

## Accepted Manuscript

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PII: S0262-8856(16)30186-X  
DOI: doi:[10.1016/j.imavis.2016.10.004](https://doi.org/10.1016/j.imavis.2016.10.004)  
Reference: IMAVIS 3557

To appear in: *Image and Vision Computing*

Received date: 1 August 2015  
Revised date: 22 June 2016  
Accepted date: 18 October 2016



Please cite this article as: M. Castrillón-Santana, J. Lorenzo-Navarro, E. Ramón-Balmaseda, Descriptors and regions of interest fusion for in- and cross-database gender classification in the wild, *Image and Vision Computing* (2016), doi:[10.1016/j.imavis.2016.10.004](https://doi.org/10.1016/j.imavis.2016.10.004)

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# Descriptors and regions of interest fusion for in- and cross-database gender classification in the wild

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## Abstract

Gender classification (GC) has achieved high accuracy in different experimental evaluations based mostly on inner facial details. However, these results do not generalize well in unrestricted datasets and particularly in cross-database experiments, where the performance drops drastically. In this paper, we analyze the state-of-the-art GC accuracy on three large datasets: MORPH, LFW and GROUPS. We discuss their respective difficulties and bias, concluding that the most challenging and wildest complexity is present in GROUPS. This dataset covers hard conditions such as low resolution imagery and cluttered background. Firstly, we analyze in depth the performance of different descriptors extracted from the face and its local context on this dataset. Selecting the bests and studying their most suitable combination allows us to design a solution that beats any previously published results for GROUPS with the Dago's protocol, reaching an accuracy over 94.2%, reducing the gap with other simpler datasets. The chosen solution based on local descriptors is later evaluated in a cross-database scenario with the three mentioned datasets, and full dataset 5-fold cross validation. The achieved results are compared with a Convolutional Neural Network approach, achieving rather similar marks. Finally, a solution is proposed combining both focuses, exhibiting great complementarity, boosting GC performance to beat previously published results in GC both cross-database, and full in-database evaluations.

*Keywords:* Gender classification, local descriptors, HOG, LBP, LSP, LOSIB, information fusion, face local context, cross-database, CNN

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