

1: Age and Gender Recognition Using Informative Features of Various Types

by *Ehsan Fazl-Ersi, M. Esmaeel Mousa-Pasandi, Robert Laganière*

(5 Pages)

This study done in 2014 suggests integrating multiple descriptors to identify age and gender, as opposed to previous methods which focused on one only. They showed that their method results in superior accuracy as compared to those previous methods.

The Method

They relied on three descriptors, Local Binary Pattern (LBP), Scalar Invariant Feature Transform (SIFT), and Color Histograms (CH). Each one of these descriptors analyzes a different aspect of the images, shape, texture, and color respectively. They used SVMs with three RBF kernels, one for each descriptor, for their model. Since, our team will build a CNN instead, that part is not useful to our research. They select the most impactful and non-overlapping features using Ullman's feature selection method, which focuses on feature response vector elimination. The previous work that they will compare their results to relied on Principle Component Analysis (PCA) for feature extraction and LBPs for their descriptor.

The Dataset

They opted not to use a controlled dataset and instead trained and tested their model on Gallagher's natural environment images since their aim was to help the development of real world applications. The dataset contains about 28,000 labelled faces from Flickr. They split the set using a five fold method proposed by Dago-Casas et al, aiming to have an average number of males/females and age group in each fold. One fold is used for testing and four for training. They also reduced the number of frequently appearing age groups to make all age group appearances even.

The Results

The accuracy of the resultant model was about 5% higher (for gender recognition) yielding a result of almost 92% when using all three descriptors as opposed to models from previous work. However, age recognition still proved to be an issue with accuracy of only 63%.

2: Comparison of Recent Machine Learning Techniques for Gender Recognition from Facial Images

by *Jospeh Lemley, Sami Abdul-Wahed, Dipayan Banik, Razvan Andonie*

(6 pages)

This study is about different strategies for tackling the problem of gender recognition. They experimented with various methodologies for feature extraction and classification. And ended with a comparison of the results. They focused on the accuracy of the models as the main measure of performance.

The Method

They used two classification methods, SVMs and CNNs, and three feature extraction methods, Principle Component Analysis (PCA), Histogram of Gradients (HOG), and Dual Tree Complex Wavelet Transform (DTCWT). They used the scikit-learn SVM library for the implementation, and tested the SVMs with unfiltered pixels and all three features extraction techniques. For the CNN, they designed three hidden layers connected to a softmax layer as the output. All three layers are rectified linear convolutional layers with:

- 4x4 kernel for the first and second, and a 3x3 for the third.
- 2x2 pool shape and stride for all.
- 128, 256, 512 output channels respectively.
- Randomized initial weights varying by 0.5

The Dataset

They trained and tested their models on two different datasets, one containing images with optimal scenarios (FERET), while the other has images with different levels of lightning, angles, etc. (Adience). They had two different experiment result sets, employing the strategies mentioned above, one on each dataset. For each experiment, they used 70% for training, repeating each experiment at least ten times.

The Results

Comparing all these results, CNNs proved to be the optimal solution, yielding the highest accuracy on both sets out of all the tested ways of classification. The average accuracy on the FERET set for the CNN was 96% while the closest was DTCWT on an SVM (90%). While for the Adience set the CNNs outperformed the competition by about 20%. A comment made on why that might be the case is that CNNs shine when datasets grow larger. And since today's public image datasets are huge, our team decided to go with them.