What Makes a Great Picture?

© Robert Doisneau, 1955

With many slides from Yan Ke,
as annotated by Tamara Berg

15-463: Computational Photography
Alexei Efros, CMU, Fall 2011

Photography 101

- Composition
  - Framing
  - Rule of Thirds
  - Leading Lines
  - Textures and Patterns
- Lighting
  - Direction
  - Color coordination / balance
  - "Golden Hour"

Framing

"Photography is all about framing. We see a subject -- and we put a frame around it. Essentially, that is photography when all is said and done."

-- from photo.blorge.com

Frame serves several purposes:

1. It gives the image depth

2. Use correctly, framing can draw the eye of the viewer of an interest to a particular part of the scene.

3. Framing can bring a sense of organization or containment to an image.
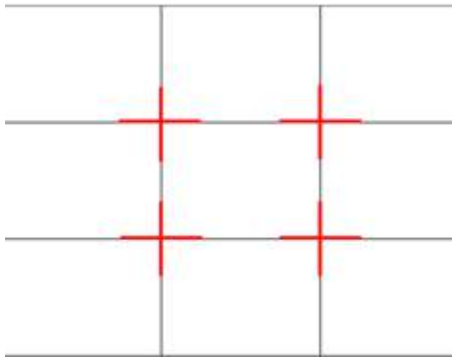
4. Framing can add context to a shot.

http://digital-photography-school.com/blog/frame-your-images/

Examples of nice framing

Rules of Thirds

Other examples
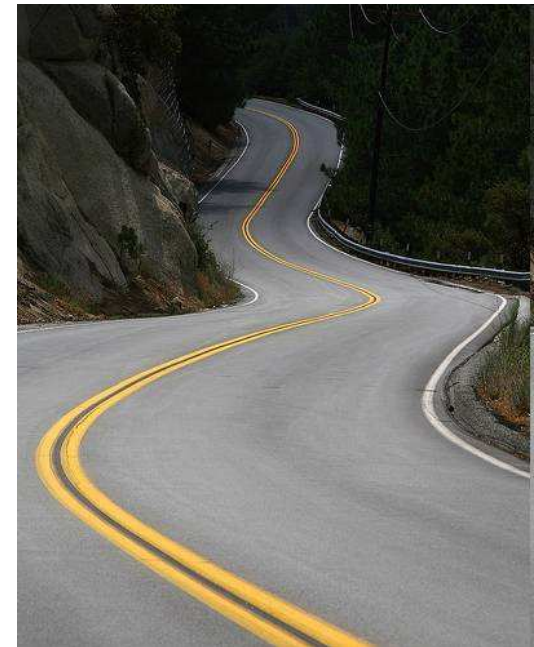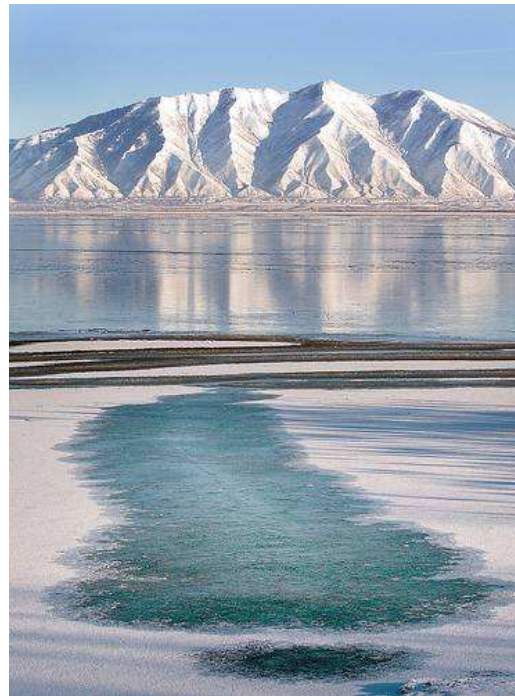
Leading Lines

More examples

Textures and Patterns

Color Coordination

Complementary colors (of opposite hue on color wheel)

Front Lighting

Side Lighting

Back Lighting

Photography 101

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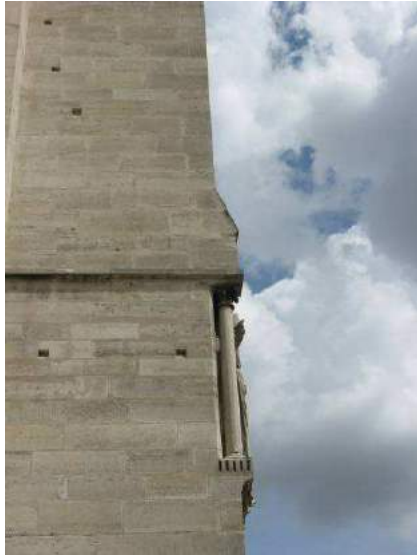
Anyone can take great pictures…

I am a sucky photographer…

...but I am a pretty good photo critic!

of my Paris photos on Flickr: 32

Total # of my Paris photos: ~1250

~2%

The Postmodern Photographer

The Old Days: a pre-process

- Load film
- Find subject
- Position camera
- Set all the settings "just right"
- Take a deep breath…
- ...Press buttom!

The New Digital Days: a post-process

- Get a 2 GB memory cartridge
- Take pictures like there is no tomorrow!!!
- …
- Back home, spend hours of agony trying to find 1-2 good ones

