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Weakly informative reparameterisations for location-scale mixtures

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While mixtures of Gaussian distributions have been studied for more than a century, the construction of a reference Bayesian analysis of those models remains unsolved, with a general prohibition of improper priors due to the ill-posed nature of such statistical objects. This diculty is usually bypassed by an empirical Bayes resolution . By creating a new parameterisation centred on the mean and possibly the variance of the mixture distribution itself, we manage to develop here a weakly informative prior for a wide class of mixtures with an arbitrary number of components. We demonstrate that some posterior distributions associated with this prior and a minimal sample size are proper. We provide MCMC implementations that exhibit the expected exchangeability.We only study here the univariate case, the extension to multivariate location-scale mixtures being currently under study. An R package called Ultimixt is associated with this paper.

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