Mean-field behavior for the quantum Ising model
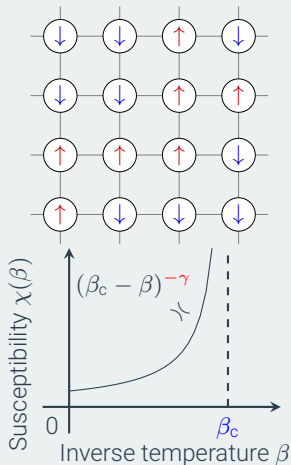
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Let Λ be a finite lattice on $\mathbb{Z}^d$.

$$\chi(\beta) := \frac{\partial}{\partial h} \mathbb{E}_{\beta, h}[\text{tensor prod.}]\Big|_{h=0}$$

Classical Ising model

We consider spin configurations $\sigma \in \{-1, +1\}^{\Lambda}$, which are r.v.'s.

$\Downarrow$ a generalization

Quantum Ising Model

We consider tensor products, e.g.,
$I \otimes \cdots \otimes S^3 \otimes S^3 \otimes \cdots \otimes I \in \bigotimes_{x \in \Lambda} \mathbb{C}^2$.

$$I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, S^3 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

Question

What is the value of γ?

For the classical Ising, $\gamma = 1$ in $d > 4$.