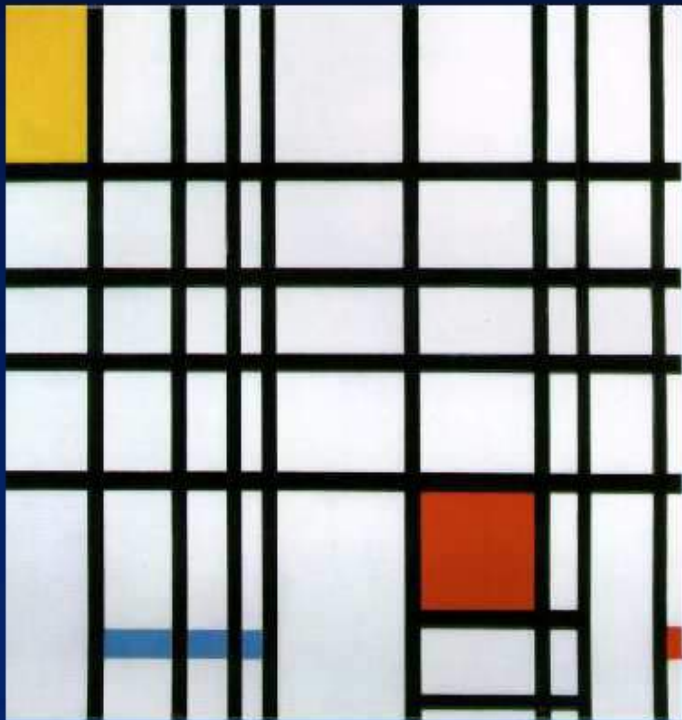# How to recognize the good photos?

Photo by "Chang-er" @ Flickr

Outline

- Photography 101

- Recognition (CVPR '06)

  - What makes one photo better than another?

  - What features can we extract?

  - How can we measure our performance?

Y. Ke, X. Tang, and F. Jing. *The Design of High-Level Features for Photo Quality Assessment.* CVPR 2006.

Not Critiquing Art

Piet Modrian

Lothar Wolleh

Not considering semantic measures of what makes a photo good (subject matter, humor, etc).
Professional = those you would frame, snapshot = those that would stay in photo album.

Applications

Image search for improved quality along with relevance.

Automatically select the best photos from a set of vacation pictures to choose the best ones to show.

See if computer can perform well on a traditionally human task.

What makes one photo better than another?

- Simplicity

- Realism

- Basic photographic techniques

Simplicity

"Look Into" by Josh Brown @ Flickr

Prof - Obvious what one should be looking at ie easy to separate subject from the background. Snap – unstructured, busy, filled with clutter.

Simplicity
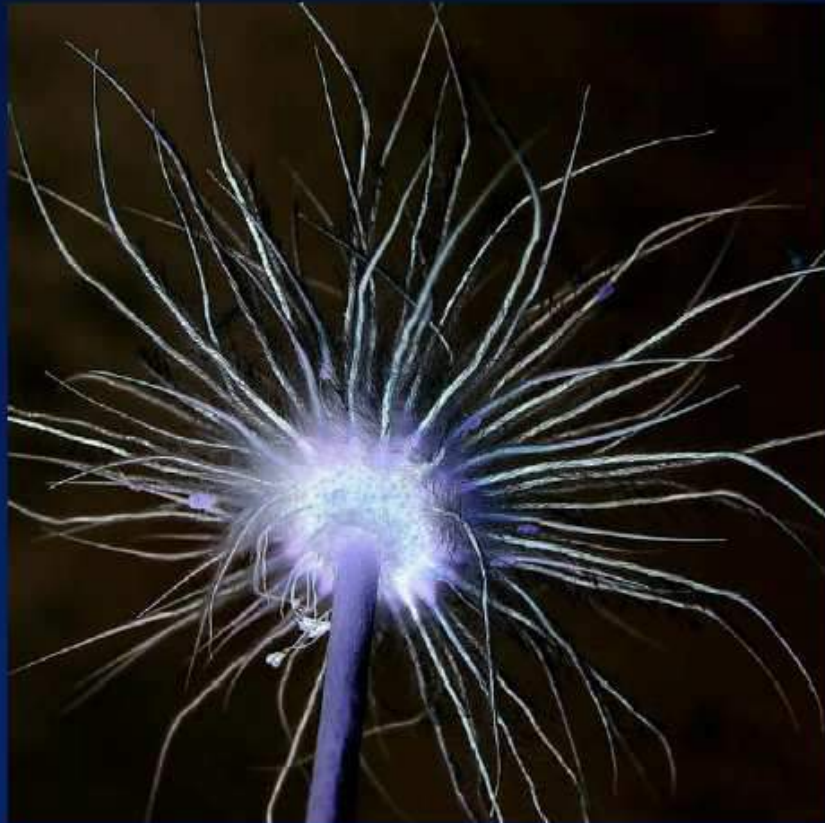
Simplicity

Basic techniques

■ **Blur** - Snaps – entire photo blurry indicates poor technique. Prof - background out of focus by widening the lens aperture, but foreground in sharp focus.

■ **Contrast and brightness** Make the subject pop out by choosing complementary colors for subject & background. Isolate the subject by increasing lighting contrast between subject & background.

Abstract concepts - "Good composition, color & lighting"

(Sur) Realism

Snaps look real, while prof photos look surreal.

