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We will present recent results concerning the importance of using a reversibility check in some Markov Chain Monte Carlo algorithms based on a Metropolis Hastings procedure. More precisely, we will discuss two situations: sampling measures supported on submanifolds and Hamiltonian Monte Carlo with non-separable Hamiltonians. In both cases, the numerical procedure requires to solve an implicit problem at some point, which induces some numerical difficulty concerning the actual reversibility of the proposed move. Special care should be taken in the rejection procedure to avoid biases. These reversibility checks can be seen as generalizations of a procedure suggested by Goodman, Holmes-Cerfon and Zappa for Metropolis random walks on submanifolds.

References:

- T. Lelièvre, M. Rousset and G. Stoltz, Langevin dynamics with constraints and computation of free energy differences, *Mathematics of Computation*, 81(280), 2071-2125, (2012).
- T. Lelièvre, M. Rousset and G. Stoltz, Hybrid Monte Carlo methods for sampling probability measures on submanifolds, *Numerische Mathematik*, 143(2), 379-421, (2019).
- T. Lelièvre, G. Stoltz and W. Zhang, Multiple projection MCMC algorithms on submanifolds, to appear in *IMA Journal of Numerical Analysis*.
- T. Lelièvre, R. Santet and G. Stoltz, Unbiasing Hamiltonian Monte Carlo algorithms for a general Hamiltonian function, work in progress.

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