

MCMC Software

There are many software packages that handle the details of MCMC, allowing the user to focus on modeling and analysis. We have opted to use JAGS for our demonstrations in this course for several reasons:

1. JAGS is available and similar across platforms.
2. JAGS employs the popular BUGS syntax for writing models.
3. JAGS is easy to call and run from R.
4. JAGS is fast and works well with the elementary models we use in this course.

As you gain experience with JAGS and pursue your own modeling projects, you may find it convenient to move to a different software package that better fits your needs. The purpose of this document is to briefly survey some of the alternatives to help you decide which ones to try.

BUGS

BUGS stands for “Bayesian inference Using Gibbs Sampling” and includes the two pioneering packages: WinBUGS and the open-source OpenBUGS. These programs introduced the popular BUGS syntax for specifying models with their hierarchical representation. WinBUGS runs on Windows only, while OpenBUGS extends to Linux. Both come with a graphical user interface, and both can be called and run from R. From a user perspective, JAGS is very similar to BUGS.

For more information, see: <http://www.mrc-bsu.cam.ac.uk/software/bugs/>

STAN

STAN is a newer and fast-growing open-source software, developed with the goal of achieving better MCMC mixing and convergence in complicated hierarchical models. To do this, STAN employs more sophisticated MCMC algorithms such as Hamiltonian Monte Carlo. It uses similar model writing syntax to BUGS, but requires slightly more overhead code. It runs on Linux, Mac, and Windows, and can be called and run from R.

For more information, see: <http://mc-stan.org/>

NIMBLE

NIMBLE is another new software that is based on the BUGS modeling framework. NIMBLE aims to be flexible, allowing the user to select among a variety of algorithms, and even write their own algorithms/samplers. It works through R on Windows and Mac.

For more information, see: <http://r-nimble.org/>

PyMC

PyMC is a Python module to facilitate Bayesian modeling in Python directly. It is fundamentally different from the BUGS-based programs listed earlier, and employs a different syntax for model specification. Like STAN, PyMC employs sophisticated MCMC algorithms for improved mixing and convergence in complicated models.

For more information, see:

<https://pymc-devs.github.io/pymc/>

<https://pymc-devs.github.io/pymc3/>

Proc MCMC

Proc MCMC is a procedure that works exclusively within the commercial SAS statistical software. Its model specification syntax is unique, but fairly easy to learn, especially for SAS programmers.

For more information, see:

http://www.sas.com/en_us/software/analytics/stat.html

http://support.sas.com/documentation/cdl/en/statug/68162/HTML/default/viewer.htm#statug_mcmc_overview.htm