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On Constrained Annealed Bounds for Pinning and Wetting Models

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Abstract

The free energy of quenched disordered systems is bounded above by the free energy of the corresponding annealed system. This bound may be improved by applying the annealing procedure, which is just Jensen inequality, after having modified the Hamiltonian in a way that the quenched expressions are left unchanged. This procedure is often viewed as a partial annealing or as a constrained annealing, in the sense that the term that is added may be interpreted as a Lagrange multiplier on the disorder variables.
In this note we point out that, for a family of models, some of which have attracted much attention, the multipliers of the form of empirical averages of local functions cannot improve on the basic annealed bound from the viewpoint of characterizing the phase diagram. This class of multipliers is the one that is suitable for computations and it is often believed that in this class one can approximate arbitrarily well the quenched free energy. ~

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