Treat learning of perceived attributes as an adaptation problem.

Problem

- However, there are real perceptual differences between annotators.

Our Idea

1) Treat learning of perceived attributes as an adaptation problem.
2) Obtain labels implicitly from user’s search history.

Impact: Capture user’s perception with minimal annotation effort. Personalization makes attribute-based image search more accurate.

Learning Adapted Attributes

Training data

\[ D_B = \{ (x_i, z_{i,B}) \} \]

\[ z \] is more [attribute] than \[ z \]

\[
\begin{align*}
\text{Learning} & : \frac{1}{2} |z - w|_2^2 + C \sum_i x_i \\
\text{subject to} & : w^T x_i - w^T z_i \geq 1 - x_i, \quad t_i \geq 0, \quad w_i \geq 0
\end{align*}
\]

Prediction

\[ f_{B}(x) = \delta f_{B}(x) + \sum_i x_i (w^T x_i - w^T z_i) \]


Inferring Implicit User-Specific Labels

- Transitivity

\[ f_{B}(A) \cap f_{B}(T) < f_{B}(B) \implies f_{B}(A) < f_{B}(B) \]

- Contradictions

Feedback implies no images satisfy all constraints.
 Contradiction implies attribute models are inaccurate.

Relax conditions for contradiction. Adjust models using new ordering on some image pairs.

Adapted Attribute Accuracy

- **Generic:** status quo of learning from majority-voted data
- **Generic+:** like above, but uses more generic data
- **User-exclusive:** learns a user-specific model from scratch

Datasets

Shoes: [Berg10, Kovashkva12] attributes: pointy, open, bright, shiny, ornamented, high-heeled, long, formal, sporty, feminine

SUN attributes: sailing, vacationing, hiking, camping, socializing, shopping, vegetation, clouds, natural light, cold, open, cold area, far-away horizon

Size: 14k images each; Features: GIST, color, HOG, SSIM

The personalized attribute models allow the user to more quickly find his/her search target. Implicitly gathering labels for personalization saves the user time, while producing similar results.