Notation: $Y = (Y_1, Y_2, \ldots, Y_n)^T \in \mathbb{R}^N$ and $U = (U_1, U_2, \ldots, U_q)^T \in \mathbb{R}^q$ are random vectors (response and random/mixed effects); their realizations are denoted $y = (y_1, y_2, \ldots, y_n)^T$ and $u = (u_1, u_2, \ldots, u_q)^T$; $\beta \in \mathbb{R}^p$ is the vector of fixed effects; $X \in \mathbb{R}^{n\times p}$ and $Z \in \mathbb{R}^{n\times q}$ are model matrices, where x_i^T or z_i^T denote the ith row of X or Z respectively.