



# A Unified Framework for Probabilistic Component Analysis

Stefanos Zafeiriou, Mihalis A. Nicolaou, Maja Pantic

(Submitted on 13 Mar 2013)

In this paper, we present a unifying framework which reduces the construction of probabilistic component analysis techniques to a mere selection of the latent neighbourhood via the prior, thus providing an elegant and principled framework for creating novel component analysis models. Under our framework, we unify many very popular and well-studied component analysis algorithms, such as Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Locality Preserving Projections (LPP) and Slow Feature Analysis (SFA). We firstly show that the projection directions produced by all the aforementioned methods are also produced by the Maximum Likelihood (ML) solution of a single joint probability density function (PDF) just by choosing an appropriate prior over the latent space in our framework. Subsequently, we propose novel Expectation Maximization (EM) algorithms utilising the proposed joint PDF. Theoretical analysis and experiments show the usefulness of the proposed framework.

Subjects: **Learning (cs.LG)**; Computer Vision and Pattern Recognition (cs.CV); Machine Learning (stat.ML)

Cite as: **arXiv:1303.3240 [cs.LG]**  
(or **arXiv:1303.3240v1 [cs.LG]** for this version)

## Submission history

From: Mihalis A. Nicolaou [[view email](#)]  
[v1] Wed, 13 Mar 2013 18:18:14 GMT (2056kb,D)

*[Which authors of this paper are endorsers?](#)*

## Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

cs.LG

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1303](#)

Change to browse by:

cs

[cs.CV](#)

stat

[stat.ML](#)

## References & Citations

- [NASA ADS](#)

## DBLP - CS Bibliography

[listing](#) | [bibtex](#)

[Stefanos Zafeiriou](#)

[Mihalis A. Nicolaou](#)

[Maja Pantic](#)

## Bookmark (what is this?)

