Hamiltonian Monte Carlo sampling for Wishart distributions with eigenvalue constraints

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Abstract

Sampling from constrained target spaces for Bayesian inference is a non-trivial problem. A recent development has been the use of Hamiltonian Monte Carlo in combination with particle re ection, see [Pakman and Paninski, 2014]. However, Hamiltonian Monte Carlo is sensitive to several hyper parameters, that need to be tuned, to ensure an ecient sampler. For this purpose, [Wang et al., 2013] suggested a black box algorithm that handles this problem. Our approach is to combine the two former ideas to solve the problem of sampling Wishart distributed matrices with eigen-value constraints. Therefore, we exploit the eigenvalue decomposition of positive de nite matrices. The suggested method performs better than the initial sampler of [Everson and Morris, 2000b] when the dimension of the target space grows. Important applications of our sampler are the normal hierarchical model of [Everson and Morris, 2000a] and the rank test in a principal component analysis as in [Choi et al., 2014].

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