Optimization through extra dimensions: the Ising spin glass

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Quite generally, metastability disappears as the dimension of the underlying phase space is made sufficiently large since the system acquires additional possibilities to escape from a local minimum using the extra dimensions. Here, this observation is used to solve the ground-state problem of Ising spins by mapping it onto an interacting particle system in a high-dimensional space and evolving it in a molecular dynamics simulation. It is shown that no metastability occurs in this system and the ground state of the spin model is mapped onto a particular state of the particle system.