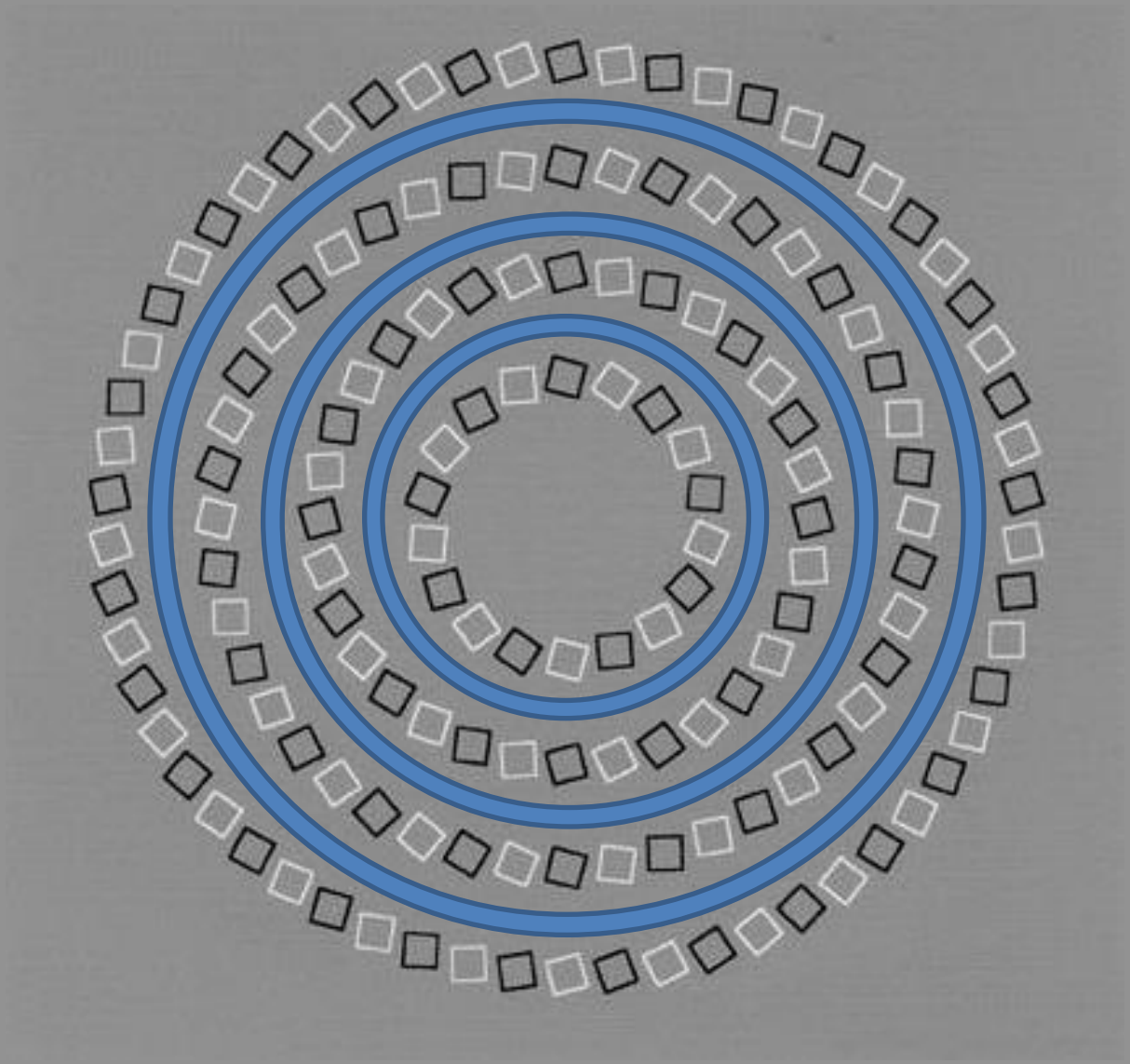


WhatsMySketch

Available on the App Store

Project 2 Results

- http://cs.brown.edu/courses/cs143/results/proj2/psangkloy/
- http://cs.brown.edu/courses/cs143/results/proj2/zyp/
- http://cs.brown.edu/courses/cs143/results/proj2/jx30/
- http://cs.brown.edu/courses/cs143/results/proj2/tuo/

Recap: Attributes and Crowdsourcing

- If you can only get one label per instance, maybe a categorical label is the most informative.
- But now that crowdsourcing exists, we can get enough training data to simultaneously reason about a multitude of object / scene properties (e.g. attributes).
- In general, there is a broadening of interesting recognition tasks.
- Zero-shot learning: model category with an attribute distribution only.

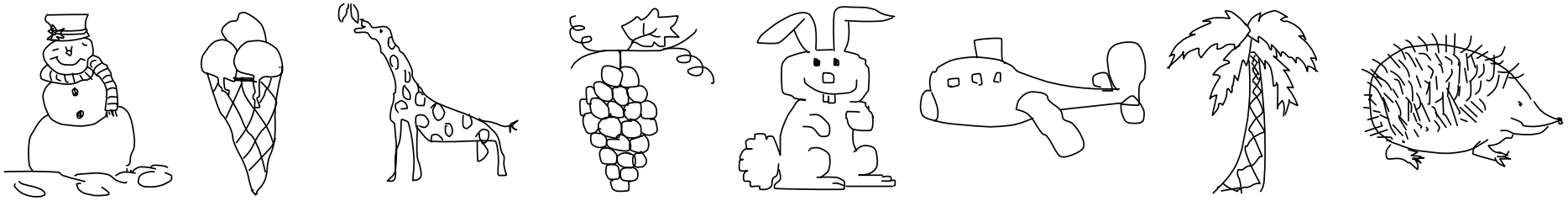
Sketching and More Crowdsourcing

Computer Vision

CS 143, Brown

James Hays

How Do Humans Sketch Objects?

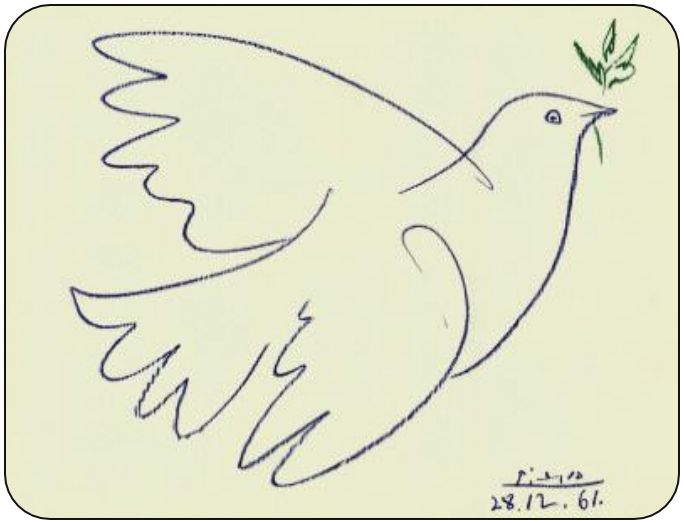


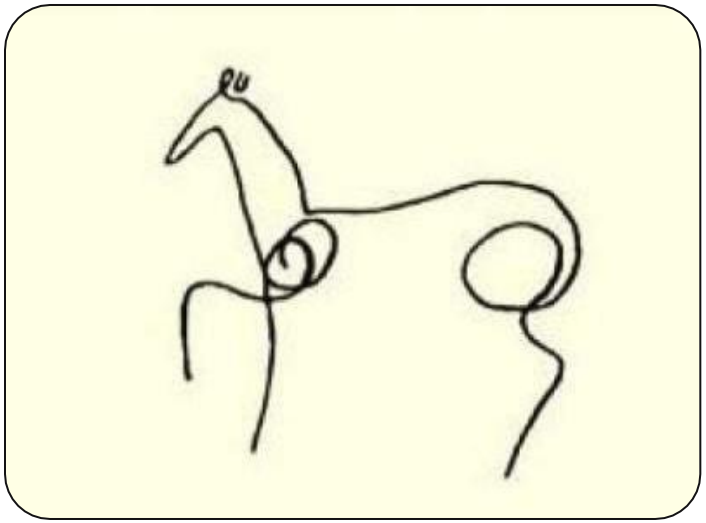
Mathias Eitz, James Hays, and Marc Alexa. Siggraph 2012

Sketches Are Important

20.000 years ago (Lascaux, France)

Sketches Are Important





~50 years ago (Picasso)

