World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:8, No:09, 2014

Sparse Principal Component Analysis: A Least Squares Approximation Approach

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Abstract : Sparse Principal Components Analysis aims to find principal components with few non-zero loadings. We derive such sparse solutions by adding a genuine sparsity requirement to the original Principal Components Analysis (PCA) objective function. This approach differs from others because it preserves PCA's original optimality: uncorrelatedness of the components and least squares approximation of the data. To identify the best subset of non-zero loadings we propose a branch-and-bound search and an iterative elimination algorithm. This last algorithm finds sparse solutions with large loadings and can be run without specifying the cardinality of the loadings and the number of components to compute in advance. We give thorough comparisons with the existing sparse PCA methods and several examples on real datasets.

Keywords : SPCA, uncorrelated components, branch-and-bound, backward elimination
Conference Title : ICMCSSE 2014 : International Conference on Mathematical, Computational and Statistical Sciences and Engineering
Conference Location : Rome, Italy
Conference Dates : September 18-19, 2014