"Golden Gate Bridge at Sunset" by Buzz Andersen @ Flickr

"Golden Gate 3" by Justin Burns @ Flickr

(Sur) Realism
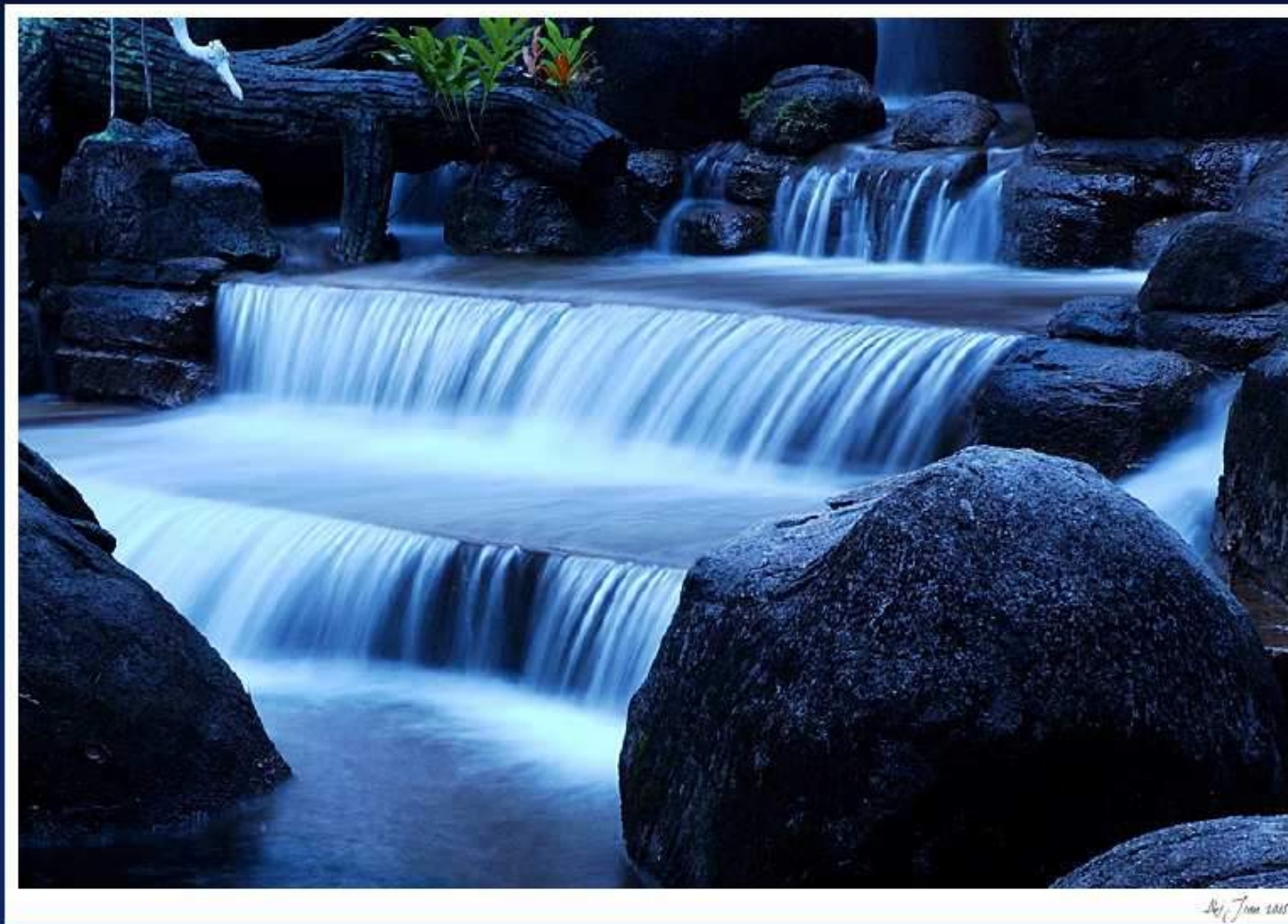
"Somewhere Only We Know Prt2 (sic)" by Aki Jinn @ Flickr

Techniques

Lighting conditions – time of day (morning, dusk), colored filters to adjust color balance (make sky bluer, sunset more brilliant), careful color selection of scene

Camera settings – adjust settings like focal length, aperture, shutter speeds to modify mood, perspective. Eg might use long shutter speed to capture waterfall and give a misty look

Subject matter – ordinary objects in unusual poses or settings (challenging since would need obj rec first)

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Features – Spatial Distribution of Edges

More edges near border due to background clutter

More edges near center of img

Trying to capture a photo's "simplicity"

Spatial Distribution of Edges

Mean Laplacian of snapshots

Mean Laplacian of professional

M_s

M_p
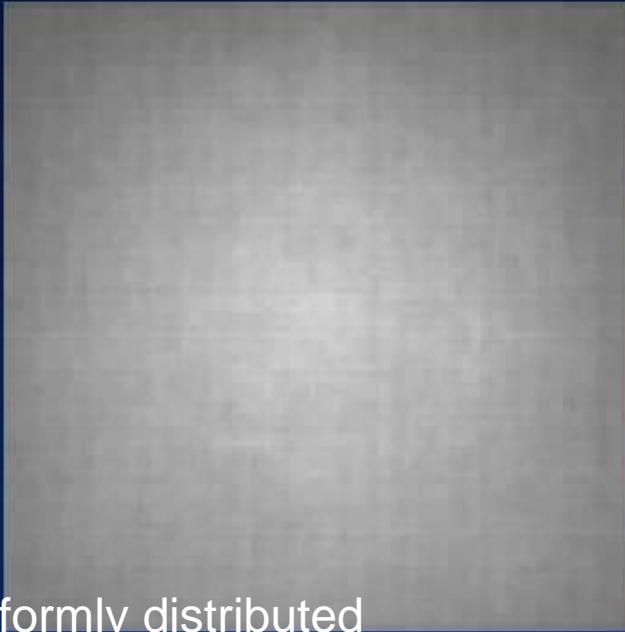
More uniformly distributed
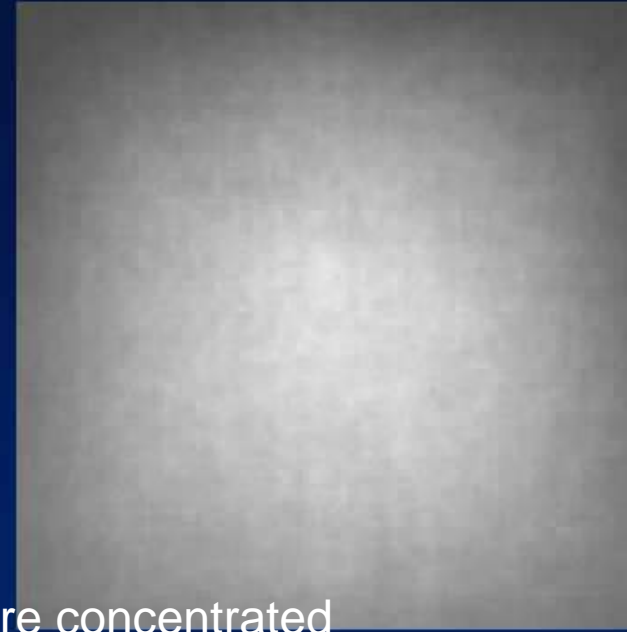
More concentrated
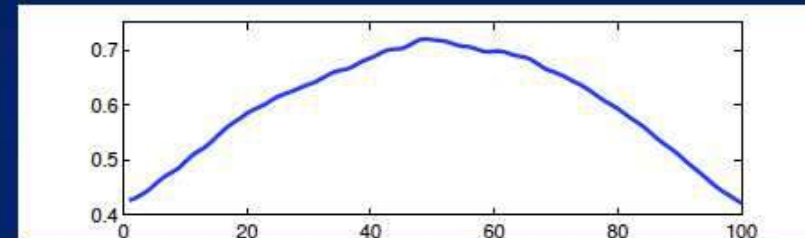
Low quality photos