Sketches Are Important

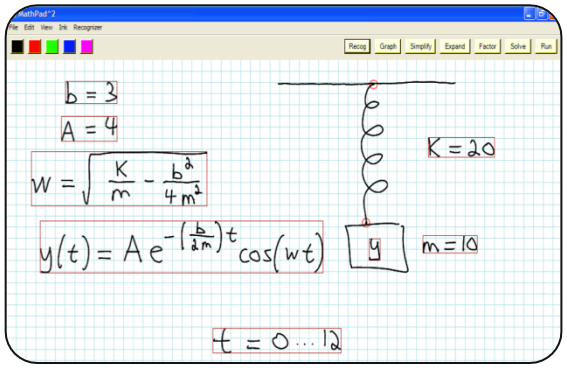
Today

Sketches Are Important

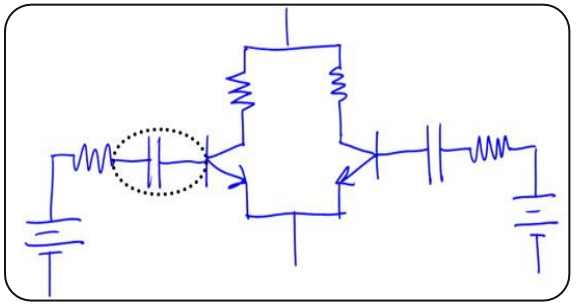
Despite decades of Computer Graphics research:

Sketching is the only method for most people to render visual content

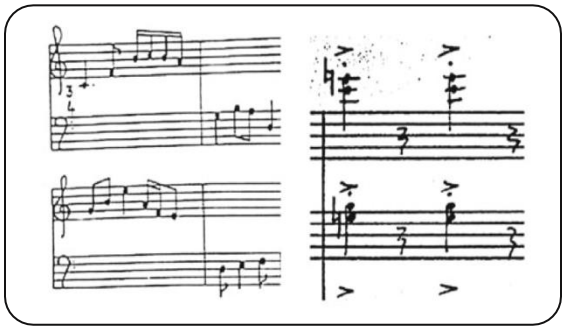
Prior Work: Domain Recognition



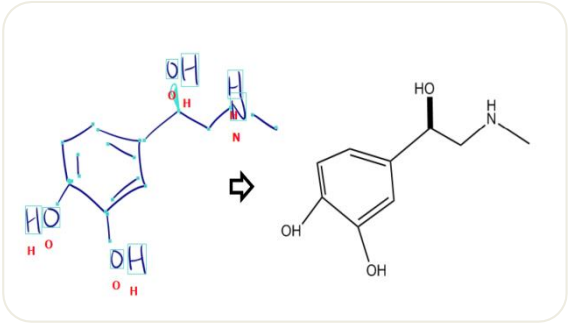
[LaViola and Zeleznik 2004]



[Sezgin and Davis 2008]

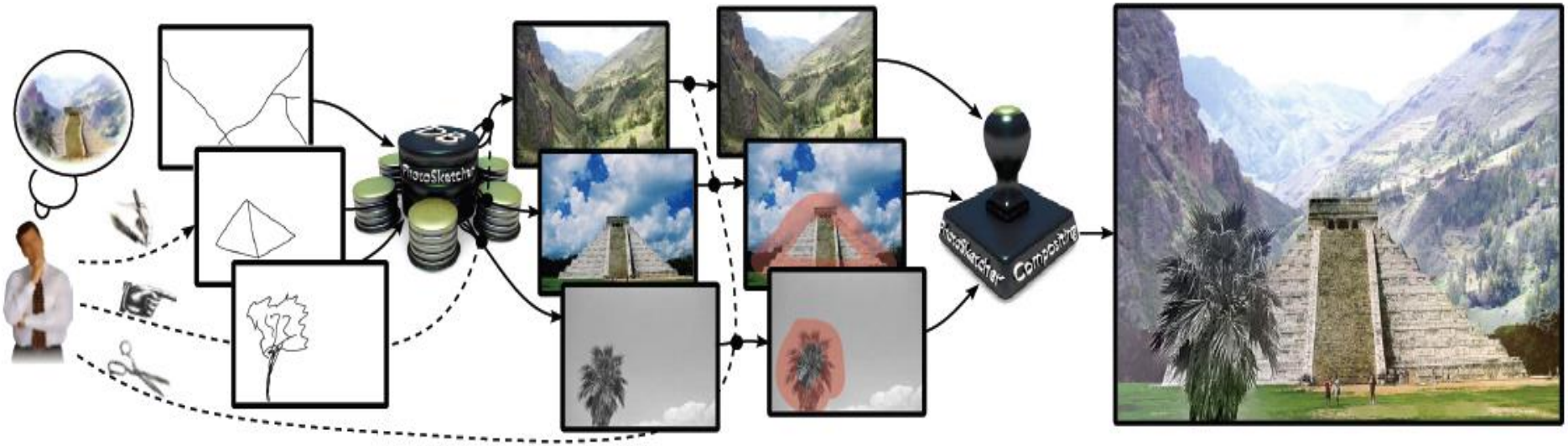


[Rebelo et al. 2009]



[Ouyang and Davis 2011]

Prior Work: Image Synthesis

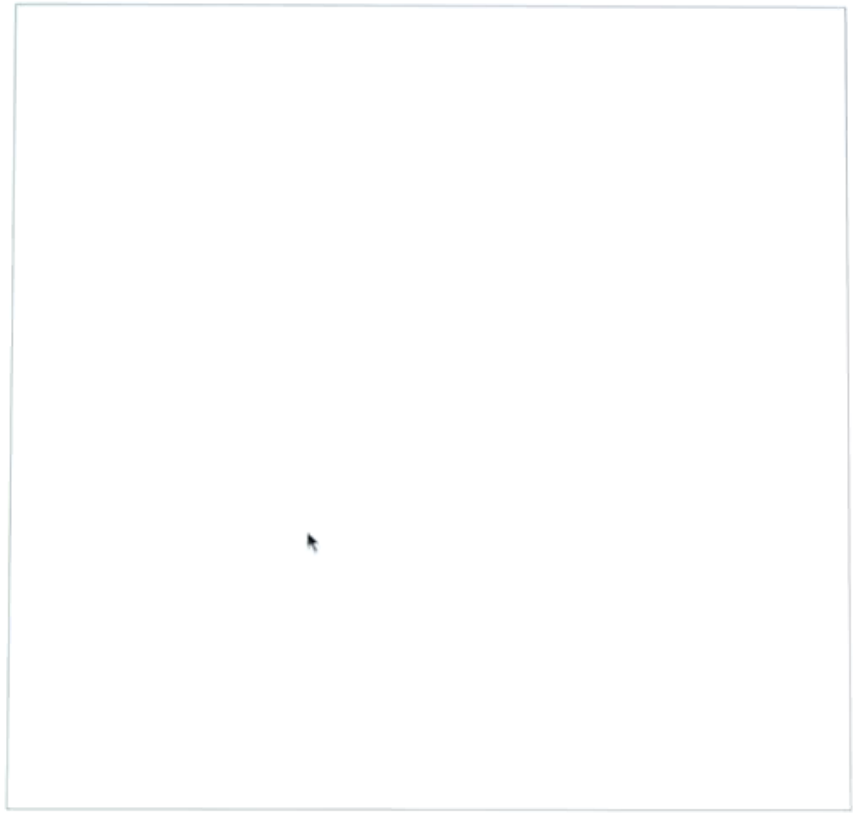


- Photosketcher, Eitz et al., CGA 2011
- Sketch2Photo, Chen et al., SIGGRAPH Asia 2009

