

# Pattern-matching using Grover's algorithm

## Trial 0.1

Stored patterns:  $\{C\} = \{C_1, C_2, C_3, \dots\}$

$\forall_i: C_i \rightarrow \text{binary string of length } (d)$

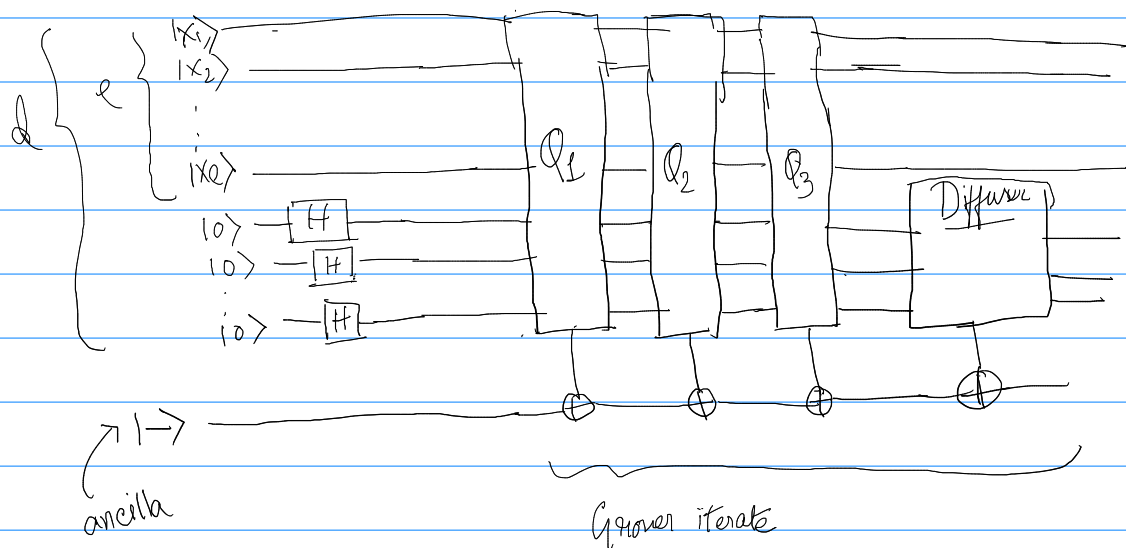
# Problem: Some part of the pattern is given and closest match for the whole pattern is to be retrieved.

say,  $|\psi_0\rangle = |x_1 x_2 x_3 \dots x_e\rangle$  ; where  $(e < d)$

# Strategy:  $|\psi_0\rangle = \underbrace{|x_1 x_2 x_3 \dots x_e\rangle}_e \underbrace{|000 \dots 0\rangle}_{d-e}$    
 unknown part of the wavefunction  $\rightarrow$  initialised all to zero  $|0\rangle$

$$|given\rangle \hat{H}^{ade} |unknown\rangle = |x_1 x_2 \dots x_e\rangle |++++ \dots +\rangle$$

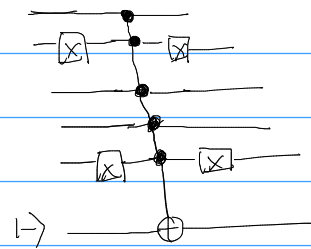
then apply Grover update rule, where the oracles correspond to the stored patterns.



# Oracle design:

$$p = \{1, 0, 1, 1, 0\}$$

equivalent  
oracle



# Action: ① the  $|unknown\rangle$  part starts in equal superposition of all states.

② Oracle conditionally flips the phase of any state that matches

③ repeated Grover iteration would amplify states in the superposition of  $|unknown\rangle$  that match either of the patterns.