# Latent variable models for a Bayesian analysis of multivariate longitudinal categorical responses

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A Bayesian latent vector autoregressive model is proposed to analyze multivariate longitudinal data of binary and ordinal variables (items) as a function of a small number of continuous latent variables. Focus is here on the evolution of the latent variables while taking into account the correlation structure of the responses. First, we consider the case of regular time intervals. We generalized the existing models assuming local independence (given the latent variables, the responses are assumed mutually independent cross-sectionally and longitudinally) to local dependence by assuming local independence given random effects. A simulation study shows that wrongly assuming local independence may give biased estimates for the regression coefficients of the latent vector autoregressive process as well as the item-specific parameters. For irregular time intervals, we propose a Bayesian latent Ornstein-Uhlenbeck model for the latent variables to overcome the limitation of equidistant time points. We show that assuming real eigenvalues for the drift matrix of the OU process, as is frequently done in practice, can lead to biased estimates and/or misleading inference when the true process is oscillating. In contrast, our proposal allows for both real and complex eigenvalues. We illustrate our proposed model with two motivating datasets. The BelRAI dataset was obtained from a registry on the elderly population in Belgium. We were interested in predictive relationships between oral health and general health status. The ALS dataset contains patients with amyotrophic lateral sclerosis disease. We were interested in how bulbar, cervical, and lumbar functions evolve over time.

**References**


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- T.D. Tran, E. Lesaffre, G. Verbeke, and J. Duyck (2020) Latent Ornstein-Uhlenbeck models for a Bayesian analysis of multivariate longitudinal categorical responses. Accepted in Biometrics