EM-algorithm for the multilinear normal distribution

Some recent papers consider estimation of a covariance matrix with Kronecker structure of higher order. Singull et al. (2012) and Manceur and Dutilleul (2013) extend the estimation procedure for the matrix normal distribution to the multilinear normal distribution of order three and Ohlson et al. (2013) consider the case of higher order tensors of order $k$. For the multilinear normal distribution of order $k$, the covariance matrix for a vectorization of the tensor is given by a Kronecker product of $k$ positive definite covariance matrices. The likelihood equations for the multilinear normal distribution are nested, for which no explicit solution exists, hence one can use the so called flip-flop algorithm to find a solution to the $k$ likelihood equations. We will derive a novel expectation maximization (EM) algorithm to compute maximum likelihood estimates in models involving the multilinear normal distribution. It is of great interest to understand the differences and similarities between the flip-flop algorithm and the EM algorithm and also to compare the performance of the two algorithms.

References

