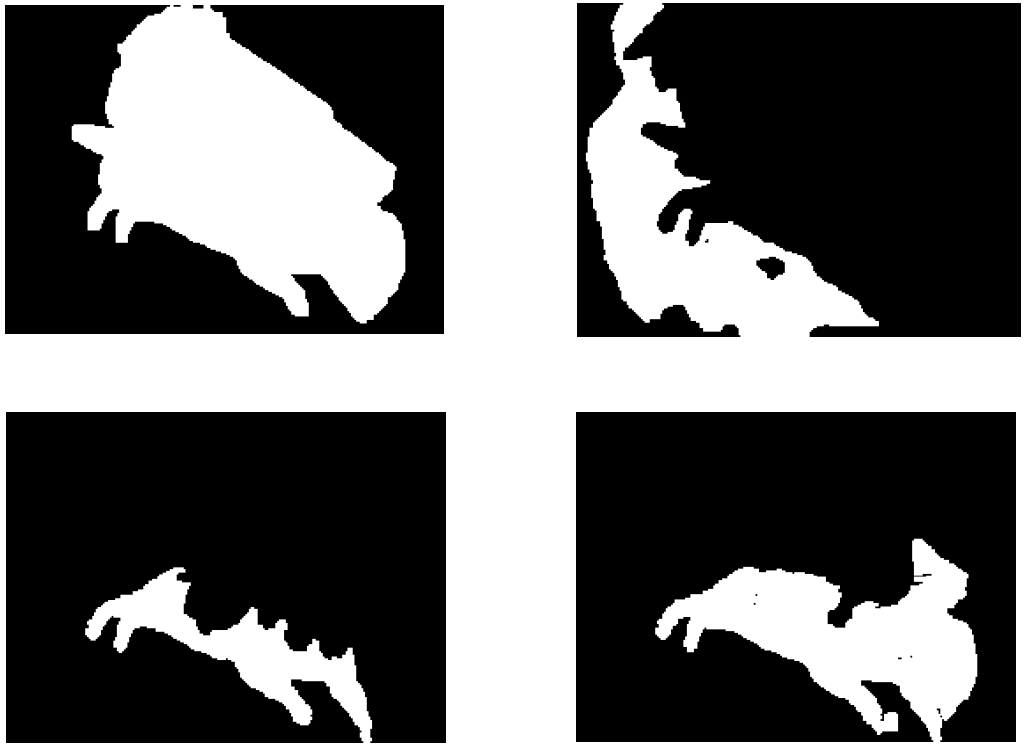
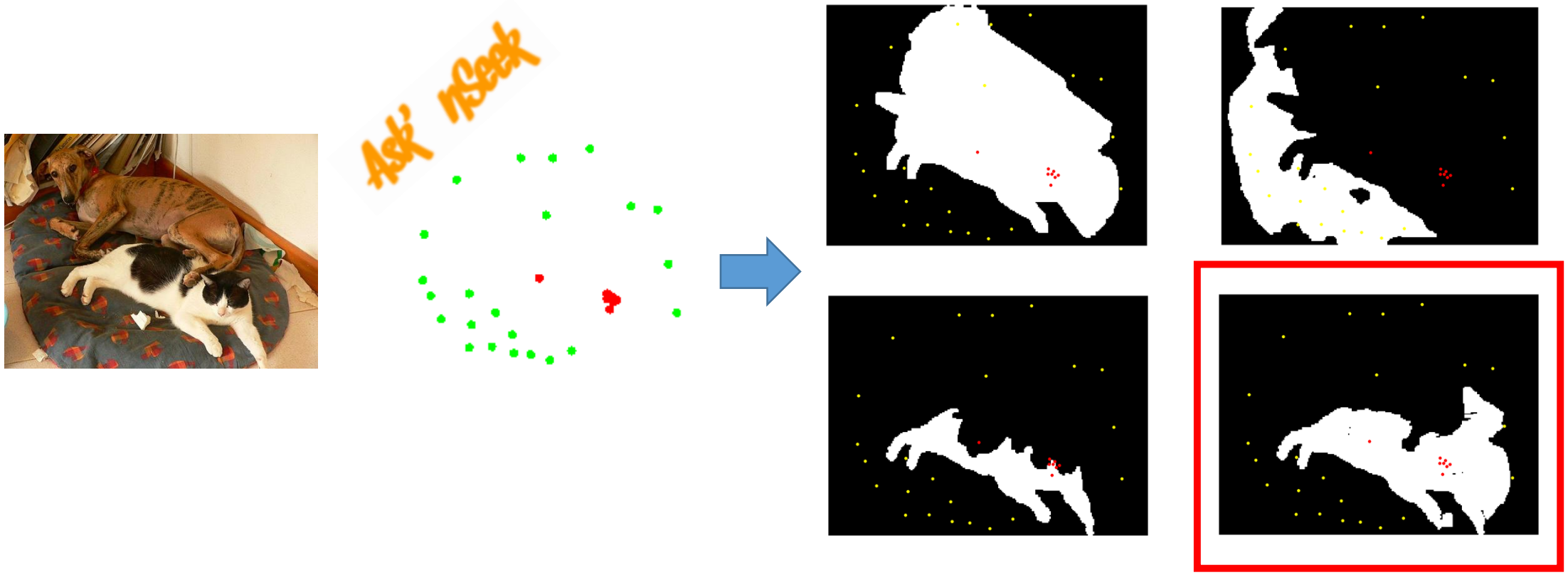
Constrained parametric min-cuts for automatic object segmentation



