Independent subspace analysis and extraction

Dr. Fabian Theis 05/06/2009
(Computational Modeling in Biology, Institute of Bioinformatics and Systems Biology, Helmholtz Zentrum Munich)

The increasingly popular independent component analysis (ICA) may only be applied to data following the generative ICA model in order to guarantee algorithm-independent and theoretically valid results. Subspace ICA models generalize the assumption of component independence to independence between groups of components. They are attractive candidates for dimensionality reduction methods, however are currently limited by the assumption of equal group sizes or less general semi-parametric models. By introducing the concept of irreducible independent subspaces or components, we present a generalization to a parameter-free mixture model, and prove separability. More generally, we ask how to identify and extract subspaces in data based on statistical properties such as non-Gaussianity or signal color (autocorrelations).

In the first part of my talk, I will review some matrix factorization techniques and results with a focus towards ICA. Then I will focus on subspace extraction for dimension reduction and finally for independent subspace analysis itself.