

# Joint modeling of multivariate continuous and time-to-event data

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**Abstract:** We propose a joint modeling approach to jointly analyze multivariate continuous and time-to-event data. The proposed model is composed of three parts. The first part is an exploratory factor analysis model that summarizes latent factors through multivariate continuous observed variables. The second part is a proportional hazards model that examines the observed and latent risk factors of multivariate time-to-event outcomes. The third part is a linear regression model that investigates the determinants of a continuous outcome. We develop a full Bayesian approach coupled with efficient MCMC methods to determine the number of latent factors, the association between latent and observed variables, and the important risk factors of different types of outcomes. A modified stochastic search item selection algorithm that introduces normal-mixture-inverse gamma priors to factor loadings and regression coefficients is developed for simultaneous model selection and parameter estimation. The proposed method is subjected to simulation studies for empirical performance assessment and then applied to a study concerning the risk factors of type 2 diabetes and the associated complications.