High quality photos

Expect high quality photos to have high spatial frequency edges nearer to center than snapshots

Edge width

Calculate area that edges occupy – width of bounding box covering 96% of edge energy

Cluttered regions should tend to produce a larger bounding box, and well defined subjects should produce a smaller one.
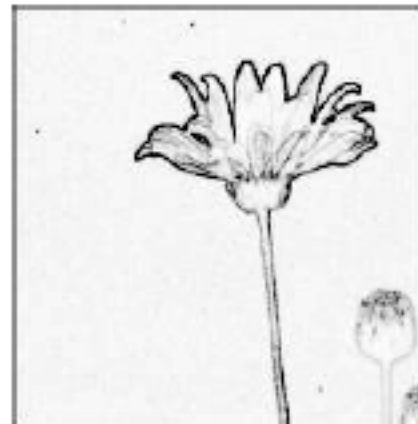
.94   .56

Color Distribution

- K-NN on color histogram
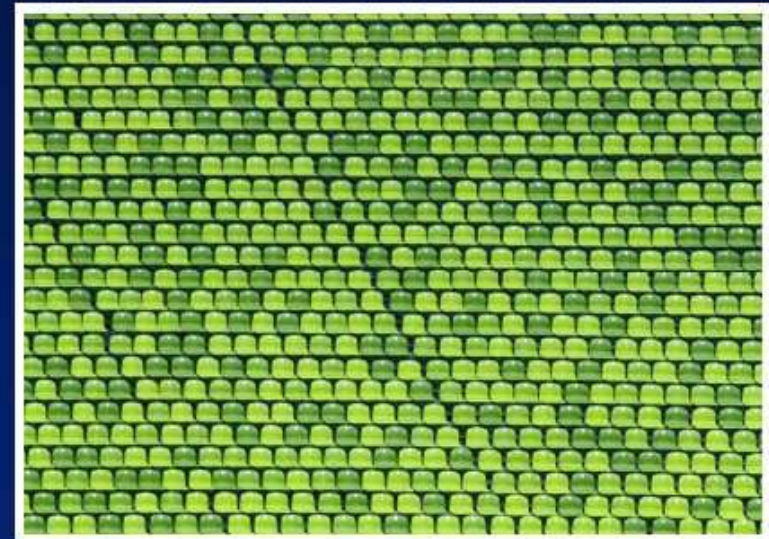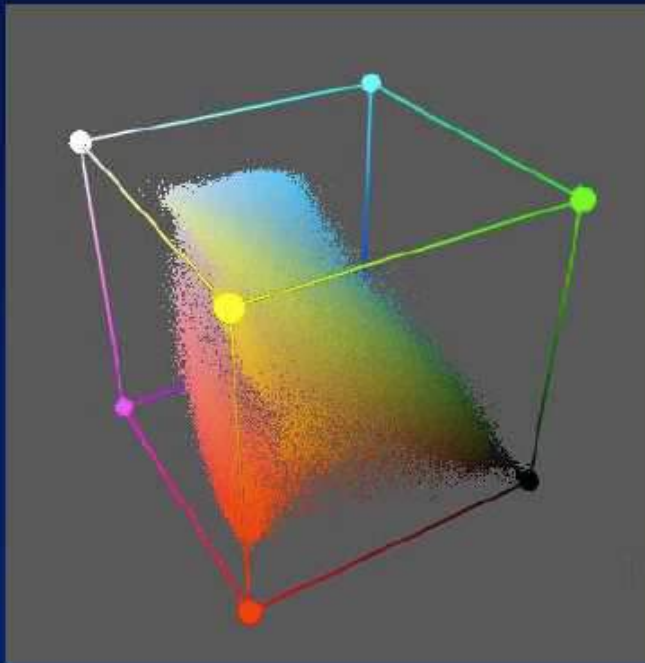
$$q_{cd} = \# professional\_neighbors$$

For query image find k nearest neighbors in training set. Quality = number of prof neighbors in top 5.