Prior Work: ShadowDraw

- Lee, Zitnick, Cohen, SIGGRAPH 2011

Our work

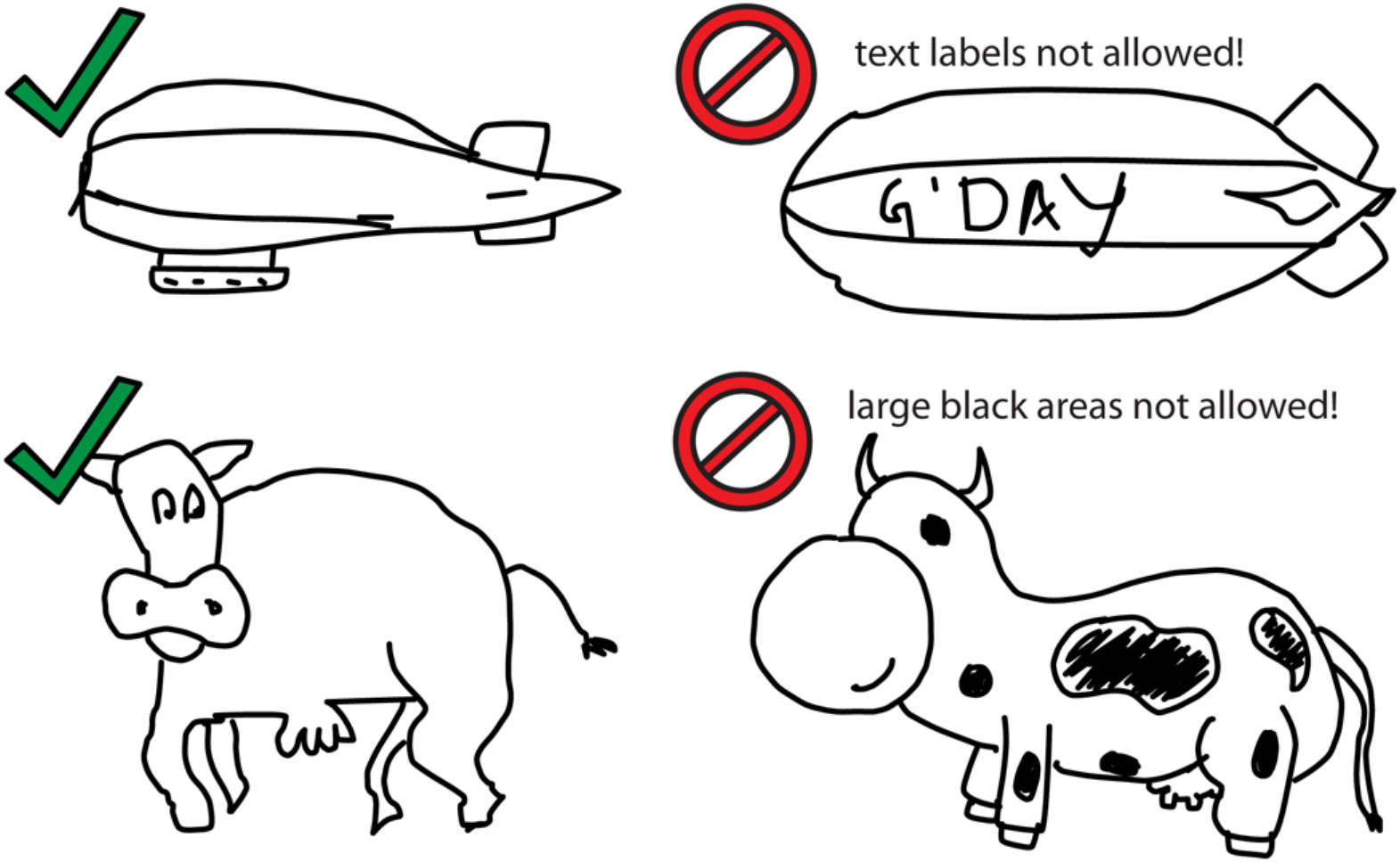


How Do Humans Sketch Objects?

- Need many example sketches from a variety of humans
- We used amazon Mechanical Turk

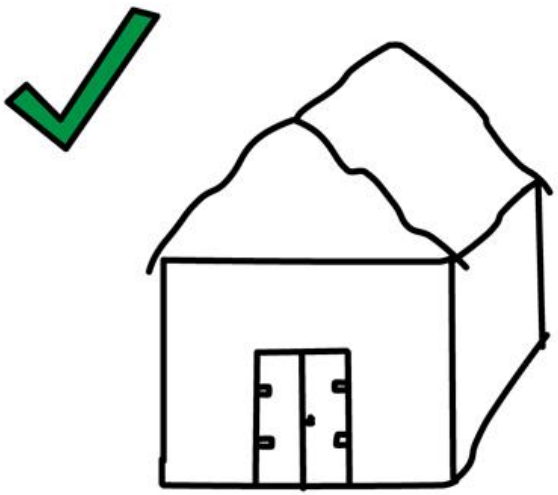
"Please sketch an image that is clearly recognizable to other humans as belonging to the following category: airplane"

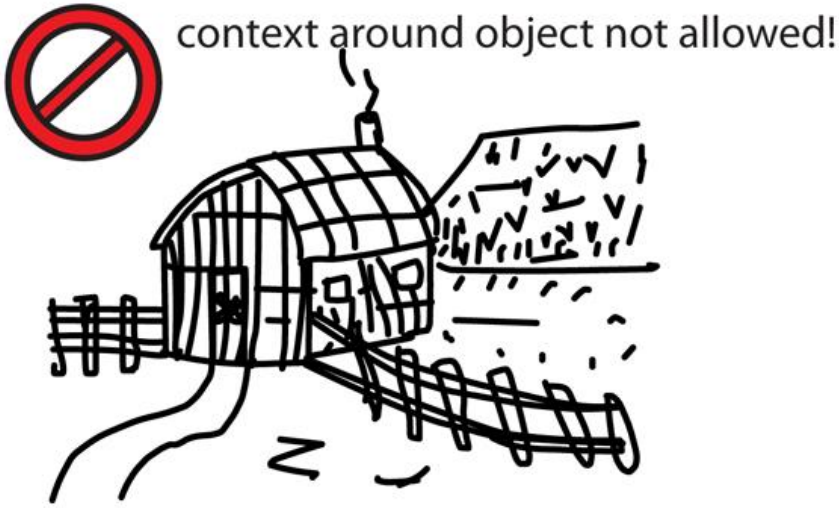
How Do Humans Sketch Objects?

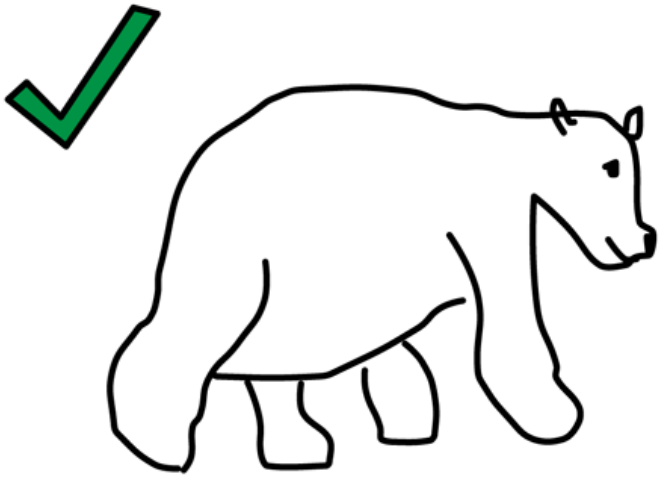


Mechanical Turk Instructions

How Do Humans Sketch Objects?



