

Introduction to Bayesian Data Analysis with R, UseR! 2015

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Bayesian data analysis is a powerful technique for fitting almost any model to data, and R is the tool that makes this easy. Bayesian modeling can be used both for inference and prediction, Nate Silver's successful prediction of the 2012 U.S. presidential election is a widely known example¹, but Bayesian modeling is also used in A.I. and robotics where an example of the latter would be Google's self driving car². This tutorial is a general introduction to Bayesian data analysis using R. It will cover the basics of Bayesian modeling, both the theory underpinning it and the practicalities of doing it in R. The target audience is useRs with little or no knowledge of Bayesian data analysis.

What will I learn?

The goal of the tutorial is for you to get an understanding of what Bayesian data analysis is and why it is useful. After the tutorial you should be able to run simple Bayesian analyzes in R. The tutorial is divided into two parts where each part consists of a presentation followed by a hands-on exercise session.

Part 1 will introduce Bayesian modeling from a simulation based perspective and describe the what? why? and how? of Bayesian data analysis. The following exercise session will have you implementing a simple Bayesian model from scratch and fitting this model using base R.

Part 2 will focus on R packages that facilitates specifying and fitting Bayesian models. The following exercise session will show you how to fit more complex models using the Metropolis Markov chain Monte Carlo algorithm (via the `MCMCpack` package) and Gibbs sampling (via the `rjags` packages).

What should I know? What should I bring?

The tutorial is very much *introductory* in that no prior knowledge of Bayesian data analysis, or even likelihood based statistics, is assumed. For the hands-on exercises it will be necessary for you to know your way around R and to be comfortable manipulating vectors and data frames. Make sure to bring a laptop running R with the `MCMCpack` and the `rjags` packages installed. To make sure these packages work try running the following script in an R session: <https://gist.github.com/rasmusab/a453c564f30692c63d38>

Who's holding the tutorial?

I'm Rasmus Bååth, researcher at Lund University Cognitive Science, Sweden, where I use Bayesian data analysis in my research. At last UseR! I presented the R package *Bayesian First Aid* (http://user2014.stat.ucla.edu/abstracts/talks/32_Baath.pdf) that aims at making it really easy to get started with Bayesian Data analysis in R. I blog about Bayesian statistics and R at <http://www.sumsar.net>.

If you have any questions regarding the tutorial feel free to mail me at rasmus.baath@gmail.com or ask me directly on twitter (@rabaath).

¹<http://www.statisticviews.com/details/feature/5133141/Nate-Silver-What-I-need-from-statisticians.html>

²<http://www.scientificamerican.com/article/why-bayes-rules/>