20 bin histogram defining possible unique hues

Hue Count
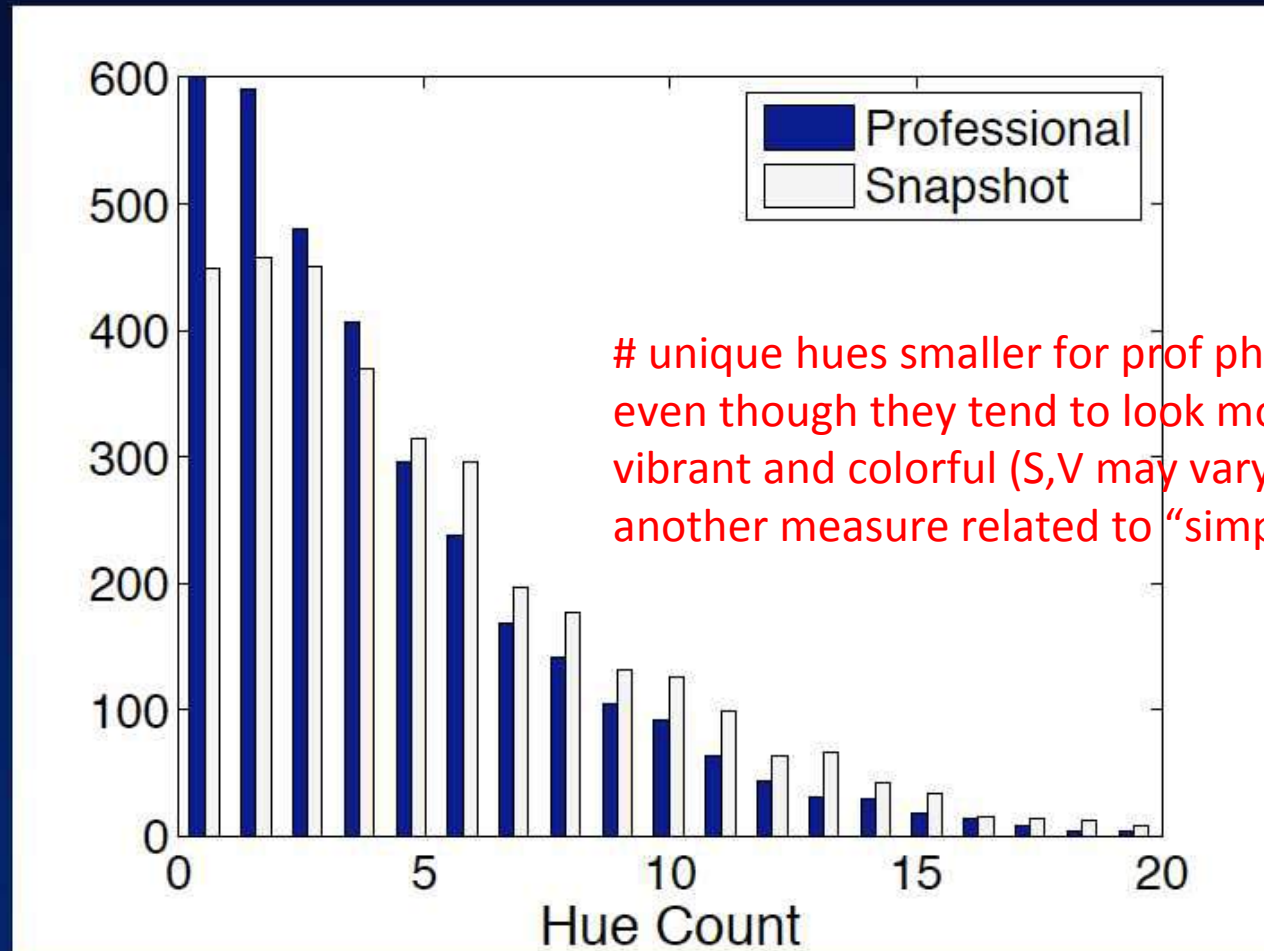
unique hues smaller for prof photos even though they tend to look more vibrant and colorful (S,V may vary more) – another measure related to "simplicity"

$$q_h = 20 - (\# \, hues > threshold)$$

Most unlikely colors…

From Lalonde and Efros, ICCV'2007

Blur

- Look at frequency distribution.

- Measure the amount of blur in the sharpest object, instead of the *average* blur.

Prof photos should have some part of photo in sharp focus

Low Level Features - Contrast
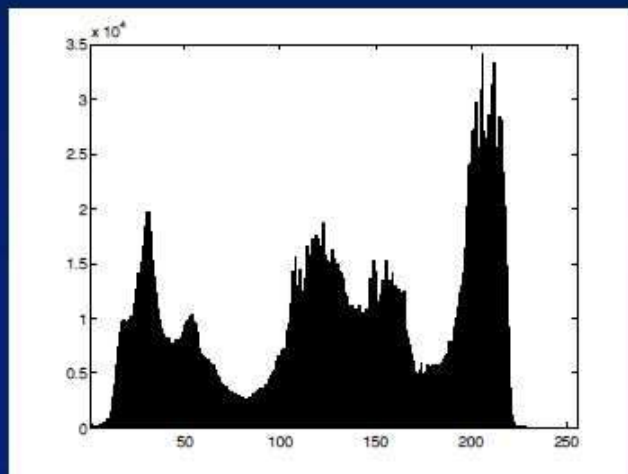
Prof photos usually have higher contrast

