Title: Reconstruction of magnetic configurations using machine learning approaches

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Abstract: This work focuses on developing an autoencoder well-suited for reconstruction of magnetic phases with a prospect of future application in phase-recognition task. Specifically, it was investigated how does the autoencoder performance change when Hamiltonian term in added to the loss function, previously computed solely from MSE error. It was found that the effect Hamiltonian inclusion on MSE error is phase specific. Notably for spiral phase, the reconstruction significantly improves. In contrast, for some of the intermediate phases, the reconstruction greatly degrades. This was especially true for the intermediate phase composed of spirals combined with merons. In addition to simple MSE error, it was also investigated whether the reconstruction conserves the energy ascribed to individual spins. It was found that the Hamiltonian term improves the spin-energy conservation for all the magnetic phases.

Keywords: neural networks, autoencoder, Heisenberg model, Hamiltonian