Gibbs Sampler Example

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Below is a Gibbs sampler that was blogged about by Darren Wilkinson and Dirk Eddelbuettel and is mentioned in Hadley Wickham's advanced R programming book. It is useful to be familiar with this as an example of code that is relatively easy to speed up in Rcpp.

This is a Gibbs Sampler for a bivariate distribution

$$f(x, y) = kx^2 \exp(-xy^2 - y^2 + 2y - 4x)$$

where the conditional distributions are a Gamma density kernel

$$f(x \mid y) = x^2 \exp(-x(4 + y^2))$$

and a Gaussian kernel

$$f(y \mid x) = \exp(-(x + 1)(y^2 - 2y/(x + 1)))$$

.

```
Rgibbs <- function(N,thin) {
    mat <- matrix(0,ncol=2,nrow=N)
    x <- 0
    y <- 0
    for (i in 1:N) {
        for (j in 1:thin) {
            x <- rgamma(1,3,y*y+4)
            y <- rnorm(1,1/(x+1),1/sqrt(2*(x+1)))
        }
        mat[i,] <- c(x,y)
    }
    mat
}
```

In the package building practical you will build a package that contains this Gibbs sampler, and in the Rcpp part you will have the opportunity to speed this up with Rcpp. An extension exercise for the end of the class is to include an Rcpp version in your package, and compare the speed of the functions from within your package.

Links to the blog posts and book section will be made available in the solutions section of the repo at the end of the session.