Generative Adversarial Network on 2-D Ising Model

2-D Ising Model: Different Approaches

- Overview: 2D Ising Model On Ferromagnetism

- Traditional Method and Limitation: Metropolis Algorithm and Mean-Field Approach

- Generative Adversarial Network: Advantages

Sampling and Tuning Methods

- GAN Architecture of Ising Model Simulator:

- Reproduce the configurations at critical temperature

- Generate REAL Configurations

- Result Comparison

- Benifits Compared

- Generative Adversarial Network: Advantages

- Next step

- Make more learning at different temperature, in order to reproduce the rz vs. T plot from Metropolis.

- Try to tune the hyperparameters in order to learn the long-range correlation between spins far from each other.

- With the ability to learn the long-range correlation, train the model to scale up the size of Ising Model.

- Configurations generated by four different models, WGAN with GP did very poorly on phase separation even with the help of rz loss. And WGAN with hinge loss and GAN with BCE loss did a pretty decent job on generating real-life configurations similar to the one above.

- Two figures on the top: without rz loss

- Figure on the right: with rz loss