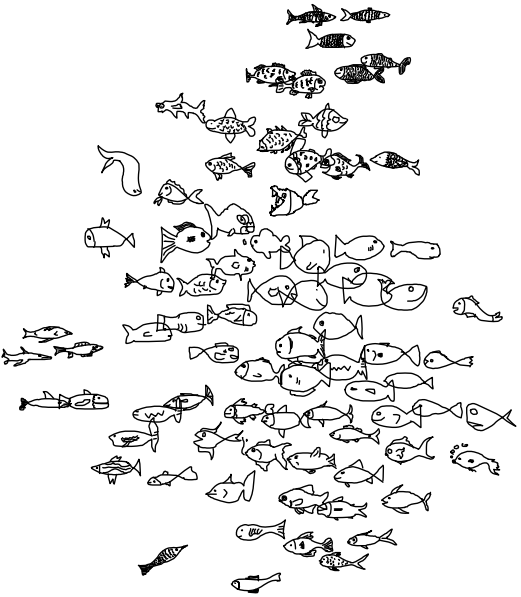


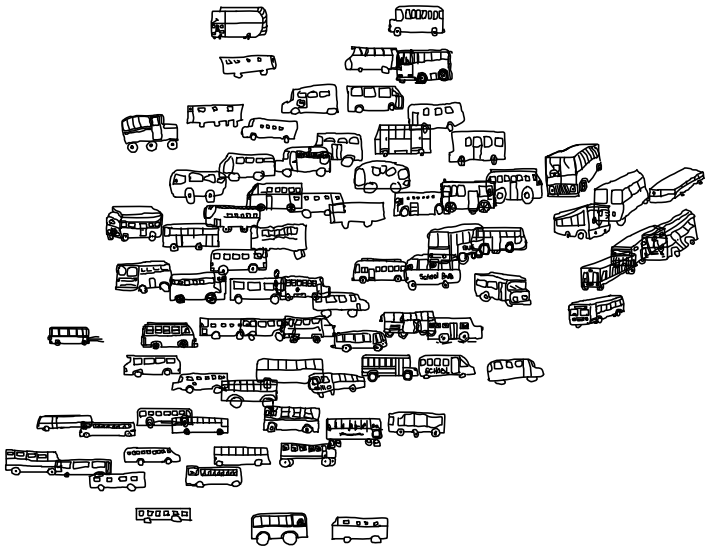


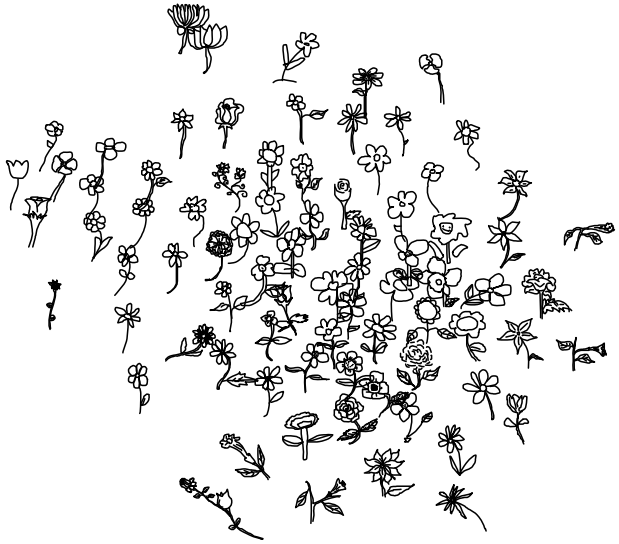
Mechanical Turk Instructions

How Do Humans Sketch Objects?

- 20,000 sketches in 250 categories
  - 1,350 unique participants, 741 hours drawing time

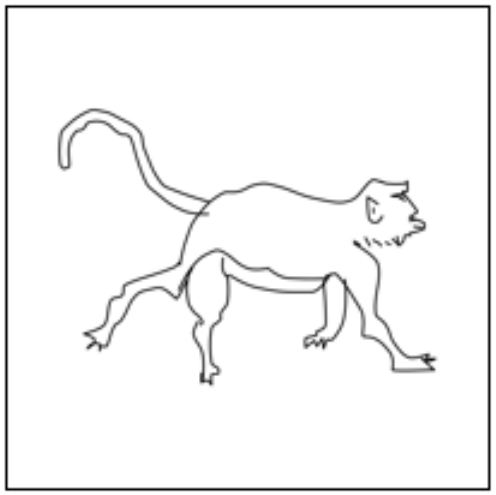






Human Sketch Recognition

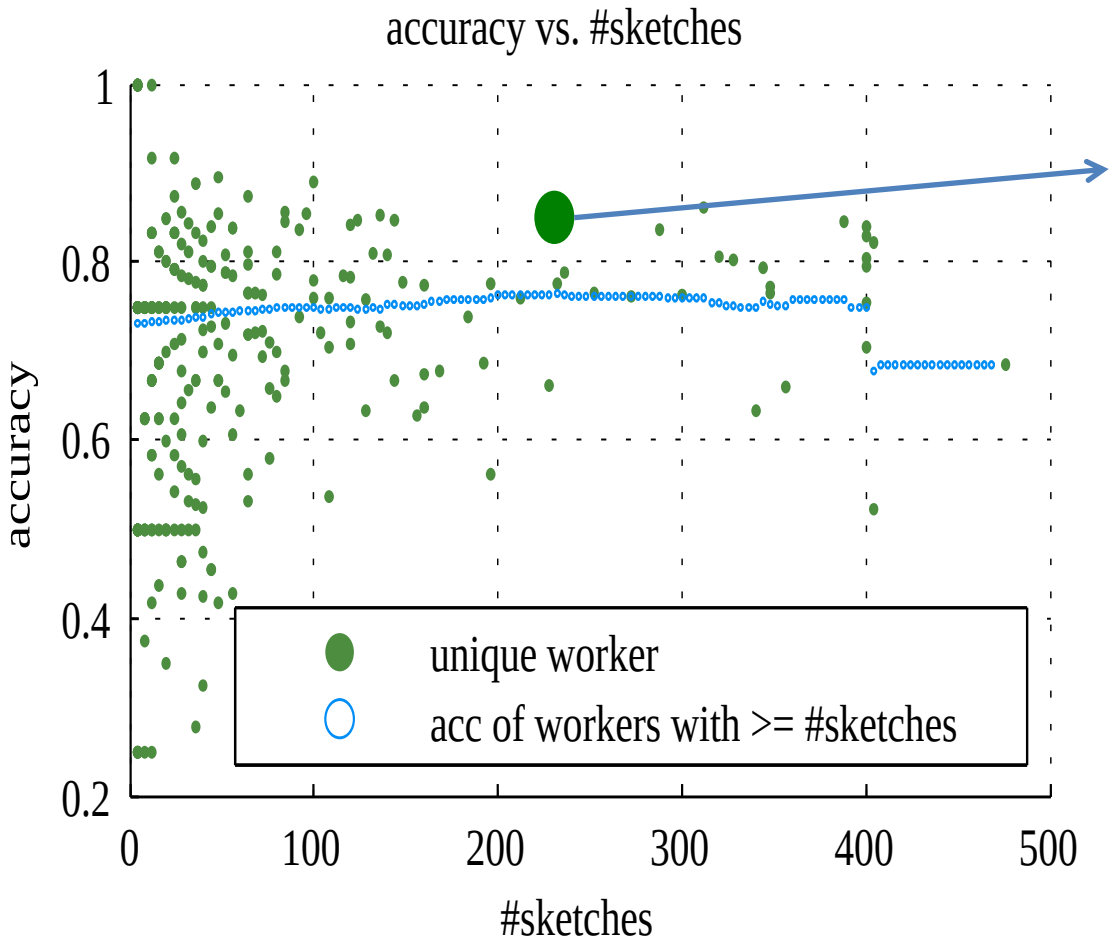
- 2nd study on Amazon Mechanical Turk



animals →	animal (air)	monkey ✓
buildings, home, office	animal (ground) a-l	mouse (animal)
leisure, personal items	animal (ground) m-z →	panda
nature, body, food	animal (water)	penguin
sound, figures, weapons		pig
vehicles, traffic		rabbit
		rooster
		scorpion
		sea turtle
		sheep
		snail
		snake
		spider
		squirrel
		standing bird
		teddy-bear
		tiger
		zebra

