Hamiltonian of 2-D Heisenberg model

Bond Hamiltonian :

$$\mathcal{H}_b = -J\boldsymbol{s}_0 \cdot \boldsymbol{s}_1 \boxed{+\frac{h}{2}s_0^z - \frac{h}{2}s_1^z}$$

External magnetic field

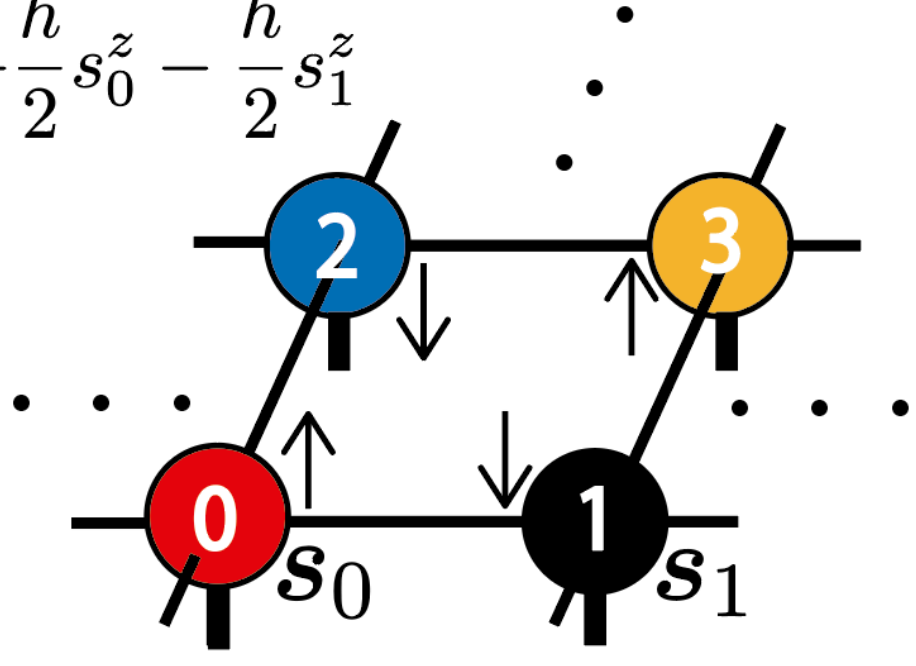
$$= -J\left[\frac{1}{2}(s_0^+ s_1^- + s_0^- s_1^+) + s_0^z s_1^z\right] + \frac{h}{2}s_0^z - \frac{h}{2}s_1^z$$

$$\langle 00|\mathcal{H}_b|00\rangle = \langle 11|\mathcal{H}_b|11\rangle = 0,$$

$$\langle 10|\mathcal{H}_b|10\rangle = \frac{J}{4} + \frac{h}{2},$$

$$\langle 01|\mathcal{H}_b|01\rangle = \frac{J}{4} - \frac{h}{2},$$

$$\langle 10|\mathcal{H}_b|01\rangle = \langle 01|\mathcal{H}_b|10\rangle = -\frac{J}{2}.$$



↑,↓ : Spin