A modified EM algorithm for mixture models based on Bregman divergence

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Abstract The EM algorithm is a sophisticated method for estimating statistical models with hidden variables based on the Kullback–Leibler divergence. A natural extension of the Kullback–Leibler divergence is given by a class of Bregman divergences, which in general enjoy robustness to contamination data in statistical inference. In this paper, a modification of the EM algorithm based on the Bregman divergence is proposed for estimating finite mixture models. The proposed algorithm is geometrically interpreted as a sequence of projections induced from the Bregman divergence. Since a rigorous algorithm includes a nonlinear optimization procedure, two simplification methods for reducing computational difficulty are also discussed from a geometrical viewpoint. Numerical experiments on a toy problem are carried out to confirm appropriateness of the simplifications.