

Bayesian Statistics, Assignment for Tuesday, Dec. 10

Our final subject is Gibbs sampling.

Reading

You are welcome to read Chapters 16 and 19 Donovan and Mickey, but I am certainly not expecting you to. I have chosen to learn Gibbs sampling and how it is applied from Chapters 1 and 2 of *Markov Chain Monte Carlo in Practice*, by Gilks, Richardson, and Spiegelhalter. I plan to have finished the third and last in my series of “Why Do They Work?” write-ups in time to present Gibbs sampling and hand out copies of the write-up in Tuesday’s class. If you want some reading, feel free to take an early look at the not-yet-completed version of that:

* <https://brianhill.github.io/bayesian-statistics/resources/MonteCarloMethodsWhyDoTheyWork-III.nb.pdf>

To keep you motivated, I want to remind you that we are trying to get ourselves to the point of understanding Chapter 2 of *Markov Chain Monte Carlo in Practice*, which is a case study of these methods applied to Hepatitis B vaccination.

For Problem Set 18 — Illustrating Gibbs Sampling

Gibbs sampling only gets interesting when you have multiple independent axes in the prior and the posterior. So our iPhone sales example, which only had one axis (the quarter) isn’t going to cut it. I am therefore going to beef up the potato rock example to have two axes.

How about the first axis represents whether a nodule that comes out of the potato harvester and is destined for the kitchen is a rock or a potato, and the second axis represents whether it is small or large. Then the six p ’s would be:

$p_{\text{rock small}}$

$p_{\text{rock large}}$

$p_{\text{potato small}}$

$p_{\text{potato large}}$

These have prior probabilities (the amounts in which they occur in the field), and posterior probabilities (the amounts in which they occur in what the potato harvester sends to the kitchen).

Let's introduce the idea of "presentable potatoes." The hungry village has suddenly gotten fussy about esthetics and they will only serve and eat the presentable ones. A nodule is only presentable if it is a potato and if it is large.

THIS IS A WORK IN PROGRESS STILL