Abstract

In this project, we have implemented a Restricted Boltzmann machine (RBM) to solve the 1D Ising model. We have shown that the RBM can be used to approximate the ground state energy of the Ising model, and that the model is capable of learning the ground state energy of the system. We have also shown that the model is sensitive to its hyperparameters, and that it is important to have a large enough sample size for the Monte-Carlo sampler to properly traverse the spin-configuration landscape. For a 12 spin-chain lattice our model found the ground state energy $E_0 = -24$, for $J = \mu = 1.0$ - with the spin-aligned ground state $\Psi = \bigotimes_i \sigma_\uparrow$ Our successful identification of the ground state of the simple 1D Ising model, as well as the more complex long-range interacting Ising model, shows that the RBM can be used to solve more complex systems, and that it is a promising tool for solving more complex systems in the future.