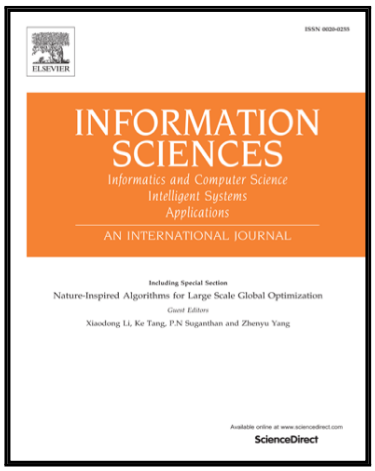


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# Face Recognition with A Small Occluded Training Set Using Spatial and Statistical Pooling

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**Abstract**

Occlusion is one of the most intractable problems for face recognition. *Double-occlusion problem* is an extremely challenging case that the occlusion can occur in both of training and test images. Existing robust face recognition approaches against occlusion rely on large-scale training data, which can be expensive or impossible to obtain in many realistic scenarios. In this paper, we aim to address the double-occlusion problem with a limited amount of training data using a unified framework named *subclass pooling*. A face image is divided into ordered subclasses according to their spatial locations. We propose a *fuzzy max-pooling* scheme to suppress unreliable local features from occluded regions. The final average-pooling can enhance the robustness by automatically weighting on each subclass. Our method is evaluated on two face recognition benchmarks. Experimental results suggest that our method leads to a remarkable margin of performance gain over the benchmark techniques.

*Keywords:* Pooling, Face Recognition, Occlusion, Insufficient training data

## 1. Introduction

Face recognition has a wide range of real-world applications, and has been widely studied since mid-1990s [30, 1, 14, 15, 35, 33]. With the advances of computer vision and machine learning techniques, the robustness

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