TOWARDS THE EXAGGERATED IMAGE STEREOTYPES

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Abstract Given a training set of images and a binary classifier, we introduce a concept of **Exaggerated Image Stereotype** for one of the two classes, based on the combination of generative and discriminative models, respectively built from the training set and the classifier. The exaggerated image stereotype should emphasize / exaggerate patterns in an image, resulting in an optimal trade-off between classification result and likelihood of being generated from the class of interest.

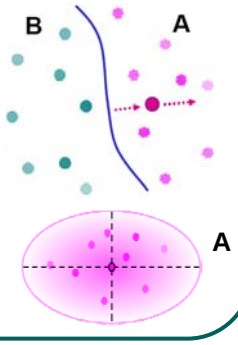
Typicality Measurement

Discriminative term

The posterior probability or the likelihood ratio

$$E^d = P(C_A|I)$$

$$E^d = \frac{p_A(I)}{p_B(I)}$$



Generative term

The class density function

$$E^g = P(I|C_A)$$

Building Exaggerated Stereotypes

Objective function

Weighted negative logarithm of two terms

$$E = -\lambda_d \log(E^d) - \lambda_g \log(E^g)$$

Optimization problem

$$I^* = \arg\min_I \{E\}$$

Evolution: Gradient descent

$$I^{n+1} = I^n - \nabla_I E \, \Delta t$$

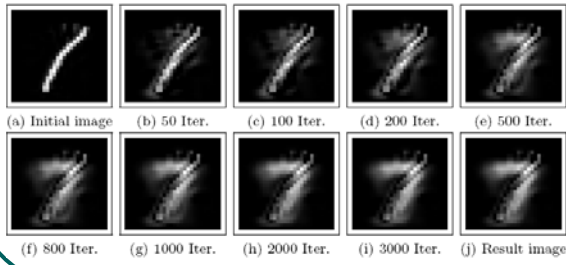
Experiments and Results

• Modeling

Fisher's Linear Discriminant Analysis as discriminative model (posterior probability function approximated by sigmoid function) ;
Multivariate Normal Distribution as the generative model (class density function).

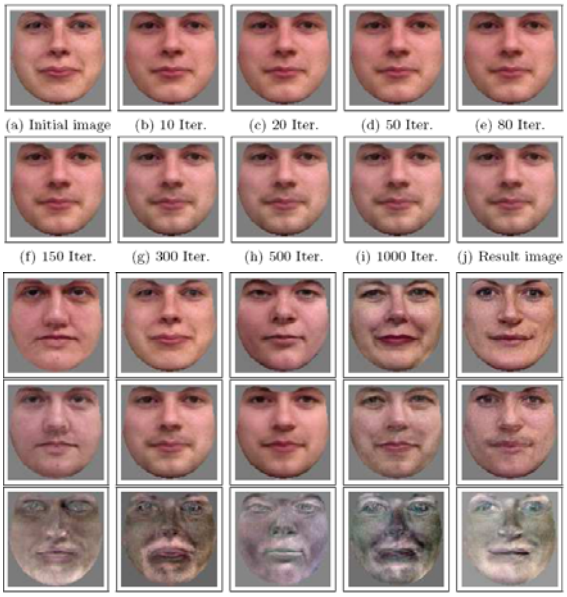
• Handwritten digits: 1 vs. 7

The MNIST database of handwritten digits
Size: 28 by 28 pixels
Features: intensities



• Human Faces: Female vs. Male

The IMM face database
Size: 100 by 100 pixels (shape free patch)
Features: parameters via AAM transform



Future Work

- Advanced classifiers
- More faithful distribution assumption
- More accurate objective function
- More effective optimization methods
- Medical and other applications