Biostat 276 Homework 1

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Bayesian Probit Regression

In R load the package (survival) and consider the analysis of the data-set (infert). Ignoring dependence due to matching, consider a Bayesian analysis for a logistic regression model relating case status to: age, parity, education, spontaneous and induced. More precisely, assume case status y_i has density $y_i \sim_{ind} Bern(p_i), p_i = \Phi(X_i^{'}\beta)$, where $\Phi(.)$ is the standard Gaussian cdf. Consider a prior $\beta \sim N(0, 10^2(X^{'}X)^{-1})$. We are interested in $p(\beta|Y)$.

(1)

Describe and implement an adaptive Metropolis-Hastings algorithm designed to obtain a MC with stationary distribution $p(\beta|Y)$.

(2)

Describe and implement a data augmented (DA-MCMC) strategy targeting $p(\beta|Y)$.

(3)

Describe and implement a parameter expanded - data augmentation (PX-DA MCMC) algorithm targeting $p(\beta|Y)$.

(4)

Assess mixing and convergence of the chains induced by the competing transition schemes implemented in 1,2 and 3. Comment on potential trade-offs involving: coding complexity, storage and cpu time.