

# Semiparametric Analysis in Conditionally Independent Multivariate Mixture Models

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## Abstract

The conditional independence assumption is commonly used in multivariate mixture models in behavioral research. This assumption postulates the independence of the repeated measurements within an observation, given the status of the observation's component membership. In this paper, the component distributions in a multivariate mixture model are fitted using an exponential tilt model, in which the log ratio of the density functions of the components is modeled as a quadratic function in the observations. There are a number of advantages in this approach. First, it does not require training samples. Second, except for the exponential tilt assumption, the marginal distributions of the observations can be completely arbitrary. Third, unlike previous methods, which require the multivariate data to be discrete or require the data to be discretized, modelling can be performed based on the original data. Simulations showed that the proposed model performs very well. The method is applied to a dataset from a reaction time task that is commonly used in developmental psychology research.

Key words: Biased sampling, exponential tilting, empirical likelihood, multivariate mixture