

Brief introduction to NIMBLE

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NIMBLE

NIMBLE stands for Numerical Inference of statistical Models for Bayesian and Likelihood Estimation. NIMBLE is building software for fitting general hierarchical models using a variety of fitting techniques. Hierarchical statistical models are often analyzed with computationally-intensive algorithms because of some unobserved random variables between the parameters and the data, the best known of which is Markov chain Monte Carlo (MCMC). NIMBLE is built in R but compiles your models and algorithms using C++ for speed.

It includes three components:

1. A system for using models written in the BUGS language as programmable objects in R. (The BUGS language originally appeared in WinBUGS, then in OpenBUGS and JAGS.)
2. An initial library of algorithms for BUGS models, including basic MCMC, which can be used directly or can be customized from R before being compiled and run.
3. A language, called NIMBLE, embedded in R for programming algorithms for BUGS models, both of which are compiled through C++ code and loaded into R.

Both BUGS models and NIMBLE algorithms are automatically processed into C++ code, compiled, and loaded back into R with seamless interfaces. We can use NIMBLE to analyze the data without using the NIMBLE language to write algorithms.

One of the most important concepts behind NIMBLE is to allow a combination of high-level processing in R and low-level processing in compiled C++.

- High-level processing in R (as much as possible)
 - Process BUGS language for declaring models (with some extensions)
 - Process model structure (node dependencies, conjugate relationships, etc.)
 - Generate and customize algorithm specifications
 - Generate model-specific C++ code to be compiled on the fly
 - Provide matching implementation in R for prototyping / debugging / testing
 - Some high-level algorithm control possible in R (adapting tuning parameters, monitoring convergence, high levels of iteraRon)
- Low-level processing in C++
 - Model and algorithm computations
 - "Run-time" parameters allow some modification of behavior without recompiling

To install the NIMBLE package, use the command:

```
install.packages("nimble", repos = "http://r-nimble.org", type = "source")
```

To run NIMBLE, you need:

1. R
2. The igraph R package
3. A working C++ compiler that R can use on your system. There are standard open-source C++ compilers that the R community has already made easy to install. You don't need to know anything about C++ to use NIMBLE.
4. The Eigen C++ library for linear algebra. This comes with NIMBLE, or you can use your own copy.
5. The BLAS and LAPACK numerical libraries for linear algebra. These come with R.

NIMBLE is available in RStudio, but you should turn off the option to display the Global Environment to avoid freezing.

Ref:

<http://r-nimble.org/>

<http://r-nimble.org/manuals/NimbleUserManual.pdf> :pdf Manual