An EM algorithm for fitting matrix-variate skew-normal distributions on interval-censored and missing data

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Matrix-variate normal distributions are widely used for modeling three-way data structures that frequently arise in longitudinal studies and multidimensional spatiotemporal analyses. In practice, however, such datasets often contain incomplete information, including censored values—reported only as being above or below detection limits—and missing observations. Moreover, deviations from normality, such as skewness, introduce additional challenges. To address these issues, we propose an efficient EM-type algorithm for maximum likelihood estimation under interval-censored and/or missing data within the matrix-variate skew-normal framework. The algorithm leverages closed-form expressions based on the truncated moments of multivariate skew-normal distributions, which can be efficiently evaluated using available software. Through simulation studies, we demonstrate the limitations of matrix-variate normal models when applied to non-normal data. The practical value of the proposed method is further illustrated with a real-world case study on water quality monitoring.