

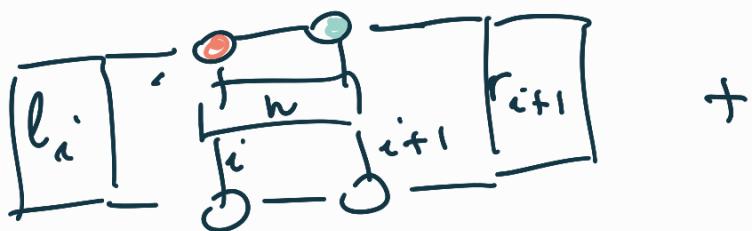
$q-q-q \dots \dots q-q$

① $\{-q_i\}$ keep in mind
first & last have
different # legs

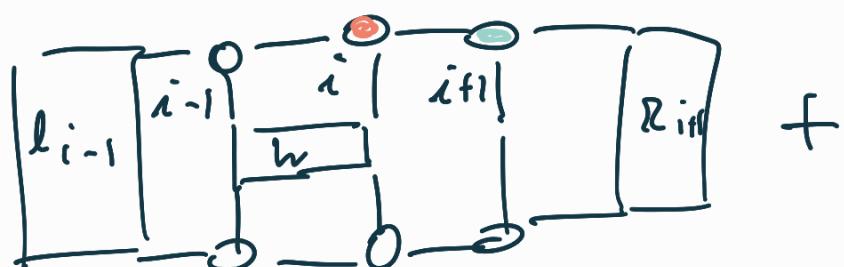
② $\{w_{i,i+1}\} = \boxed{i \quad i+1}$

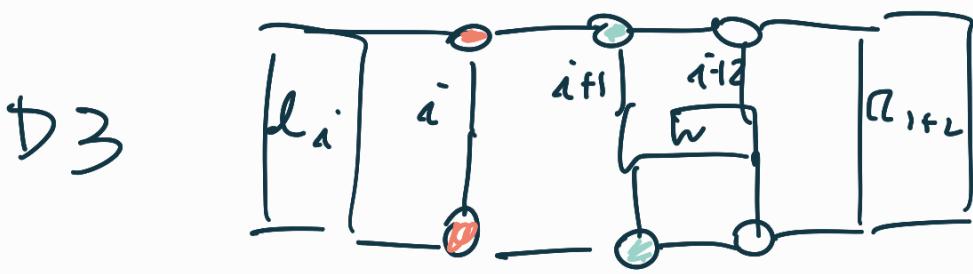
③ generic diagrams

D1



D2





(4) Provide functions to

F_1 - compute e_{i+1} starting

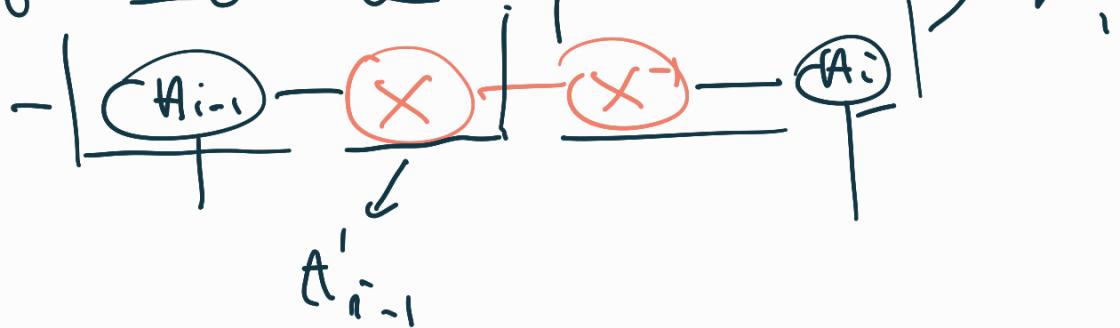
from e_i

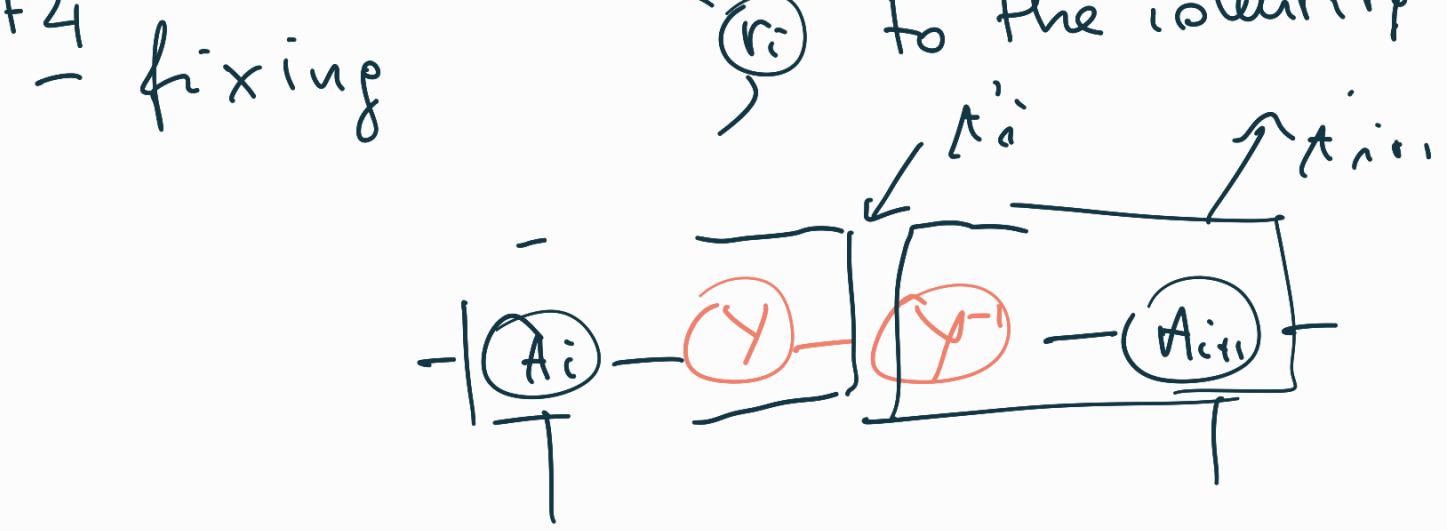
F_2 - compute r_{i-1} starting from



F_3 - fixing e_i to the identity

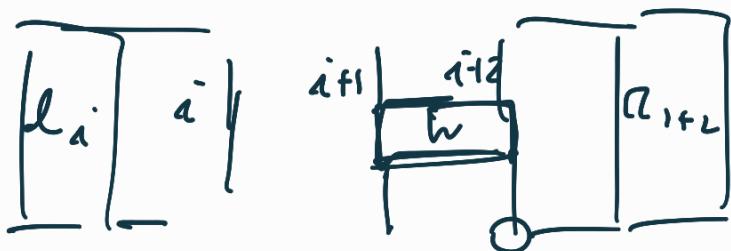
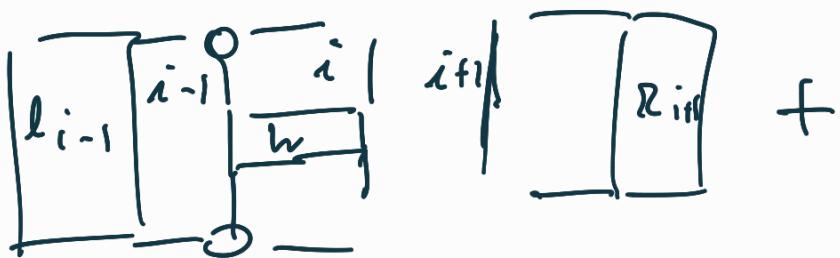
by a gauge transformation on





F3 Completing the effective

Hamiltonian left = ~~\mathcal{H}~~



F6 Solve for the smallest eigenvector
of \mathbf{h}_{eff} .

* (use sparse solver to reduce
the cost to $\mathcal{O}^3 d^2$)

F7 perform the SVD of
the largest eigenvector

$$\begin{array}{c} \text{---} \\ | \\ \text{---} \\ | \\ \text{---} \end{array} \rightarrow \begin{array}{c} \text{---} \\ | \\ \text{---} \\ | \\ \text{---} \end{array} \cdot \begin{array}{c} \text{---} \\ | \\ \text{---} \end{array}$$

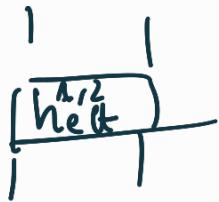
