

Robust mixture modelling using skewed multivariate distributions with variable amounts of tailweight

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The family of location and scale mixtures of Gaussians has the ability to generate a number of flexible distributional forms. It nests as particular cases several important asymmetric distributions like the Generalised Hyperbolic distribution. The Generalised Hyperbolic distribution in turn nests many other well-known distributions such as the Normal Inverse Gaussian (NIG) whose practical relevance has been widely documented in the literature. In a multivariate setting, we propose to extend the standard location and scale mixture concept into a so called multiple scaled framework which has the advantage of allowing different tail and skewness behaviours in each dimension of the variable space with arbitrary correlation between dimensions. Estimation of the parameters is provided via an EM algorithm with a particular focus on NIG distributions. Inference is then extended to cover the case of mixtures of such multiple scaled distributions for application to clustering. Assessments on simulated and real data confirm the gain in degrees of freedom and flexibility in modelling data of varying tail behaviour and directional shape