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Strengths and Weaknesses of Parallel Tempering[1]

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Parallel tempering, also known as replica exchange Monte Carlo, is widely used for studying glassy systems with complex free energy landscapes. In this talk I will describe parallel tempering and then discuss its utility for systems with various free energy landscapes. For some simple model free energy landscapes the performance of parallel tempering can be analyzed and the results highlight strengths and weaknesses of the method. Parallel tempering is effective in overcoming free energy barriers but not in finding equilibrium states with small basins of attraction. The method is particularly effective when states separated by barriers have significantly different free energies. The relevance of these result for simulations of spin glasses using parallel tempering will be discussed.

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