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TITLE: An Affine-Invariant Bayesian Cluster Process with Split-Merge Gibbs Sampler

ABSTRACT:
We develop a clustering algorithm which does not requires knowing the number of clusters in advance. Furthermore, our clustering method is rotation-, scale- and translation-invariant coordinatewise. We call it "Affine-invariant Bayesian (AIB) process". A highly efficient split-merge Gibbs sampling algorithm is proposed. Using the Ewens sampling distribution as prior of the partition and the profile residual likelihoods of the responses under three different covariance matrix structures, we obtain inferences in the form of a posterior distribution on partitions. The proposed split-merge MCMC algorithm successfully and efficiently estimate the partition. Our experimental results indicate that the AIB process outperforms other competing methods. In addition, the proposed algorithm is irreducible and aperiodic, so that the estimate is guaranteed to converge to the posterior distribution.