Now you are ready to write a
DMRG code

- IMPLEMENT A LEFT SWEEP

(1) start with all tensors in the
gauge where $\langle r_i \rangle = \langle \rangle$
using F4

(2) start from the leftmost
tensor and move by the

two tensors & solve for
the smallest ϵ_{ij}



of

using $F_5 \& F_6 \rightarrow$

(3) using F_7 redefine $A_1 \wedge A_2$

Notice A_1 already in the left gauge ✓

(4) move to the next left \rightarrow

& repeat from (2)

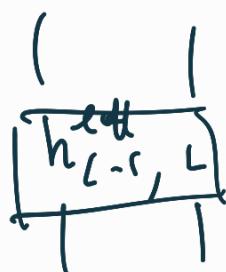
ITERATE until you reach ℓ_i (update to the correct form)
the end of the chain.

Continue with a RIGHT SWEEP

(R1) start with all tensors in
the left canonical form $\ell_i = ($

(notice this is ~~supposed~~
if coming from a left succ)

R2 start with the rightmost



& solve for

the minimum eigenvector
using F5 & F6 $\rightarrow \boxed{L^{-1}, L}$

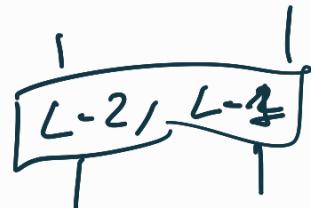
R3

Using F7 redefine A_{L-1}, A_L

R4
move

to the

next
left



& repeat from R2

After each left right sweep
 compute the energy ($\langle q | H | q \rangle$)
 (Sum all the D_1 terms) *
 stop when the energy stops decreasing.

Eg : Need to implement matrix vector mult

