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Graphical Representation for Heterogeneous Face Recognition

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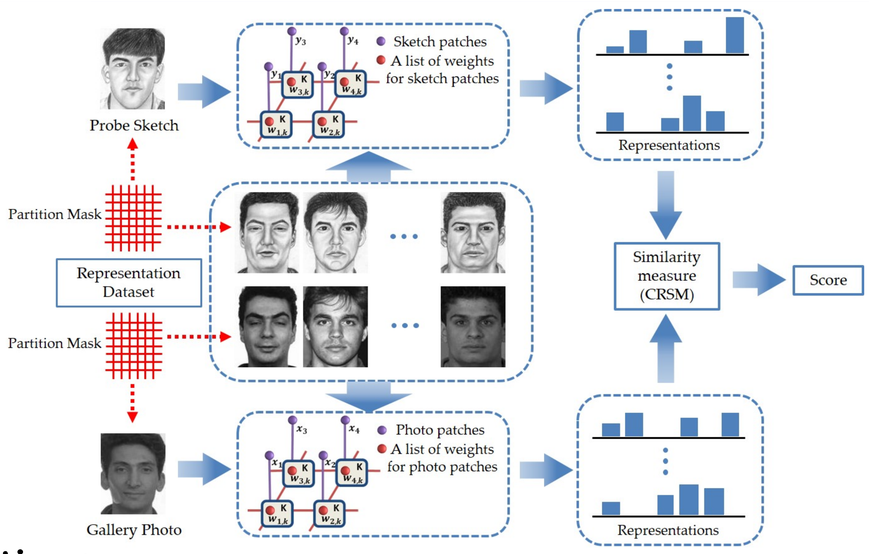
Introduction

Examples of heterogeneous faces tested in this paper.

Overview



Contributions:

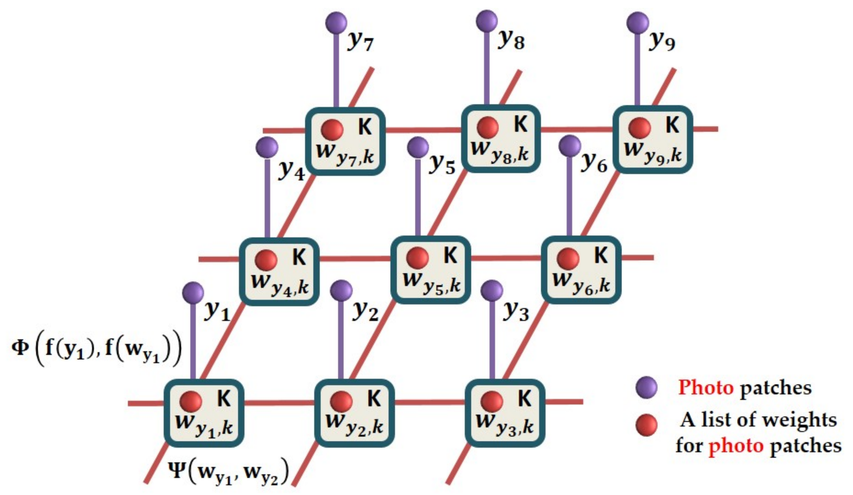
- We employ Markov networks to obtain graphical representations for representing heterogeneous face images, which firstly takes spatial information into consideration;
- A coupled representation similarity metric is developed for matching, which considers the spatial structure between heterogeneous face image patches;
- Leading accuracies are achieved on multiple HFR scenarios which illustrates the effectiveness of the proposed method.

Results

Database	Method	Accuracy
IIIT-D sketch database	MCWLD	28.52%
	G-HFR	30.36%
PRIP-VSGC database	Component-based	<5%
	G-HFR	51.22%
Forensic sketch database	P-RS	20.80%
	G-HFR	31.96%

Rank-50 accuracies on three types of forensic sketch databases.

Graphical Representation



Joint probability:

$$\mathrm{p}\left(\mathbf{w}_{\mathbf{y}_1},\ldots,\mathbf{w}_{\mathbf{y}_N},\mathbf{y}_1,\ldots,\mathbf{y}_N\right)=\prod_i \boldsymbol{\Phi}\left(\mathbf{f}(\mathbf{y}_i),\mathbf{f}\left(\mathbf{w}_{\mathbf{y}_i}\right)\right)\prod_{(i,j)\in\Xi}\boldsymbol{\Psi}\left(\mathbf{w}_{\mathbf{y}_i},\mathbf{w}_{\mathbf{y}_j}\right)$$

Coupled Representation Similarity Metric

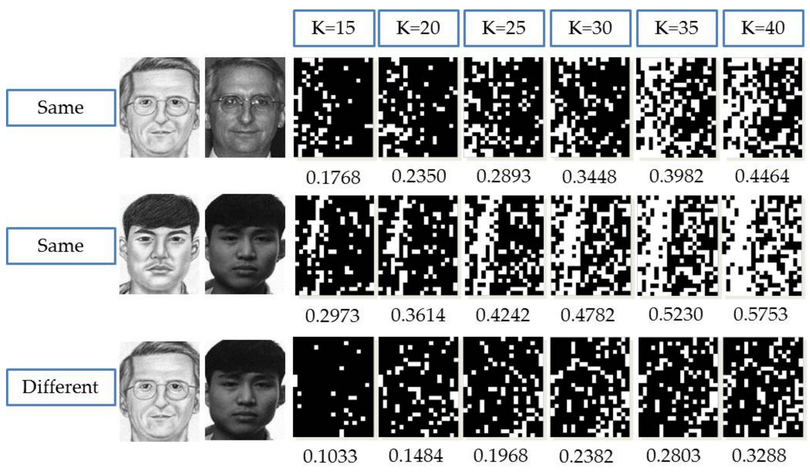
We compute the similarity score of the probe sketch patch $\mathbf{y}_i$ and the gallery photo patch $\mathbf{x}_i^l$ as the sum of the weights sharing the same nearest neighbors:

$$\mathrm{s}\left(\mathbf{y}_i,\mathbf{x}_i^l\right)=0.5\sum_{z=1}^{M} n_z\left(w_{\mathbf{y}_{i,z}}+w_{\mathbf{x}_{i,z}^l}\right)$$

where

$$n_z=\begin{cases}1, & w_{\mathbf{y}_{i,z}}>0 \text{ and } w_{\mathbf{x}_{i,z}^l}>0\\ 0, & \text{otherwise}\end{cases}$$

Similarity Map Images



The first two pairs are of the same person and the third pair is of different persons. We have quantified the similarity map images into binary images for better visualization, where the bright area denotes that the corresponding similarity score is larger than 0.5.

Homepage

References

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