Contrast = width of middle 98% mass of hist
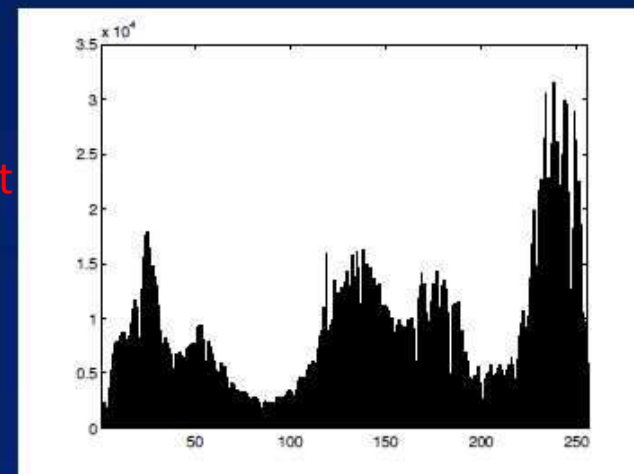
Contrast
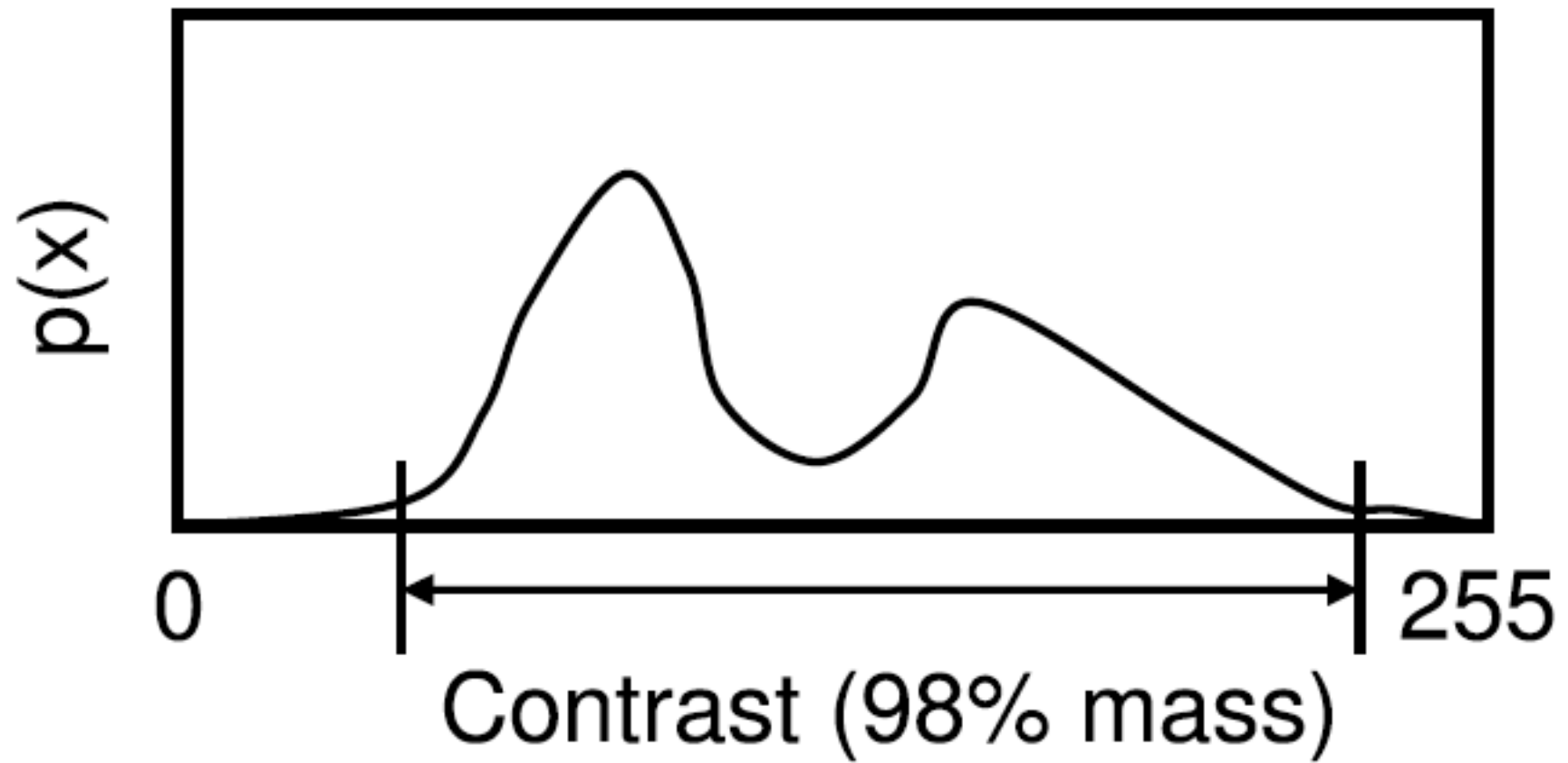
Low Level Features – Avg. Brightness

Professional photographers may adjust exposure to be correct on subject only so subj pops from bkd. Cameras tend to adjust brightness to average at 50% gray, but prof photos might deviate significantly. Use ave brightness as feature.

Classifier

- Naives Bayes

- We assume independence of the features

- We achieve better results with added features even though they are not independent.

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Dataset – DPChallenge.com

Use photos average rating as ground truth quality measure

Use only top 10%, bottom 10% as dataset.

Use half for training/half for testing.

Statistics

Place: 1 out of 829
Avg (all users): 7.987
Avg (commenters): 8.805
Avg (camera): 7.998
Avg (no camera): 6.333
Views since voting: 6597
Views during voting: 1003
Votes: 478
Comments: 190
Favorites: 133 (view)

Add this photograph to your favorites!

