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Density of States

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Although Monte Carlo calculations using Importance Sampling have matured into the most widely employed method for determining first principle results in QCD, they spectacularly fail for theories with a sign problem or for which certain rare configurations play an important role. Non-Markovian Random walks, based upon iterative refinements of the density-of-states, overcome such overlap problems. In my talk, I will review the Linear Logarithmic Relaxation (LLR) method and, in particular, focus onto ergodicity and exponential error suppression. Applications include the high-state Potts model, U(1), SU(2) and SU(3) Yang-Mills theories as well as quantum field theories with a sign problem: the Z₃ spin model and QCD at finite densities of heavy quarks.

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