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Comparative evaluation of the mutual information class of ICA with other classes: A case study on denoising EEG

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Statement of the Problem: Independent component analysis (ICA) is a popular blind source separation (BSS) technique that has proven to be promising for the analysis of electroencephalography (EEG) data. A number of ICA approaches have been used for EEG data analysis, and even more ICA algorithms exist, however, the impact of using different algorithms on the results is largely unexplored. The purpose of this study is to examine the performance of different classes of algorithms when they are applied to EEG data.

Methodology & Theoretical Orientation: Four major classes of algorithms for spatial ICA were examined. They were information maximization, maximization of non-Gaussianity, joint diagonalization of cross-cumulant matrices, and second-order correlation based methods. Each algorithm performance was evaluated using several analysis techniques.

Findings: The results showed that the ICA algorithms using mutual information estimation proved to have better performance at separating signals.

Conclusion & Significance: This research supports the claims made by researchers that algorithms using mutual information estimators produced more accurate ICA algorithms. With this information, it is recommended that for creation of any new algorithms which has great separation performance it should use a mutual information based estimator.

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