Voting Breakdown

1 | 0
2 | 1
3 | 2
4 | 5
5 | 24
6 | 54
7 | 89
8 | 109
9 | 89
10 | 105

Photo contest website, user rated

60K photos
40K photographers
10/90 percentile

Difficulty of Dataset
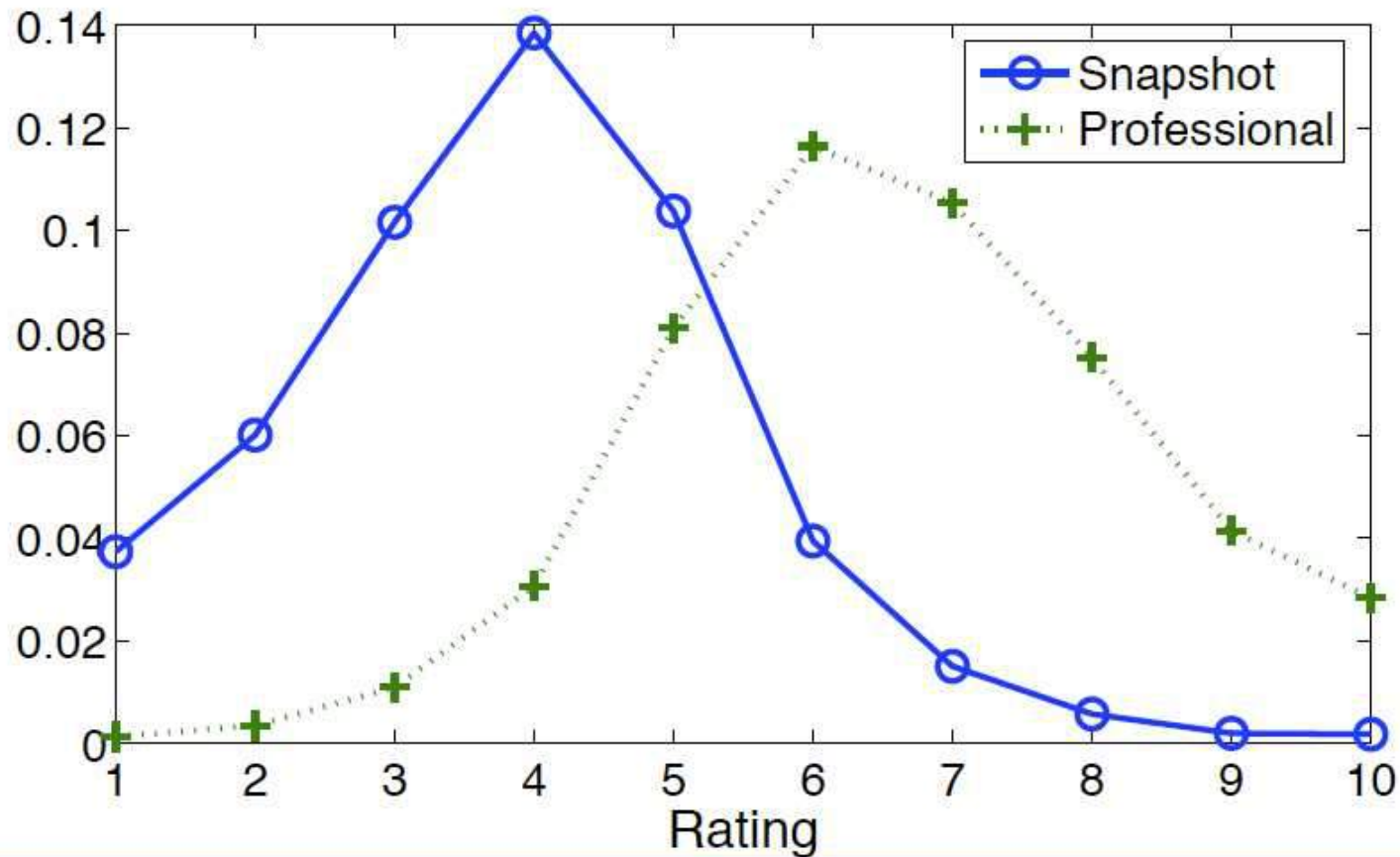
Results
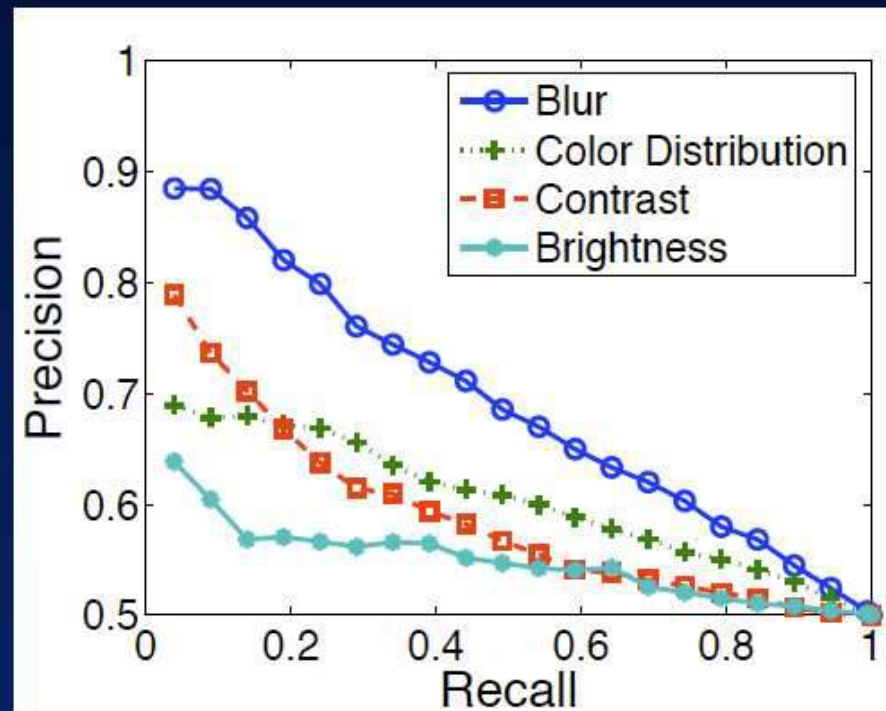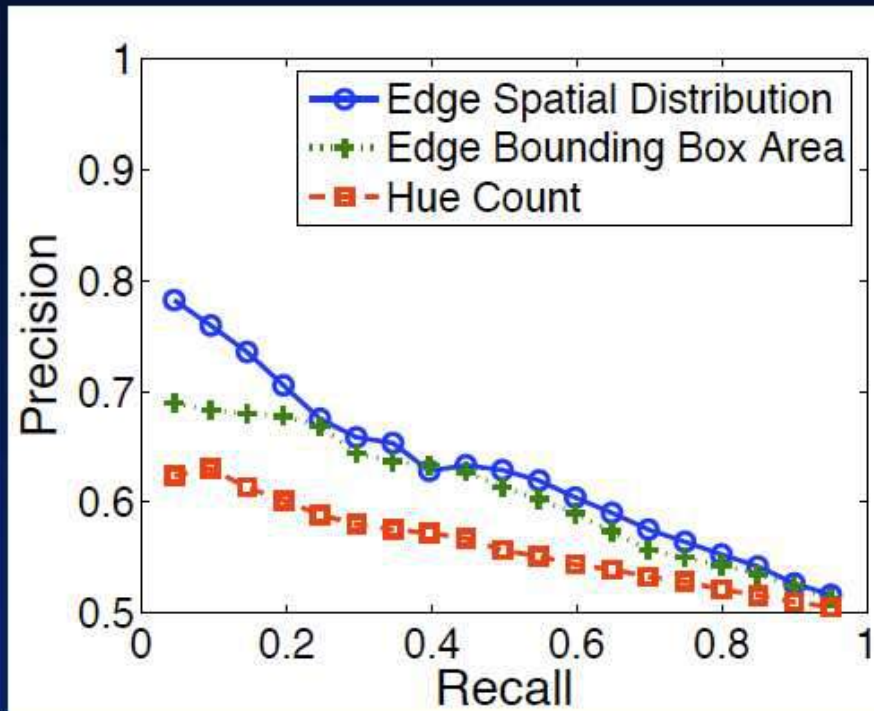
$$recall = \frac{\# \; professional \; photos \; above \; threshold}{total \; \# \; professional \; photos}$$

$$precision = \frac{\# \; professional \; photos \; above \; threshold}{\# \; photos \; above \; threshold}.$$

Most Distinctive Feature: Blur

- A *badness* metric, rather than a *goodness* metric.