J. Carreira and C. Sminchisescu. Constrained parametric min-cuts for automatic object segmentation. In CVPR'10, 2010.

Constrained parametric min-cuts for automatic object segmentation



J. Carreira and C. Sminchisescu. Constrained parametric min-cuts for automatic object segmentation. In CVPR'10, 2010.

Motivation

Ask' nSeek

CPMC

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Experiments

How many clicks do we need to achieve a certain quality in the segmentation?

Test the algorithm for a large image dataset

Pascal VOC2010

PASCAL2
Pattern Analysis, Statistical Modelling and Computational Learning

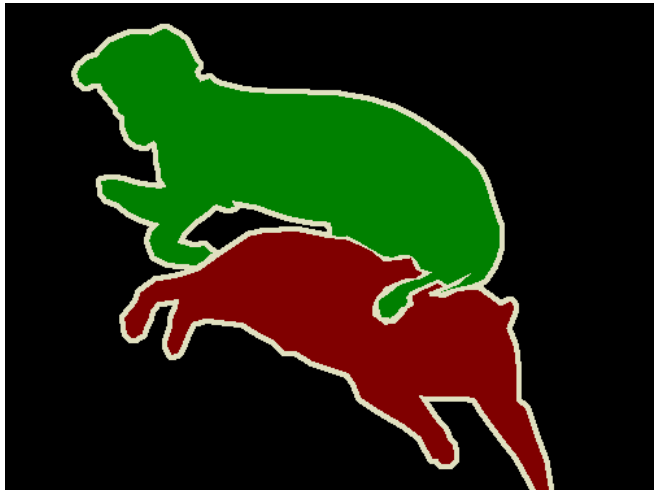
1928 images divided in:
Train (964)
Validation (964)

Problem

Simulator

Simulator

- The simulator generates points using the ground truth of the image.



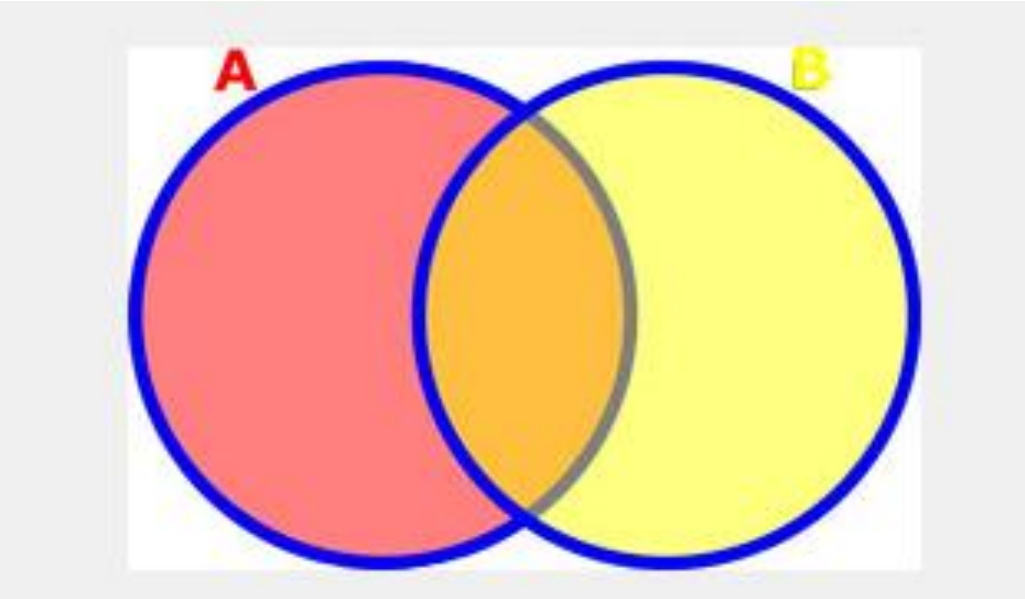
Simulator validation

- Subset of Pascal objects with a minimum of 15 associated clicks collected with Ask’nSeek
- Comparison between real and simulated results

How do we compare?

