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| Advanced Statistical Computing Course - Fall 2015  **Improved Sampling and Parallelization of a Sampling Importance Resampling (SIR) Procedure**  Project by Anne-Gaëlle Dosne |

**Aim**

Increase the efficiency of SIR (Sampling Importance Resampling), a method to obtain parameter uncertainty, by improving sampling and implement parallelization.

**Background**

This method was originally developed in a Bayesian context [ref] and implemented to estimate parameter uncertainty for nonlinear mixed effects models [ref]. The idea behind SIR is to sample *M* p-dimensional parameter vectors *θ* from a p-dimensional proposal distribution *hprior(θ)*, compute weights (also called importance ratios *IR*) based on the vectors’ adequacy to the data relative to their likelihood in *h(θ)*, and resample *N* vectors based on their IR. The resampled vectors form the posterior density *hpost(θ).* This procedure can be iterated a number of times, using *hpost(θ)* of one iteration as the as the input proposal for the next.

The idea is to investigate different sampling strategies for generating *M* samplesfrom the proposal distribution *hprior(θ)* and implement computation of the *IR* in parallel.

**Methods**

All work will be done in R. A very simple simulated example will be used, where *hpost(θ)* is assumed to be known. Samples will be generated from different proposals and the number of iterations (at fixed *M* and *m*) for *hpost(θ)* to be reached will be compared to evaluate the performance of the sampling strategies. The speed increase when using parallelization for IR computation will be quantified.