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Linear Mixed Models with Mixed-Distribution Random Effects

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Abstract

This paper introduces an extension to the standard Linear Mixed Model (LMM) framework by incorporating random effects that follow a mixture of continuous and discrete distributions. While traditional LMMs rely heavily on the assumption of normality for all random components (Laird & Ware, 1982; Pinheiro & Bates, 2006), this constraint often fails to capture the layered heterogeneity found in modern economic, health, and social science datasets (Abowd et al., 1999; Zeldow & Hatfield, 2021). Our proposed model accounts for individual-level variation and structural discontinuities attributable to latent categorical factors (Bonhomme & Sauder, 2011). By relaxing the restrictive Gaussianity assumption, the framework addresses recent methodological calls for more realistic representations of complex data-generating processes (Andrews et al., 2021). We evaluate the proposed model through numerical simulations. It may be seen that it improves accuracy in the presence of non-Gaussian components (Ferreira & Ferreira, 2022).

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