

CS6190: Probabilistic Modeling Homework 3 MCMC

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1.

2. Say you are given data (X, Y) , with $X \in \mathbb{R}^d$ and $Y \in \{0, 1\}$. The goal is to train a classifier that will predict an unknown class label \tilde{y} from a new data point \tilde{x} . Consider the following model:

$$Y \sim \text{Ber}\left(\frac{1}{1 + e^{-X^T \beta}}\right),$$
$$\beta \sim N(0, \sigma^2 I).$$

This is a **Bayesian logistic regression** model. Your goal is to derive and implement a Hamiltonian Monte Carlo sampler for doing Bayesian inference on β .

- (a) Write down the formula for the unnormalized posterior of $\beta|Y$, i.e.,

$$p(\beta|y; x, \sigma) \propto \prod_{i=1}^n p(y_i|\beta; x_i) p(\beta; \sigma)$$