Results
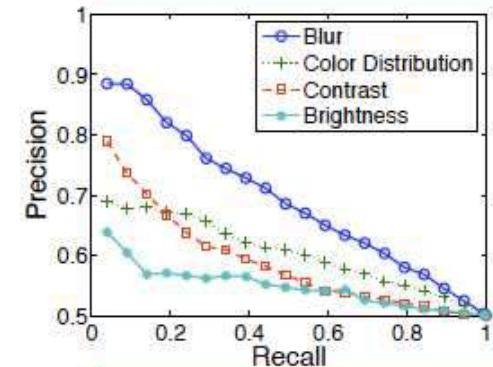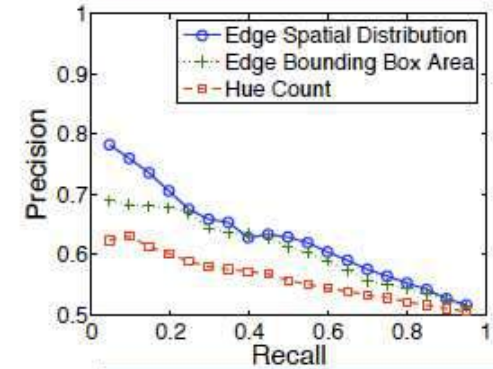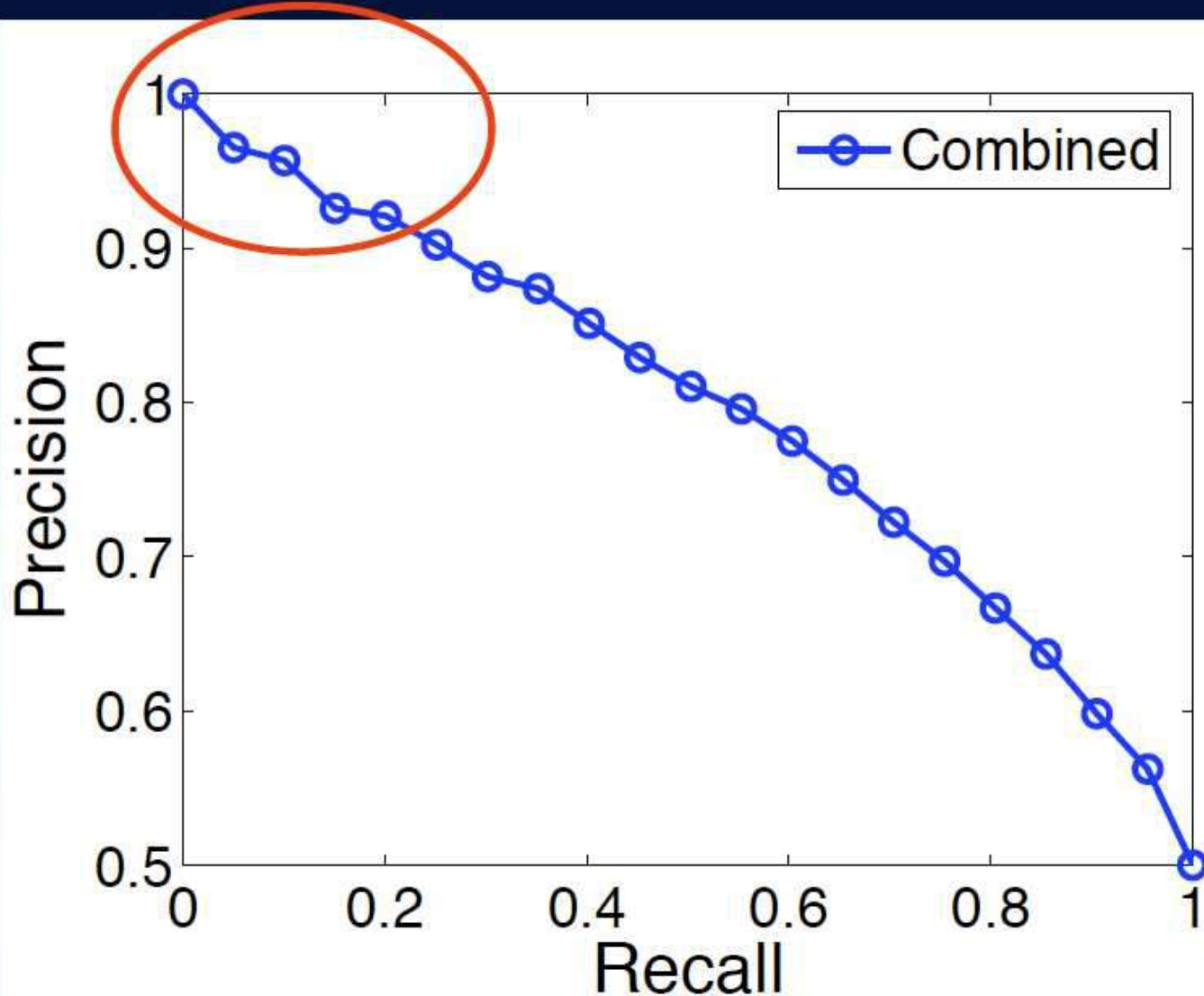
72% classification rate

Web Retrieval Results

Web Retrieval Results

Web Retrieval Results

Oscar (Lei Yau et al, IJCV'11)

Lucky Imaging
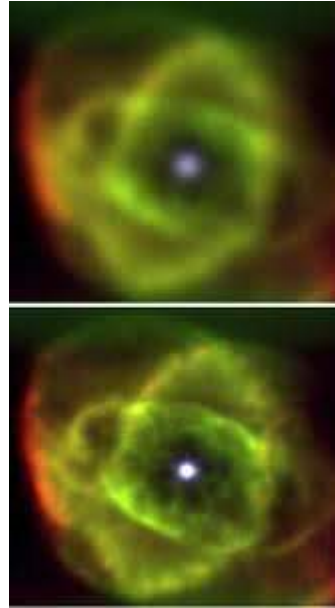
Juliet Bernstein, **Aseem Agarwala**, Brian Curless. "Candid Portrait Selection From Video," *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia 2011)*

http://grail.cs.washington.edu/projects/candid_video_portraits/