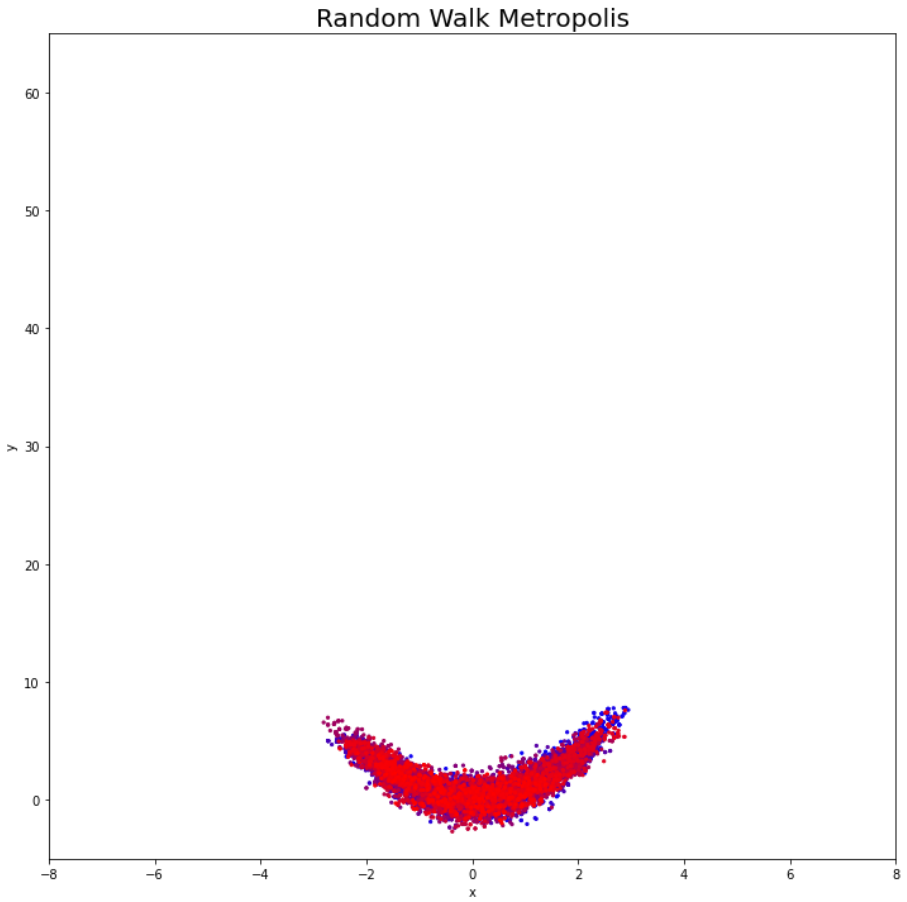
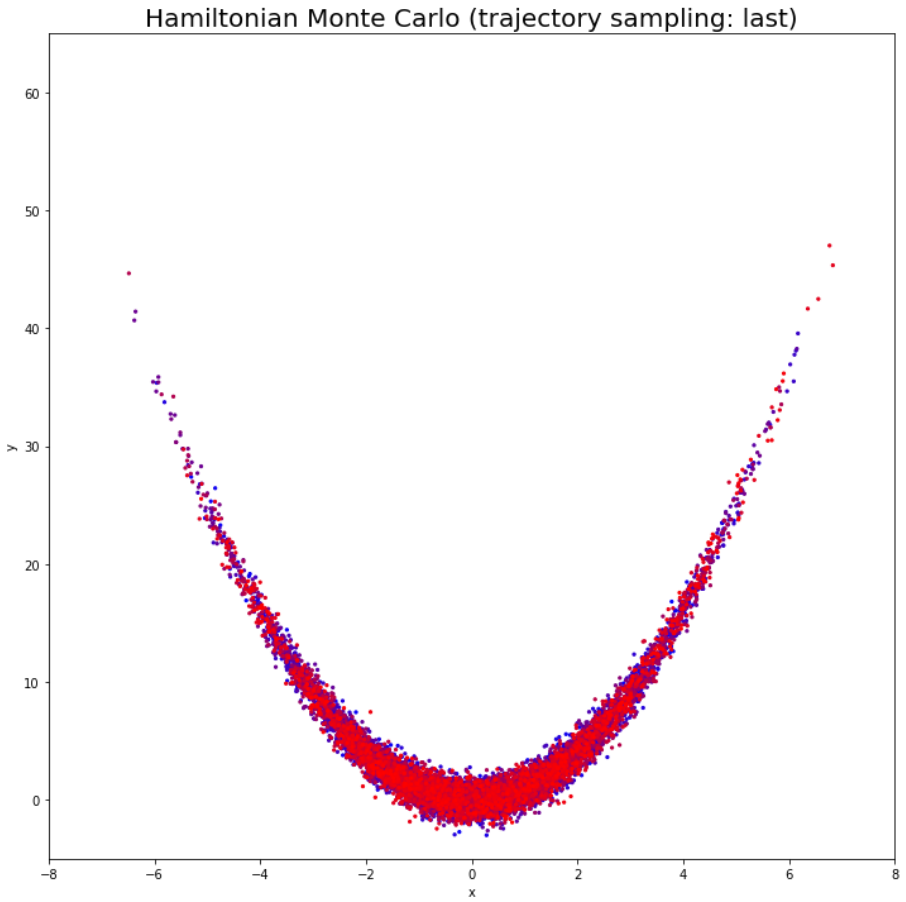
Alternative methods for trajectory sampling in HMC

Using the Rosenbrock function for testing (all with 10 000 MCMC steps):



