

Gibbs Sampling with Auxiliaries

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Introduction

Neal's algorithm...

Algorithm

Implementation

Experiment/Verification

To verify our implementation of the sampler, we design a mixture of non-overlapping uniform distributions. There are a total of three clusters, each with their own center, $\theta \in \{-5, 0, 5\}$. Specifically, we let

$$\begin{aligned}\theta_i &= -5 + 5 \left\lfloor \frac{1}{30}(i-1) \right\rfloor, \text{ for } i \in [1, 90] \\ Y_i &\sim \mathcal{U}(\theta_i - 0.3, \theta_i + 0.3)\end{aligned}$$

Where the log-likelihood of a single observation y_i is given by

$$\log f(y_i; \theta_i) = \begin{cases} -\log(0.6), & y_i \in [\theta - 0.3, \theta + 0.3] \\ -\infty, & \text{otherwise} \end{cases}$$

Consequently, we define the Dirichlet Process mixture model as:

$$\begin{aligned}\mathcal{P} &\sim \text{DP}(\alpha, \mathbb{C}_0) \\ \Theta_i &| \mathcal{P} \sim \mathcal{P} \\ Y_i &| \Theta_i \sim \mathcal{U}(\Theta_i - a, \Theta_i + b)\end{aligned}$$