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  Latent identity variables: a generative probabilistic framework for face recognition

  Most face recognition algorithms use a "feature space" approach: feature vectors are extracted from each face and distances in feature space are compared to determine matches. In this paper we present a fundamentally different approach. We consider each image as having been generated from an underlying cause (a latent identity variable, or LIV). In recognition we evaluate the probability that two faces have the same underlying cause. Since image generation is noisy, we can never be exactly certain what this cause was, so we integrate (marginalize) over possible causes. We present example LIV learning and inference algorithms and compare to the equivalent feature-space approach. We demonstrate our approach for identification and verification tasks and argue that it has numerous advantages. We also show that it can simply be extended to tackle the hard task of comparing faces captured with different poses, lighting or expressions. Finally, we present results for the "face clustering" problem: given N face images, we estimate how many different individuals are present and which is in which image.

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