2. **Parallel Markov Chain Monte Carlo**

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Brief Description: Several Monte Carlo simulation algorithms are particularly suited to parallelisation. MCMC algorithms are harder to parallelise, as MCMC seems to be an intrinsically serial process. There are ways round this problem. Two papers suggesting very different approaches are

DR Greenberg, (1990), 'Parallel Simulated Annealing Techniques', *Physica*, D 42, pp293-306

A. Sohn (1995), 'Parallel N-ary Speculative Computation of Simulated Annealing', *IEEE Trans. Parallel Distrib. Syst*.,6,997-1005 and also

JS Liu, H Wang and WH Wong (2000), 'The Multiple Try Method and Local Optimisation in Metropolis sampling'*, JASA*, 95, pp121-134.

We will compare these two methods theoretically and in a simple simulation study. The 1st proposal (due to Greenberg) is fairly simple but is described for annealing. We would like to see if it is efficient for straightforward Monte Carlo simulation. The 2nd proposal is quite complicated. A student interested in programming could make a parallel implementation of one or both the schemes on a simple test problem.

This can be done in R, or in C. Some simple specimen code to get the student started can be found here

http://www.stats.ox.ac.uk/~nicholls/linkfiles/papers/basicexample.R

Prerequisite courses: BS3a or Part A *Simulation*

Type of project: Theoretical/Simulation study

Computing required? Yes.

Data available? Not applicable