Human Sketch Recognition

- 73% overall human recognition accuracy

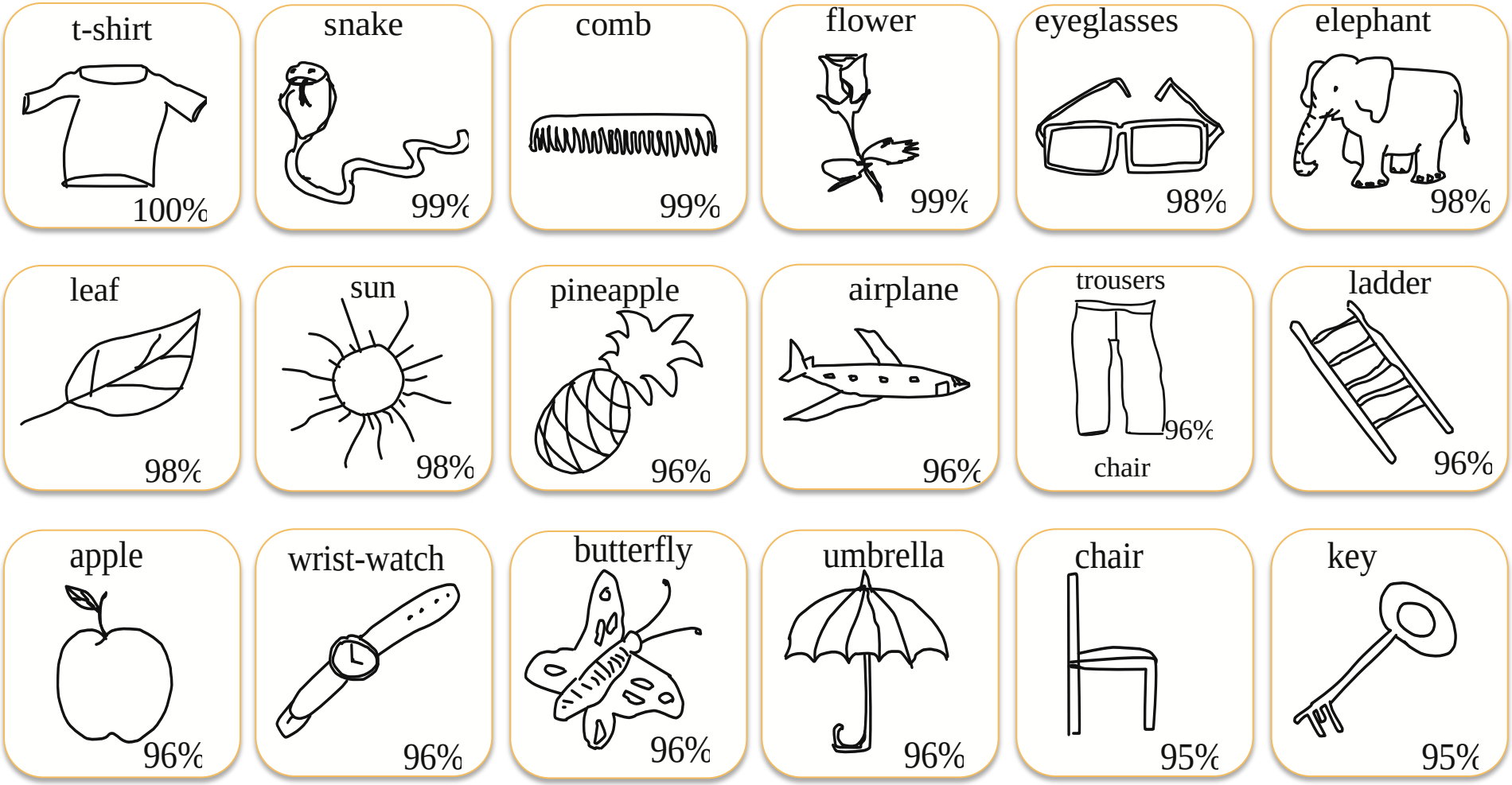


This particular worker:

- 250 sketches
- 85% accuracy

Human Sketch Recognition

- 73% overall human recognition accuracy



Human Sketch Recognition

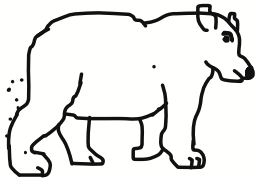
category

panda

11%

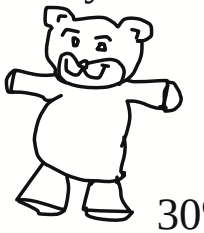
confusing categories

bear



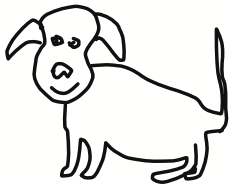
44%

teddy bear



30%

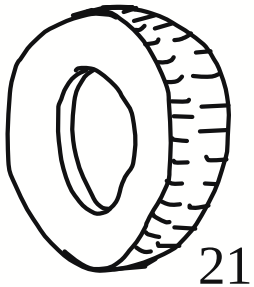
dog



8%

category

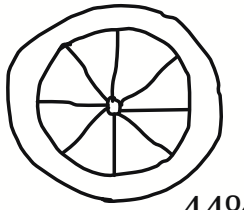
tire



21%

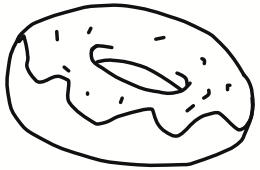
confusing categories

wheel



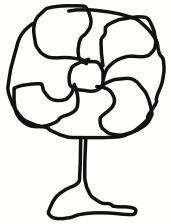
44%

donut



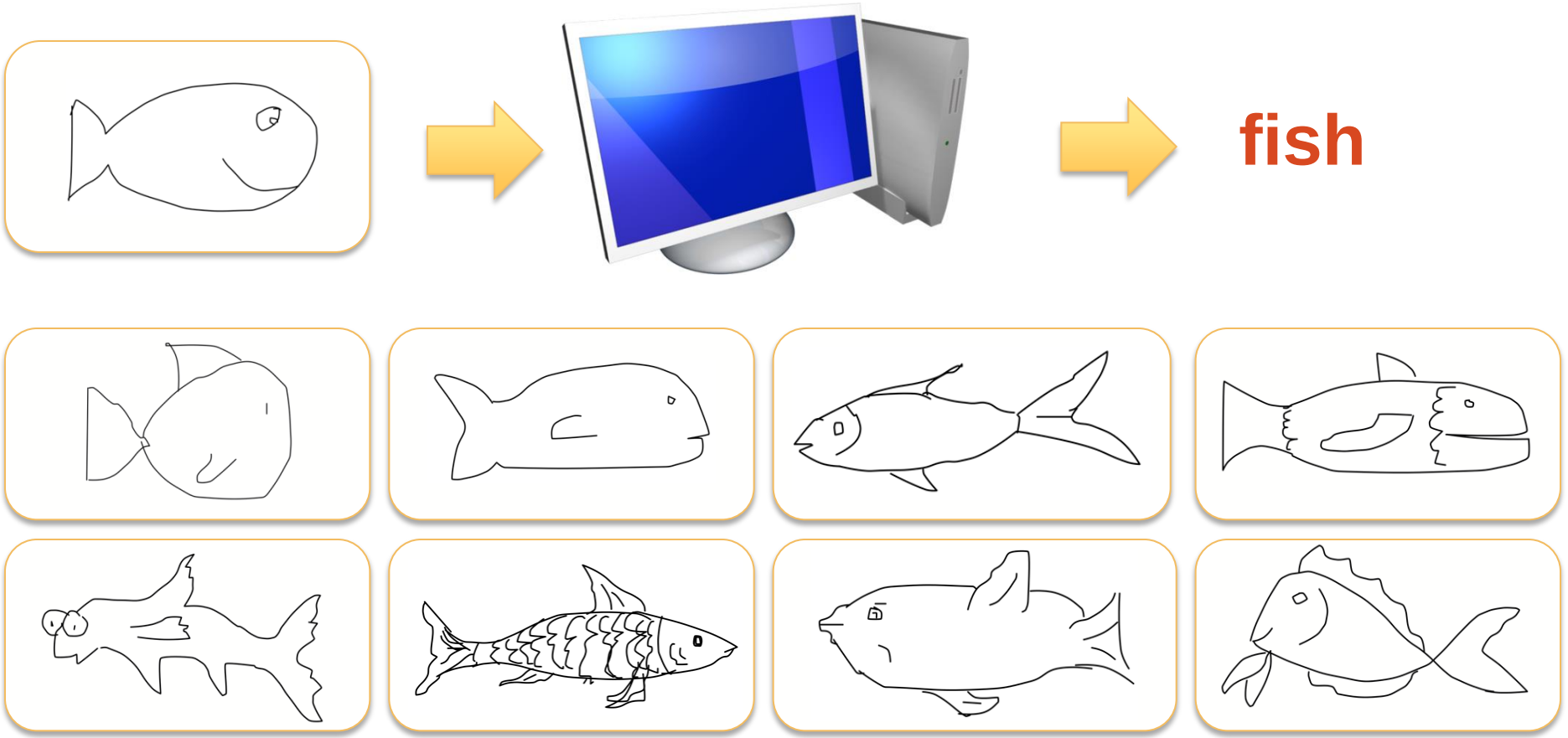
16%

fan

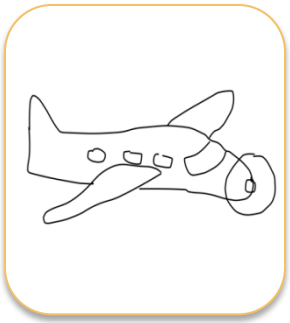
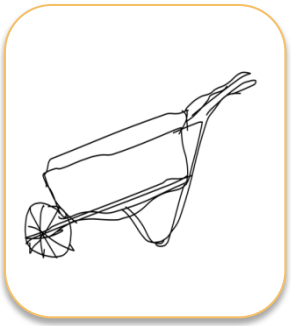
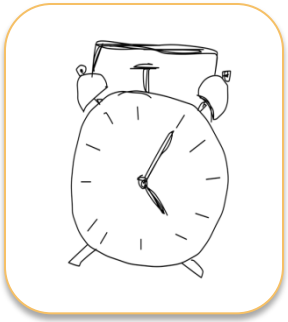


6%

Sketch Recognition



Sketch Recognition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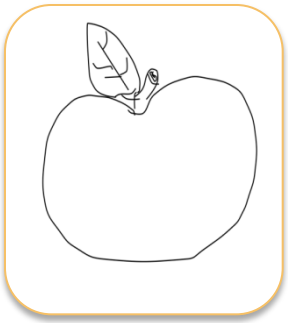
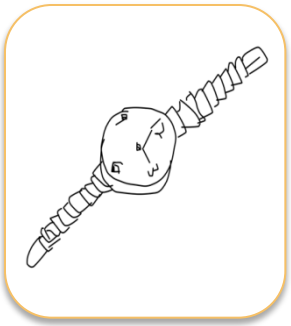



airplane

alarm clock

apple

...

