Ergodicity of No U-Turn Samplers

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There is substantial empirical evidence about the success of dynamic implementations of Hamiltonian Monte Carlo (HMC), such as the No U-Turn Sampler (NUTS), in many challenging inference problems but theoretical results about their behavior are scarce. Our work [1] addresses this gap in the literature. We present the first ergodicity results for NUTS and prove that the NUTS variant currently implemented in major software packages is ergodic and, under regularity conditions similar to the ones existing for HMC, geometrically ergodic. In contrast to much recent work on HMC, to prove our results for NUTS we need to consider long integration times for discretized Hamiltonian dynamics, leading to significant technical challenges.

[1] On the convergence of dynamic implementations of Hamiltonian Monte Carlo and No U-Turn Samplers. Alain Durmus, Samuel Gruffaz, Miika Kailas, Eero Saksman, Matti Vihola. arXiv:2307.03460. (2023)