Self-learning Monte Carlo Method and Cumulative Update

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Abstract:
Self-learning Monte Carlo (SLMC) method is a general-purpose numerical method to simulate many-body systems. SLMC can efficiently cure the critical slowing down in both bosonic and fermionic systems. Moreover, for fermionic systems, SLMC can generally reduce the computational complexity and speed up simulations even away from the critical points. For example, SLMC is more than 1000 times faster than the conventional method for the double exchange model in 8*8*8 cubic lattice. In this talk, I will give an introduction about the background, basic idea and the design principle of SLMC. Later, I will explicitly show how to use SLMC and its great accelerations in classic systems, free fermions coupled with classical spins systems, and interacting fermion systems. I will also talk about how to explicitly use advanced machine learning techniques in SLMC.