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AGE INVARIANT FACE RECOGNITION USING CONVOLUTIONAL NEURAL NETWORKS AND SET DISTANCES

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Description

Time lapse affects the reliability and security of biometric face recognition systems. Face Authentication is affected by covariates such as aging and demographics. This invention improves performance despite such varying factors. Existing methods for face recognition can be divided in two groups: generative (rely on statistical models to predict the appearance of faces at different ages) and discriminative (avoid creating models for face aging using direct demarcation). Our method combines aspects from both generative and discriminative methods through the medium of transfer learning. We evaluate the accuracy of automatic facial verification for subjects belonging to varying age, ethnicity, and gender categories. The method proposed yields better performance on individual demographics compared to a commercial face recognition engine.

Problem Addressed

We provide systems and methods for facial recognition that use deep-learning and convolutional neural networks (CNN) for automatic feature extraction for robust face recognition across time lapse. A CNN architecture using the VGG-Face deep (neural network) learning is found to produce highly discriminative and interoperable features that are robust to aging variations even across a mix of biometric datasets. The features extracted by this method show high inter-class and low intra-class variability leading to low generalization errors on aging datasets using ensembles of subspace discriminant classifiers. The biometric methods proposed for authentication are competitive with "state of the art" methods. They are richer in functionality and interoperability than existing methods, and can handles mixed biometric datasets such as FG-NET and MORPH.

Advantages

- This methodology is holistic where the face image is considered as a single component rather than a collection of semantically separate parts, e.g. eyes, nose, mouth etc.
- Age-invariant methods can further reduce the overall operational cost of biometric security systems by minimizing the need for re-enrollments due to time lapse.

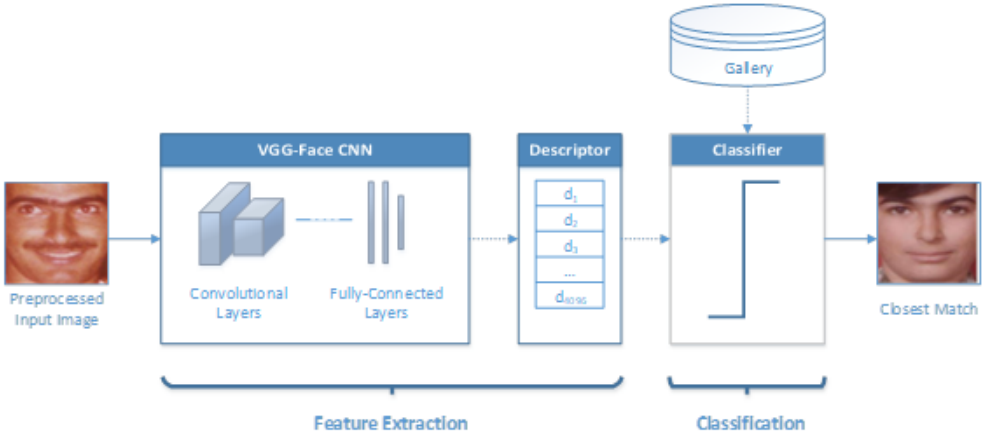

Figure One: Authentication architecture using VGG-Face CNN feature descriptors.

Recent Publicablications

- El Khiyari, H. and Wechsler, H. (2016) Face Recognition across Time Lapse Using Convolutional Neural Networks. Journal of Information Security, 7, 141-151. http://dx.doi.org/10.4236/jis.2016.73010

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