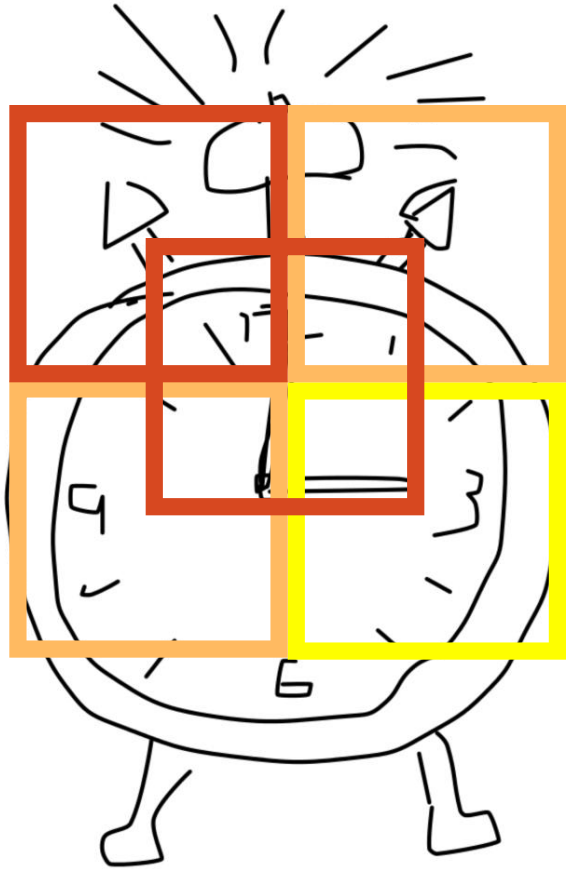
wheelbarrow

wineglass

wristwatch

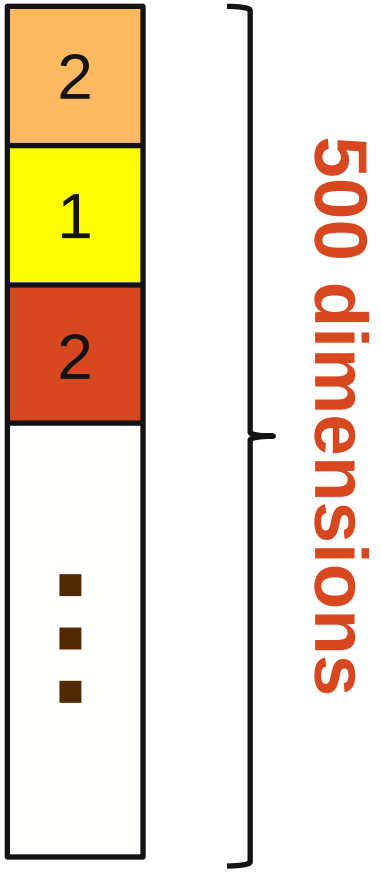
250 categories

Bag-of-Features Representation with SIFT-like features

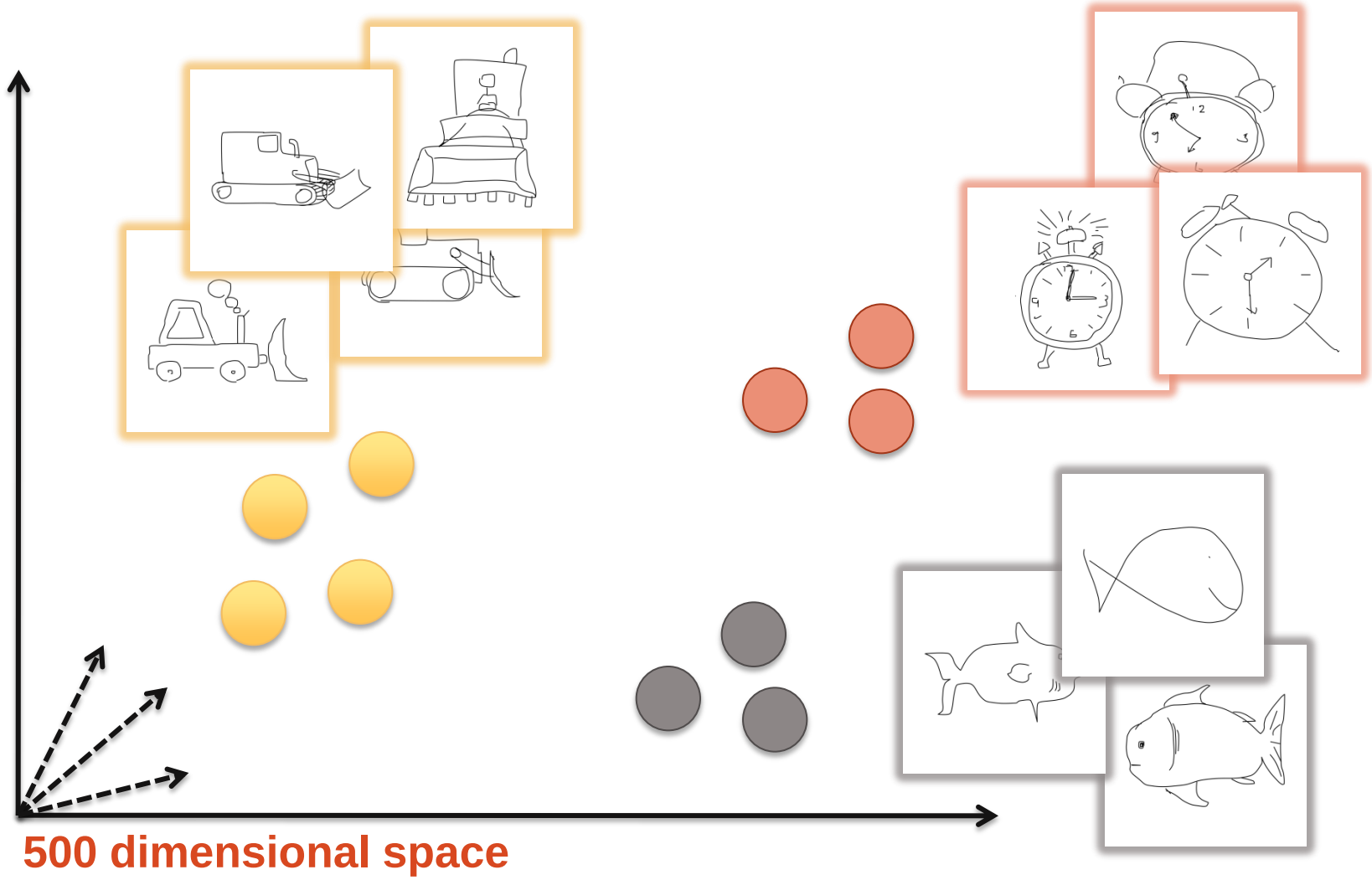


reduce into

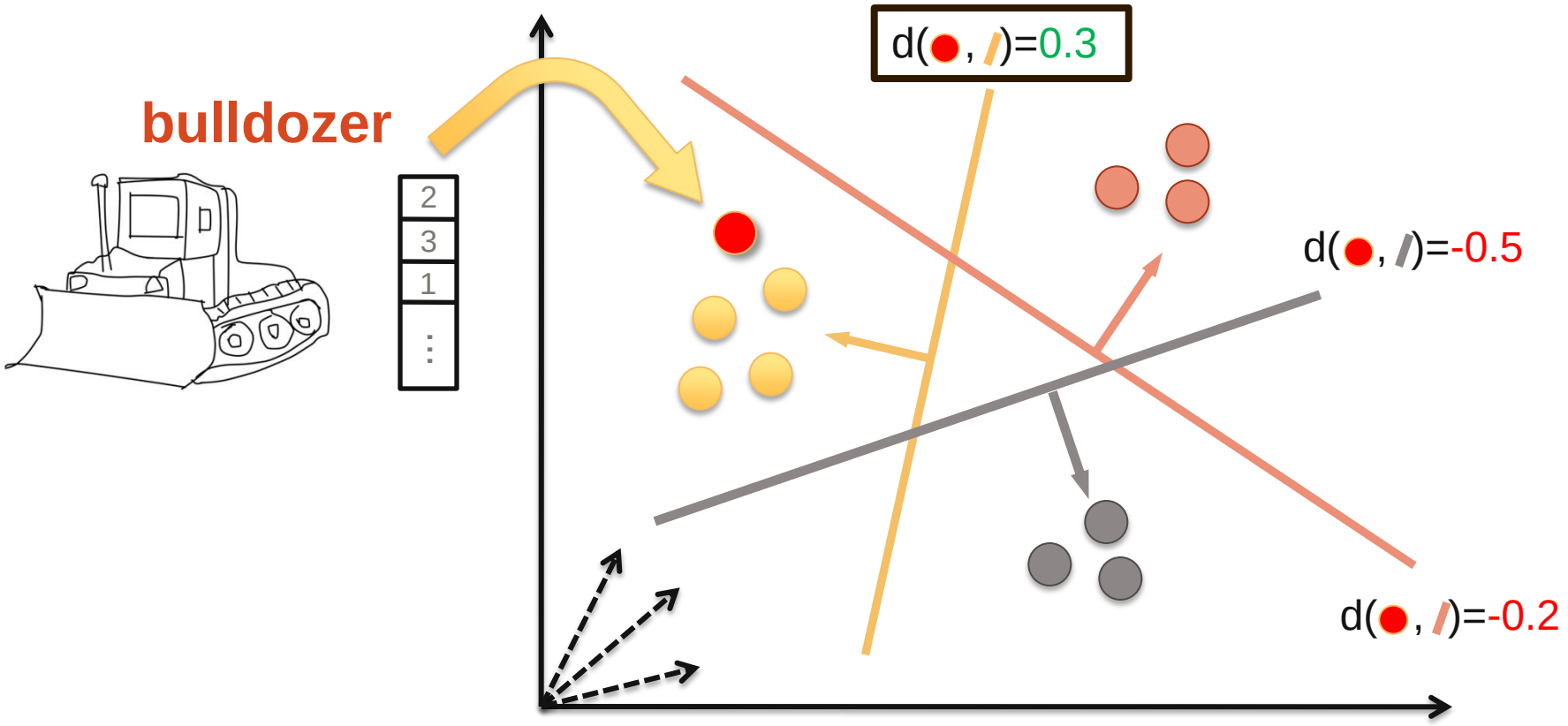
feature vector



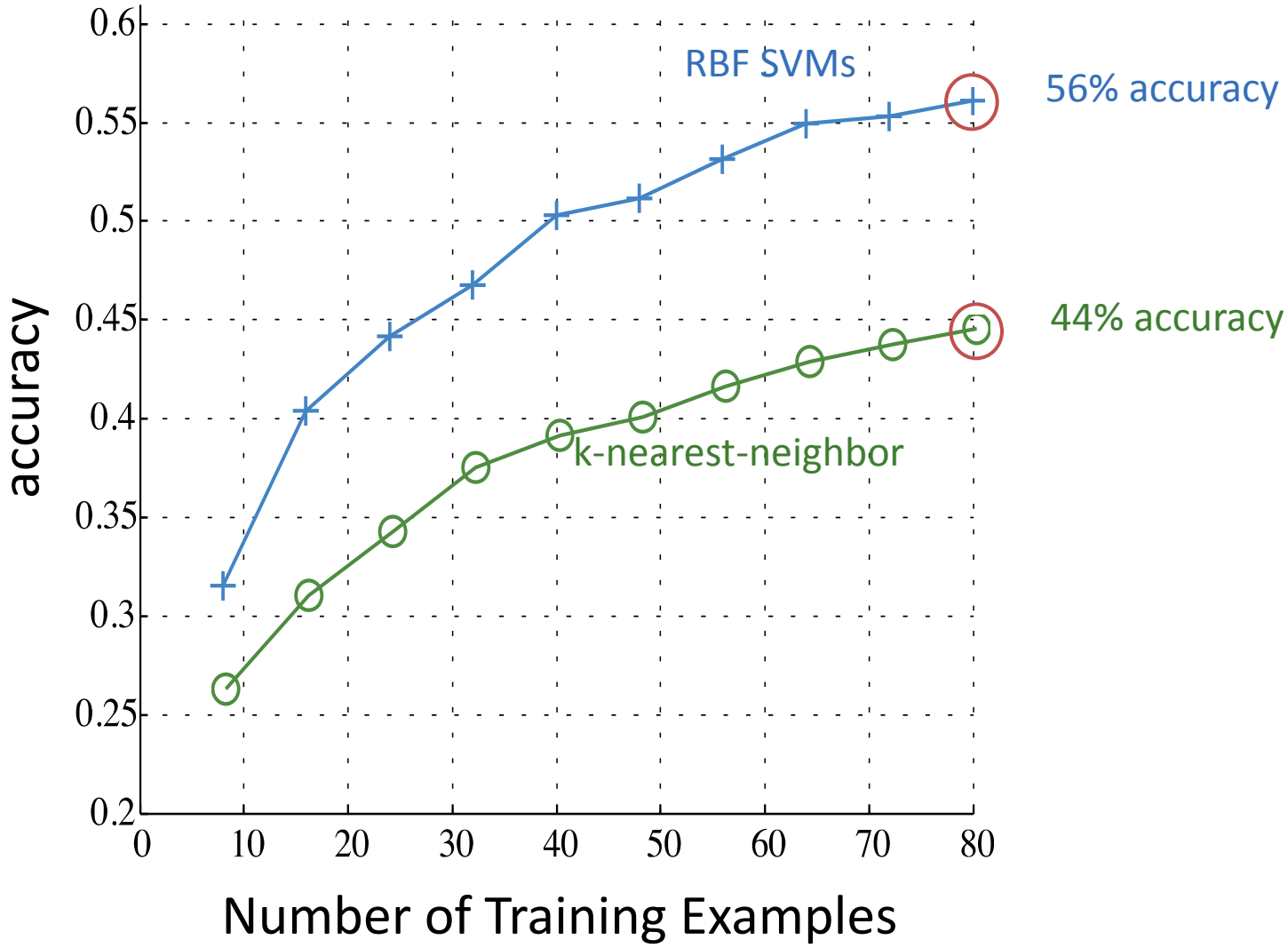
Sketch Feature Space



Classification



Classification Accuracy



Computational Sketch Recognition

