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The local Dirichlet process

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Abstract As a generalization of the Dirichlet process (DP) to allow predictor dependence, we propose a local Dirichlet process (lDP). The lDP provides a prior distribution for a collection of random probability measures indexed by predictors. This is accomplished by assigning stick-breaking weights and atoms to random locations in a predictor space. The probability measure at a given predictor value is then formulated using the weights and atoms located in a neighborhood about that predictor value. This construction results in a marginal DP prior for the random measure at any specific predictor value. Dependence is induced through local sharing of random components. Theoretical properties are considered and a blocked Gibbs sampler is proposed for posterior computation in lDP mixture models. The methods are illustrated using simulated examples and an epidemiologic application.

Keywords Dependent Dirichlet process · Blocked Gibbs sampler · Mixture model · Non-parametric Bayes · Stick-breaking representation