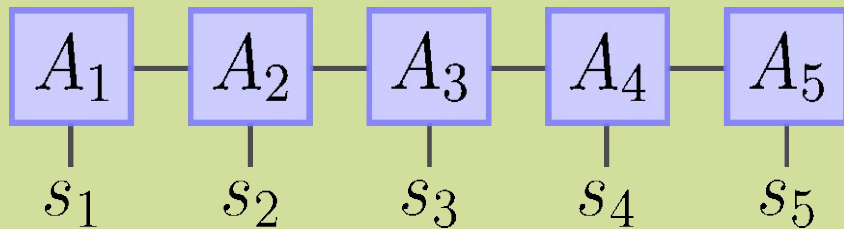


MPS: Practical Implementation

Using tensorkrowch



Qubits, Spins chains, 1D lattice, ...

We will focus on 1D systems

How does one represent states
in MPS form?

$$|0\rangle \leftrightarrow |\uparrow\rangle \leftrightarrow |\text{empty site}\rangle$$

$$|1\rangle \leftrightarrow |\downarrow\rangle \leftrightarrow |\text{occupied site}\rangle$$

Warmup: Singlet state

The singlet state is:

$$\frac{|01\rangle - |10\rangle}{\sqrt{2}}$$

How to construct the singlet state
in MPS?

The GHZ state

The GHZ state is:

$$|GHZ\rangle = \frac{|000\rangle + |111\rangle}{\sqrt{2}}$$

How to construct the GHZ state
in MPS?

W state

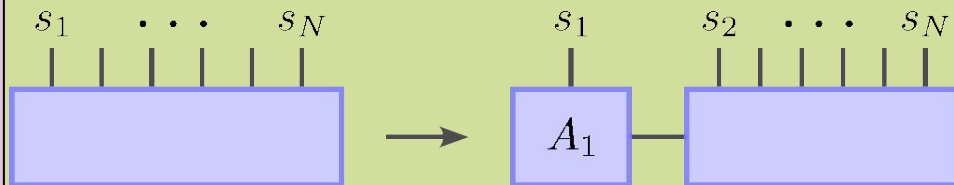
The W state is:

$$|W\rangle = \frac{|001\rangle + |010\rangle + |100\rangle}{\sqrt{3}}$$

How to construct the W state in MPS?

General state?

To obtain the MPS form of a general state, we use SVD



Dicke States

Dicke States are defined as:

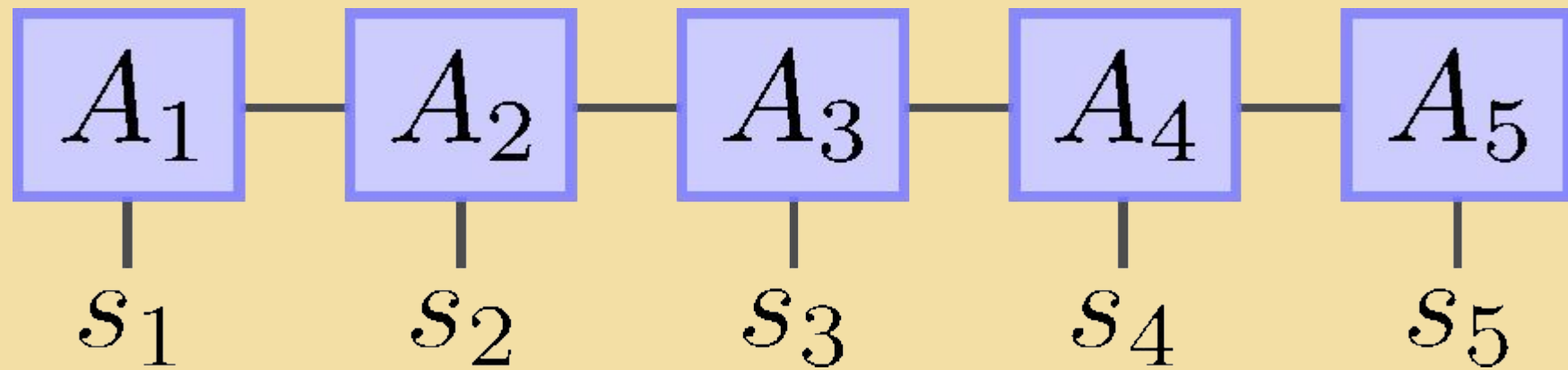
$$|D_n^{(N)}\rangle = \sum_k \mathcal{P}_k(|0\rangle^{\otimes(N-n)} \otimes |1\rangle^{\otimes n})$$

n hard-core bosons on an N-site lattice.

Dicke States

Continued ...

Thinking about $|D_2^N\rangle$



THANK YOU