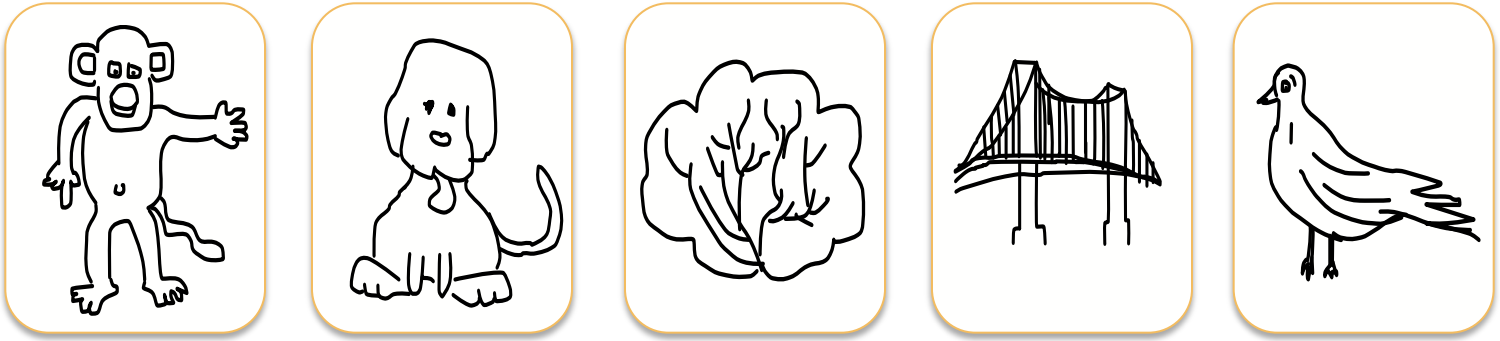
SIGGRAPH2012

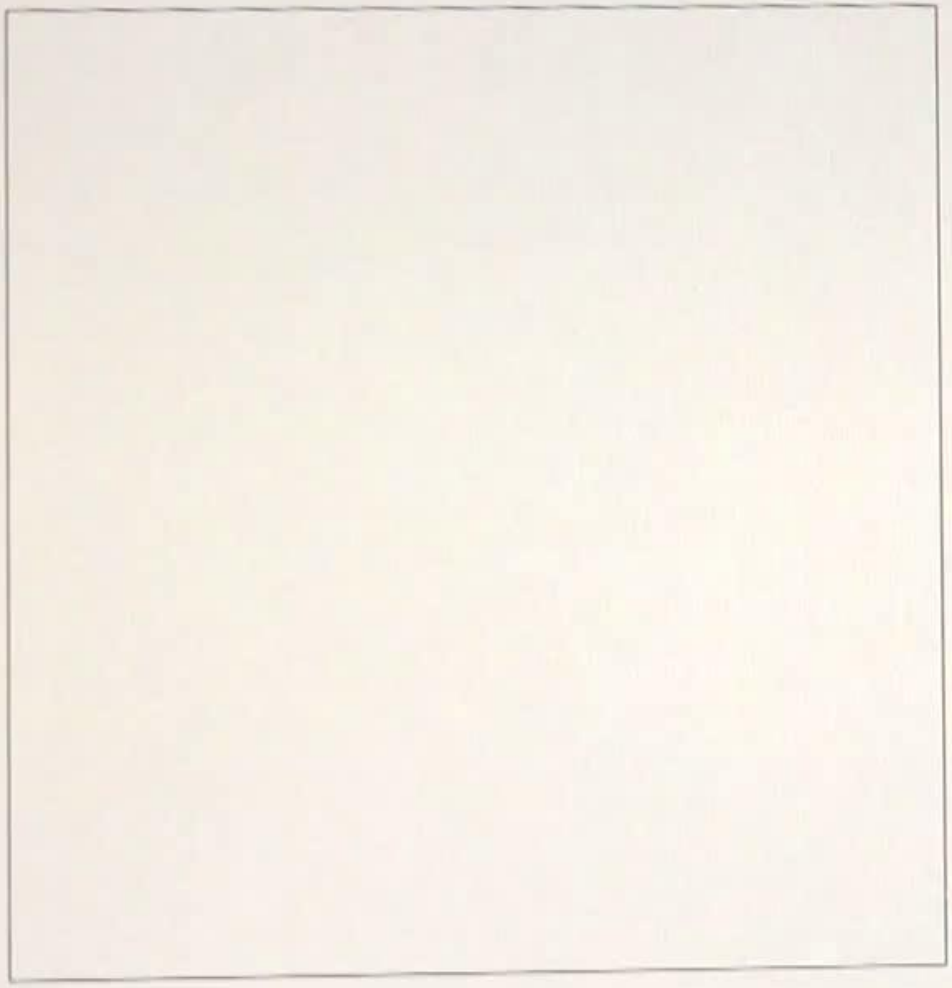
human:	96%	**100%**	96%	95%	73%
computer:	96%	96%	96%	**96%**	**96%**

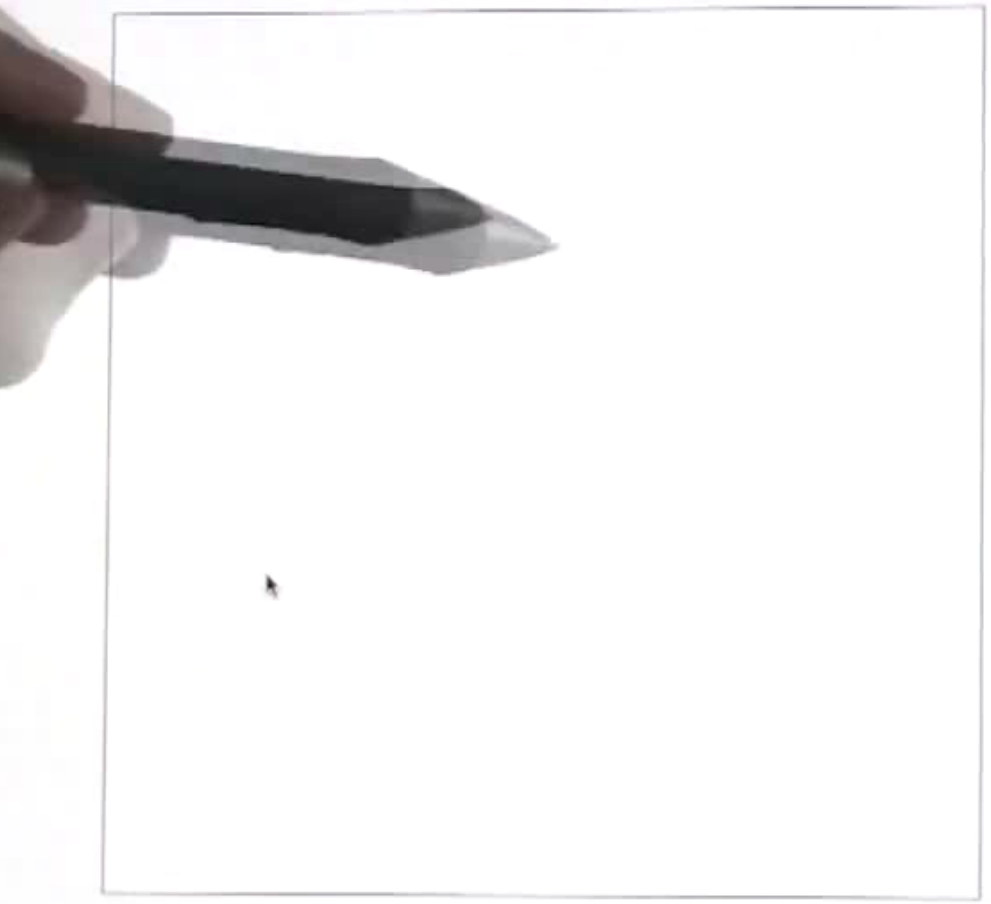
easy

human:	**79%**	**81%**	**35%**	**51%**	**31%**
computer:	7%	7%	11%	11%	14%

difficult







Sketch Recognition

- Does the system generalize beyond our AMT sketches?

flying bird

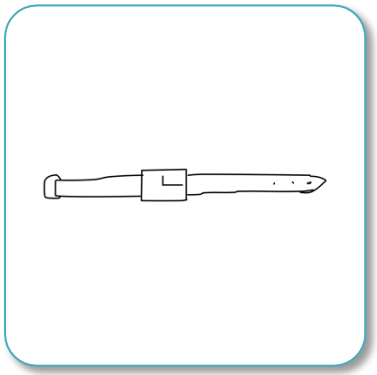