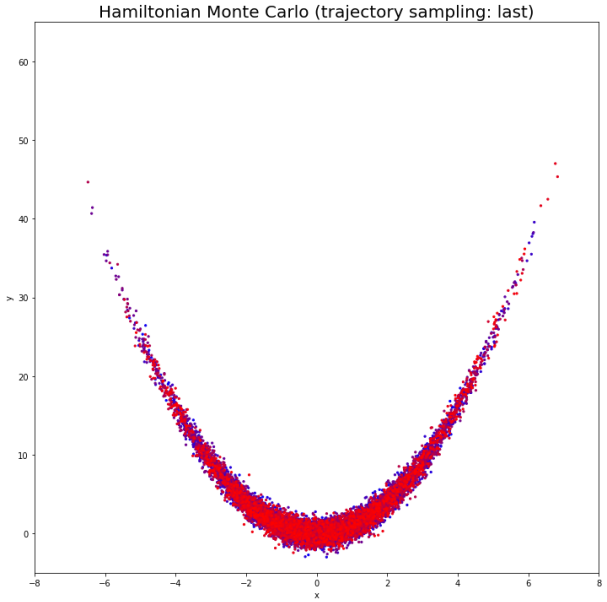
Random walk Metropolis: sigma = diag(0.15)
68% particle acceptance rate.

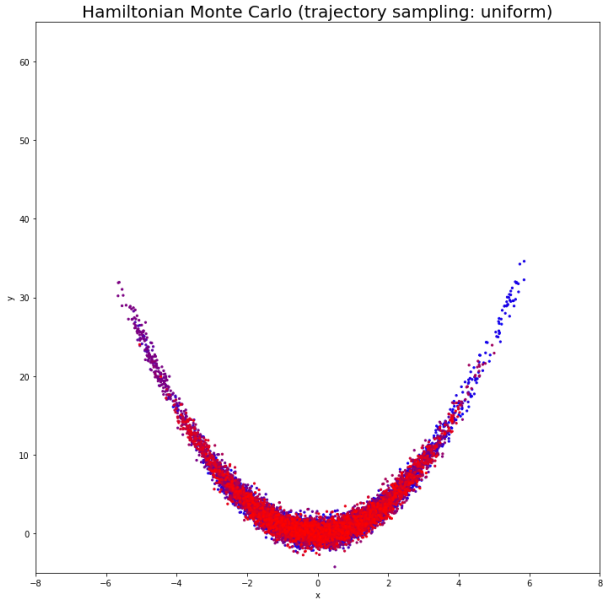


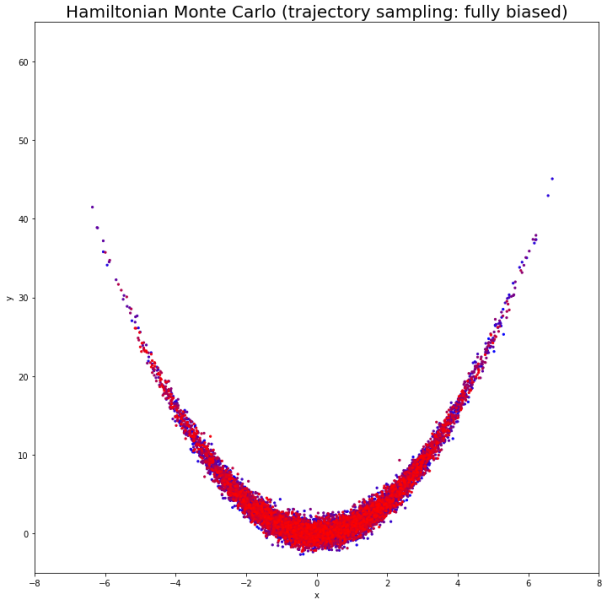
HMC: M=I, L=2^6, eta=0.10 | trajectory sampling: last
98% particle acceptance rate.

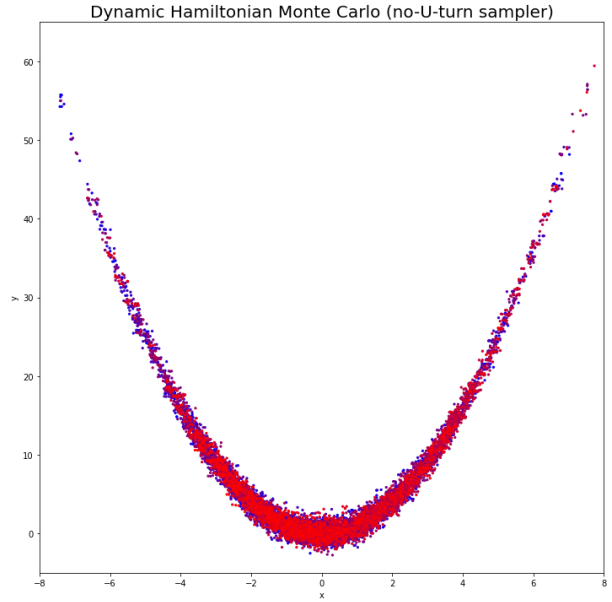
Betancourt, A Conceptual Introduction to Hamiltonian Monte Carlo, 2018

Progressive static and dynamic (no-U-turn sampler) implementations









static implementations

$L = 2^6$

dynamic implementation

$L_{avg} \approx 2^{5.4}$

(total generated; includes discarded half-trees)

expand multiplicatively while

$$\mathbb{I}[(\theta^+ - \theta^-) \cdot r^- \geq 0]\mathbb{I}[(\theta^+ - \theta^-) \cdot r^+ \geq 0$$

Betancourt, A Conceptual Introduction to Hamiltonian Monte Carlo, 2018

Hoffman et al, The No-U-Turn Sampler: Adaptively Setting Path Lengths in Hamiltonian Monte Carlo, 2011