

Quick Recap on the Posterior

Bayesian Data Analysis

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Reminders about the Posterior

- The posterior distribution encapsulates everything that we know, by combining
 - what we knew (or maybe just believed) ahead of time—that is, the prior
 - with the likelihood from the new evidence (and implicitly, the model).

- With the posterior, we can readily answer a questions like
 - “what is the probability that $\theta > 0$?” or
 - “what is the probability that $0 < \theta < 2$?” or
 - “what is the probability that both $\theta > 0$ and $\lambda > 0$?”

- That phrase, “with the posterior” is doing a lot of work.
- With a few exceptions (like our coin-tossing examples), we cannot calculate something like the probability of $\theta > 0$ exactly.
 - The fancy way to say it is that the underlying integral $\int_0^\infty p(\theta) d\theta$ is “intractable.”

- If we had a way to draw samples of θ from the posterior distribution,
 - we could draw a bunch of samples of θ and
 - calculate the proportion of θ s that are greater than 0.
- That would give us an estimate for something like the probability that $\theta > 0$.
 - The more samples we draw, the better quality the estimate.
- (A more sophisticated approach would be to use the sample draws to estimate the density, and then make the calculation from that. This approach is above our heads and we won't mention it again.)

- To draw samples from the posterior, we rely on MCMC methods such as the Metropolis algorithm.
- Remember that the samples from the MCMC process correspond to draws from the posterior distribution if the chains converge to the posterior distribution.
 - That is, the MCMC process has to work.
 - We will look more carefully at some diagnostics later this week and then again later in the semester.