camel

sheep

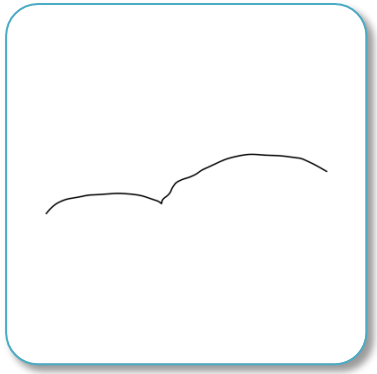
is: antilope

horse

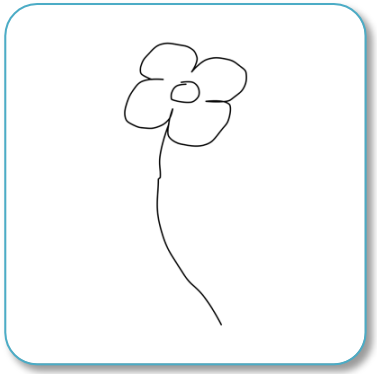
Conclusions



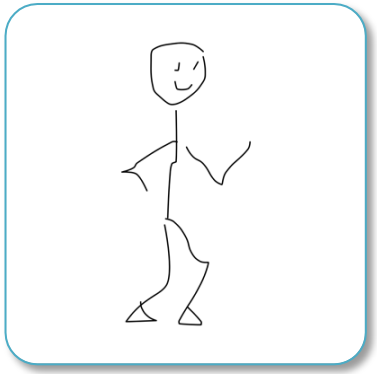
wristwatch



flying bird



flower



person walking

- People tend to agree on **iconic representations**
  - often **abstract** and **far from original geometry**
  - Dataset available at: http://cybertron.cg.tu-berlin.de/eitz/

Available on the App Store

WhatsMySketch