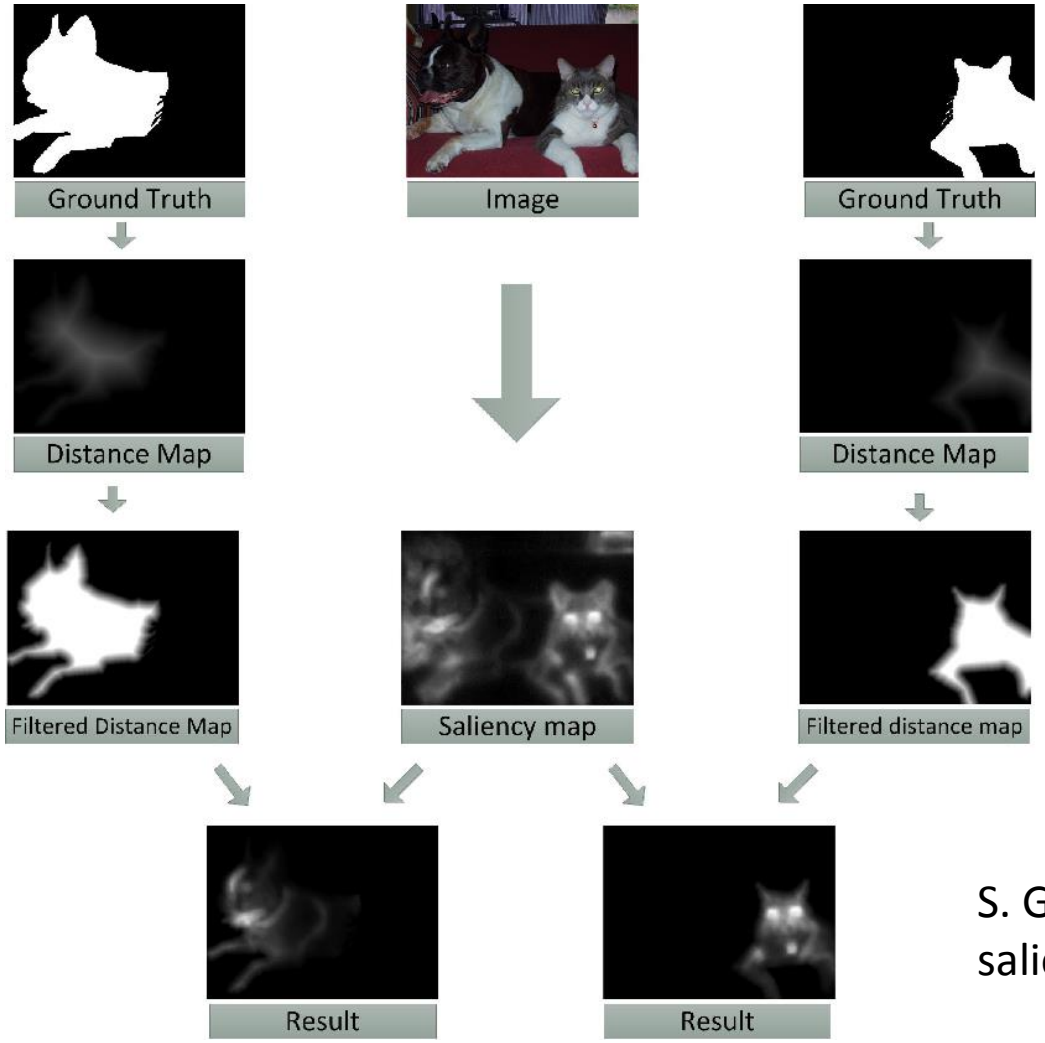
Jaccard index

$$J(A,B) = \frac{|A \cap B|}{|A \cup B|}.$$



Similarity between the segmentation result and the ground truth mask

Simulator: Location of clicks



	μ_{MSE}	σ^2_{MSE}	$\min_{MSE}$
Saliency	0.0319	0.0007	0.0143
Random	0.0545	0.0073	0.0117

