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Assessing the Aesthetic Quality of Photographs through Group Comparison

Mei-Chen Yeh* and Chun-Hui Chuang
Department of Computer Science and Information Engineering
National Taiwan Normal University

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Which photo do you like better?

Figures from:
Yiwen Luo and Xiaoou Tang, "Photo and Video Quality Evaluation: Focusing on the Subject", *ECCV* 2008.

Which photo do you like better?

- Subjective
- Differentiating professional and amateur photos may be natural to a human, but difficult to a computer.

Aesthetic quality assessment

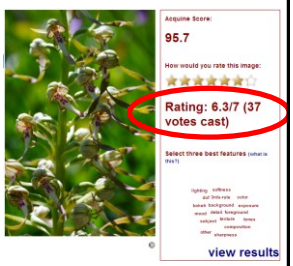
- Objective
  - Rate the aesthetic quality of a photograph
- Applications
  - Image search: relevance and quality
  - Creation of personal albums/collage pictures
  - Key frame selection

Online resources

- DPChallenge.com

http://www.dpchallenge.com/image.php?IMAGE_ID=134591

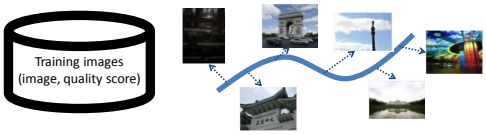
- ACQUINE



http://acquine.alipr.com/show_image.php?id=1330868839.2612

A generic approach

- Formulates a machine learning problem
  - Given a gallery of photos and the associated human ratings, design a grader that evaluates the image aesthetic quality.
- Maps *visual features* to a quality score



Existing work on feature extraction

- Low-level feature
  - Image processing: degree of noise, distortion, artifacts [Wang et al. 2004, Sheikh et al. 2005]
  - Image retrieval: low-level visual features, i.e. color, shape, texture [Datta et al. 2006]
- High-level feature / photographic composition
  - Rule of thirds, golden ratio, blur, color distribution [Ke et al. 2006, Yeh et al. 2010, Bhattacharya et al. 2010]
- Subject-driven feature
  - Foreground, face region [Luo and Tang 2006, Li et al. 2010]

Features extracted solely from the image under evaluation

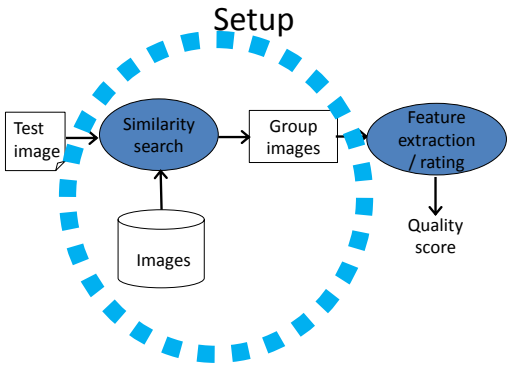
Our approach

Expand the content analysis using information beyond the source image!

Research problems

- Do a group of similar photos help the quality assessment problem?

Setup



Group features

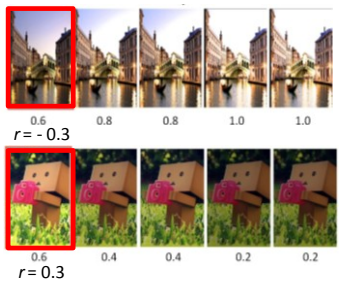
Input: m photos, type-k features $\{f_i\}$, $i = 1..m$

Output: type-k relative/deviation features $\{r_i\}$, d_k

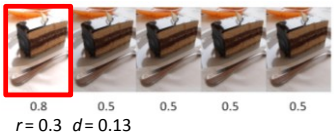
$$r_i = \frac{\sum_{j \neq i} (f_j - f_i)}{m-1} \qquad d_k = \sqrt{\frac{\sum_{k=1}^{m} (f_k - \overline{f_k})^2}{m-1}}$$

The computation of relative features is performed on a group basis!

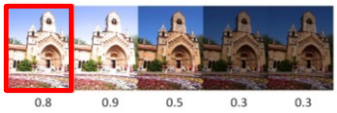
Relative feature (r_i)



Deviation feature (d_k)



$r = 0.3$ $d = 0.13$



$r = 0.3$ $d = 0.28$

Experiment

- Dataset
  - 99,000 images (9000 test photos crawled from Photo.net. For each test photo we retrieved top 10 similar ones by using Google Image Search)
- Evaluation metrics
  - Spearman and Pearson coefficients, 5-fold cross validation
- Features
  - Texture (32-d)
  - Clarity (1-d)
- Rating models
  - RankSVM [Chapelle, *Neural Computation '07*]

Results

Method	Spearman correlation	Pearson correlation
Baseline	0.3234	0.3216
Baseline + Relative	0.3580	0.3591
Baseline + Deviation	0.3540	0.3551
All	**0.3622**	**0.3631**
Yeh et al [*ICIP* '12]	0.3258	0.3238

Conclusion

- Exploring the use of *multiple images* as basic atoms for rating photos
- Introducing the *group features*: simple, computational efficient
- Demonstrating the benefits of group evaluation through experiments

Future work

- Exploration of group comparisons to not only feature extraction, but learning the grader

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Questions?

More information:
http://www.csie.ntnu.edu.tw/~myeh/