

Stat 342 Example 23

For sake of example we consider SSS algorithms for sampling from a joint distribution for (θ_1, θ_2) with pmf given by the table below

$\theta_2 \backslash \theta_1$	1	2	3
3	.1	.1	.15
2	.05	.2	.05
1	.15	.1	.1

First a Gibbs algorithm begins at some cell in the table (θ_1^0, θ_2^0) and then alternately moves in the current row and then the current column and then the current row and then ... etc. according to the corresponding conditional dsu prescribed by row or column probabilities, e.g. starting at $(2,2) = (\theta_1^0, \theta_2^0)$ one replaces θ_1 according to probabilities

θ_1	1	2	3
probability	$\frac{.05}{.3}$	$\frac{.20}{.3}$	$\frac{.05}{.3}$

etc.

Second A M-H algorithm needs proposal dsus for moving first horizontally and then vertically in the table. One simple way to make such is to simply use uniform distributions over $\theta_1 \in \{1,2,3\}$ or $\theta_2 \in \{1,2,3\}$ regardless of one's current position in the table. Operating this way one actually has a Metropolis (rather than a M-H) algorithm. If, for example, one is at $(2,2)$ and is making a horizontal proposal, if the proposal (drawn with equal probabilities) is $(1,2)$, one moves to $(1,2)$ with probability $\frac{.05}{.2} = \frac{1}{4}$. If the proposal is $(2,2)$ one stays put, and if the proposal is $(3,2)$ one moves to $(3,2)$ with probability $\frac{.05}{.2} = \frac{1}{4}$.