Theory for CDA

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Here we describe some basic theoretical properties of CDA Gibbs and M-H. We show that CDA Gibbs is ergodic, and has lower autocorrelation at stationarity than the original Gibbs sampler from which it is derived. We also show that CDA M-H is ergodic.

The autocorrelation of MCMC at stationarity can be expressed as

$$1 - \inf_{f \in L^2(\Pi)} \frac{\mathbb{E}[\mathrm{var}(\theta \mid z)]}{\mathrm{var}(\theta)},$$

where the integrals are with respect to the invariant measure Π, and

$$L_2(\Pi) = \left\{ f : \Theta \to \mathbb{R}, \int_{\theta \in \Theta} \{f(\theta)\}^2 \Pi(d\theta) < \infty \right\}$$

is the set of real-valued functions square-integrable with respect to the invariant measure.