

# NONPARAMETRIC SPECTRAL-BASED ESTIMATION OF LATENT STRUCTURES

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## Abstract

We present a constructive identification proof of  $p$ -linear decompositions of  $q$ -way arrays. The analysis is based on the joint spectral decomposition of a set of matrices. It has applications in the analysis of a variety of latent-structure models, such as  $q$ -variate mixtures of  $p$  distributions. The identification argument suggests a joint approximate-diagonalization estimator whose asymptotic properties we derive. As an application we present a nonparametric series estimator of a finite mixture of continuous densities. We show that the conditional densities can be estimated at the conventional univariate rates. The mixing proportions are estimable at the usual parametric rate. Numerical illustrations explore the finite-sample performance of this method.

*Keywords:* identification, joint diagonalization, latent structure, mixture model, non-parametric estimation, non-orthogonal basis.