

Additive Nonlinear Factor Analysis

by

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ABSTRACT

Analysis of multivariate data with possible nonlinear structure is considered. The analysis is based on a model which is an extension of the factor analysis model. An additive nonlinear factor analysis model assumes that observed variables are, except for errors, linear combinations of given nonlinear functions of unobservable underlying factors. For example, any polynomial factor analysis model is a special case. Such an analysis allows fitting of a complex model without increasing the number of factors suggested by the subject-matter theory, and is useful for exploration and representation of underlying nonlinear structure in multivariate data. The model and associated identification problem are discussed. A procedure for model fitting and parameter estimation is introduced. A test procedure for assessing the fit of a model is also introduced. The procedures do not require strong assumptions on the distributional form of the underlying factors and errors. Asymptotic properties of the procedures are derived using the large-sample small-error theory. A simulation study is also presented.