Pascal VOC2010 (train)

S. Goferman, L. Zelnik-Manor, and A. Tal. Context-aware saliency detection. PAMI, 2012.

Simulator: FG/BG ratio

- Three configurations were tested:
  - Fixed
  - By area
  - By saliency

	μ_{MSE}	σ^2_{MSE}	$\min_{MSE}$
Fixed	0.0703	0.0040	0.0277
Area	0.0472	0.0005	0.0299
Saliency	0.0453	0.0008	0.0219

Pascal VOC2010 (train)

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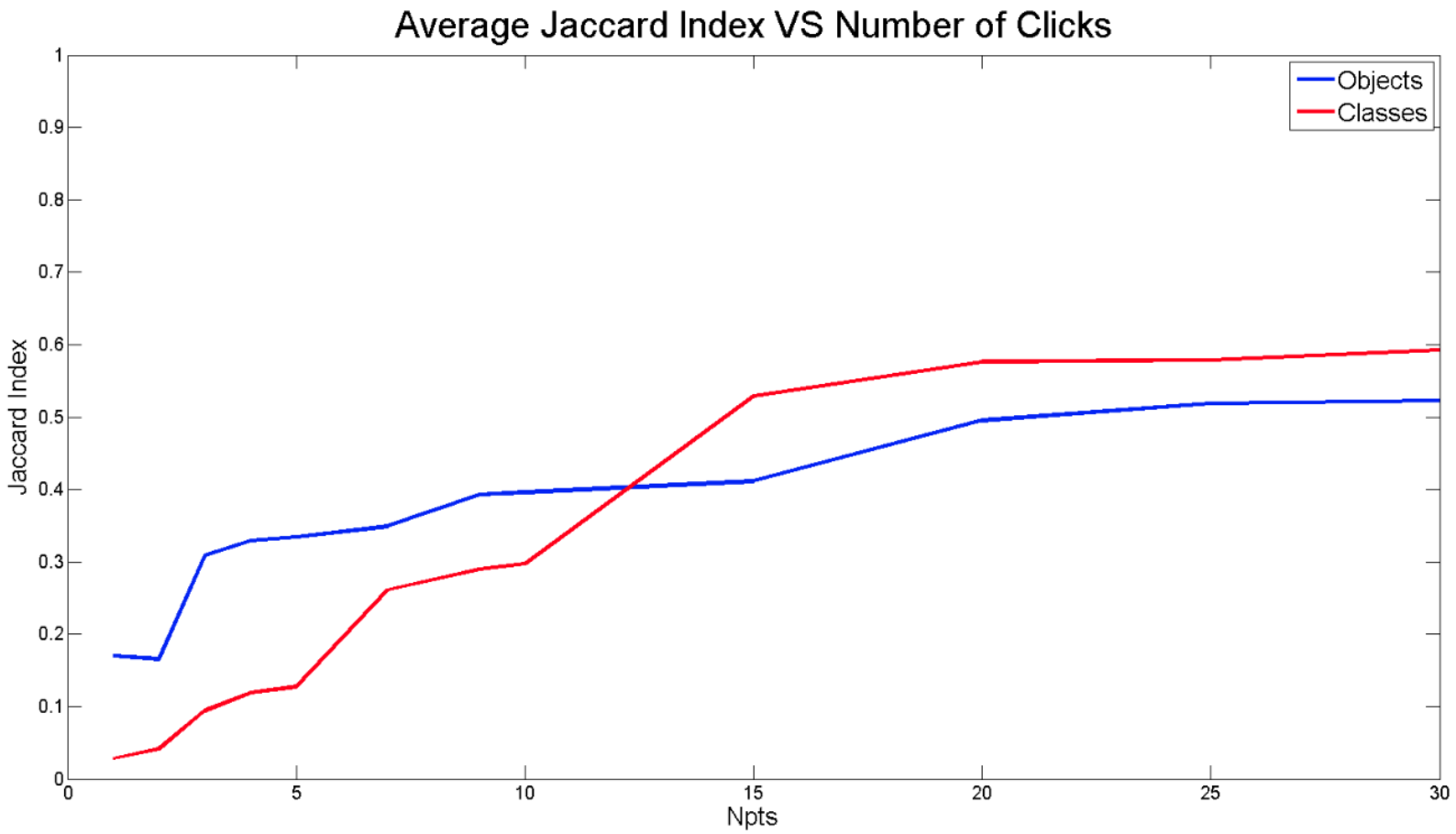
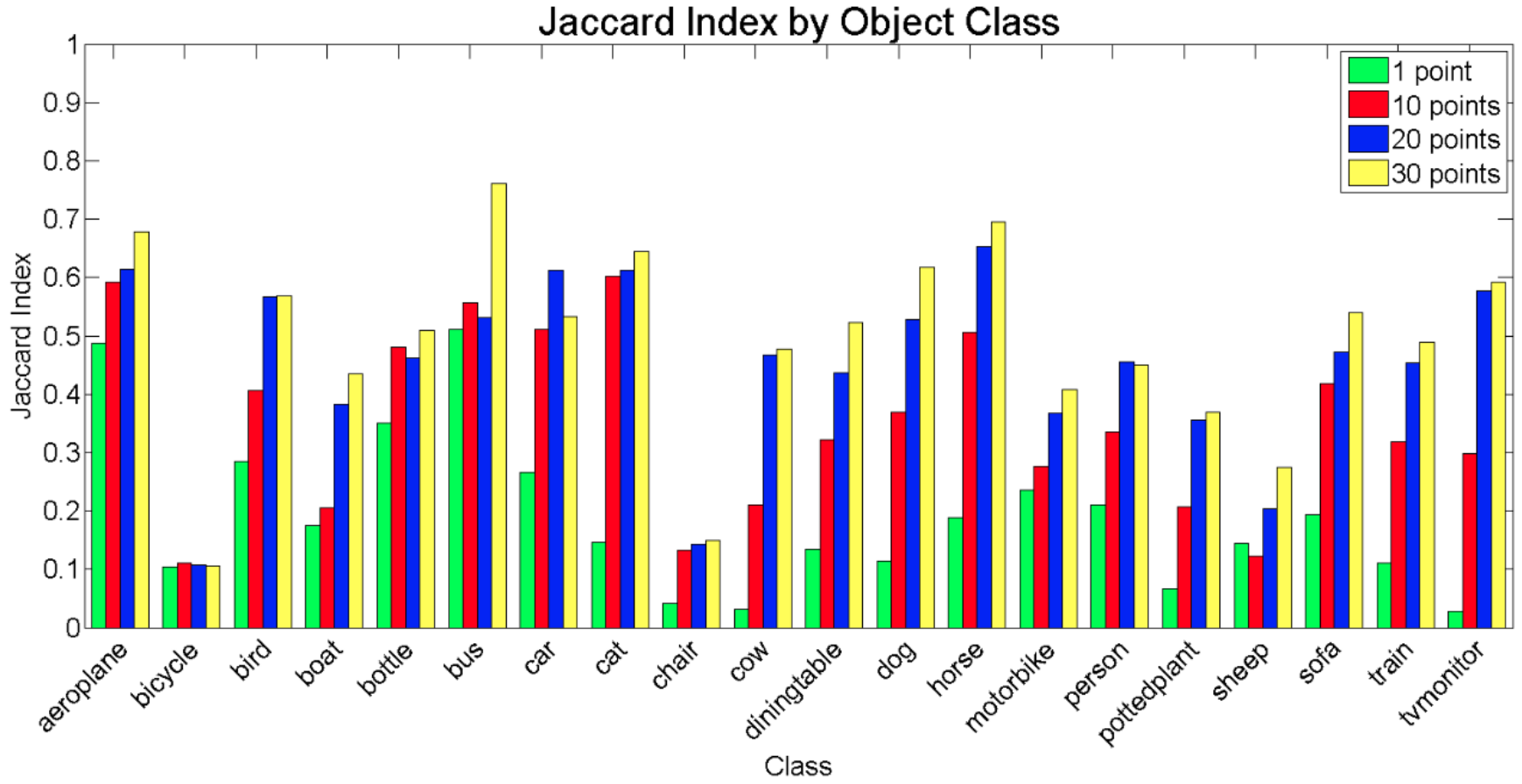
Results



Pascal VOC2010 (Validation)

Results



Pascal VOC2010 (Validation)

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Conclusions

- Realistic simulator to process large amounts of data.
- Estimation of the expected AVERAGE Jaccard index by clicks.
- Inter-class variance of results.

Next steps

- Simulator:
  - Ambiguity when multiple objects from the same class in the same image.
  - Does not generate errors, while humans do.
- Image segmentation
  - Label propagation through hiercarchical partitions (eg. UCM, BPT…)
  - Grabcut + Superpixels (Kevin McGuinness, DCU).
- Data collection
  - Awarded with $250 in CrowdMM Competition (ACM MM Barcelona 2013).

Questions, suggestions…

Thank you for your attention

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