Self-overlap as a method of stability analysis in Ising models

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The damage spreading method provides a useful tool to obtain analytical results of the thermodynamics and stability of the ($2D$) Ising model. Moreover, this method is widely used in order to analyze the evolution and stability of multistate cooperative systems (Ising models, Kauffmann networks, spin glasses, etc).

In this contribution we propose an alternative method, the so called self-overlap method (SO), that we think is numerically more efficient and analytically much simpler than the damage spreading. In order to justify this hypothesis, we tackle the $2D$ Ising model, previously studied through damage spreading. Applying markovian and mean field approximations we obtain both analytical and numerical results on the thermodynamics that agree with the expected. We also provide some analytical results on the stability of the model. We show how, despite that the main results are similar between both methods, the computational costs and the analytical command are lower and simpler in the case of self-overlap.