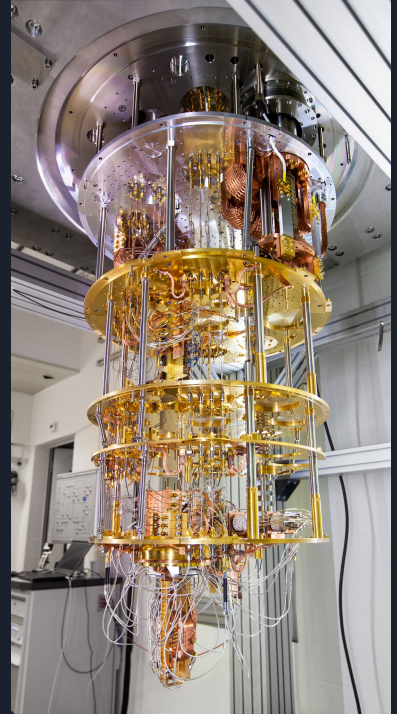


The background is a dark navy blue. In the top-left corner, there are two overlapping geometric shapes: a blue parallelogram and a light green parallelogram. In the top-right corner, there is a grey, 3D-rendered circuit board pattern. In the bottom-left, there is a circular, semi-transparent inset showing a detailed image of a microchip or circuit board. The title text is centered on the right side of the image.

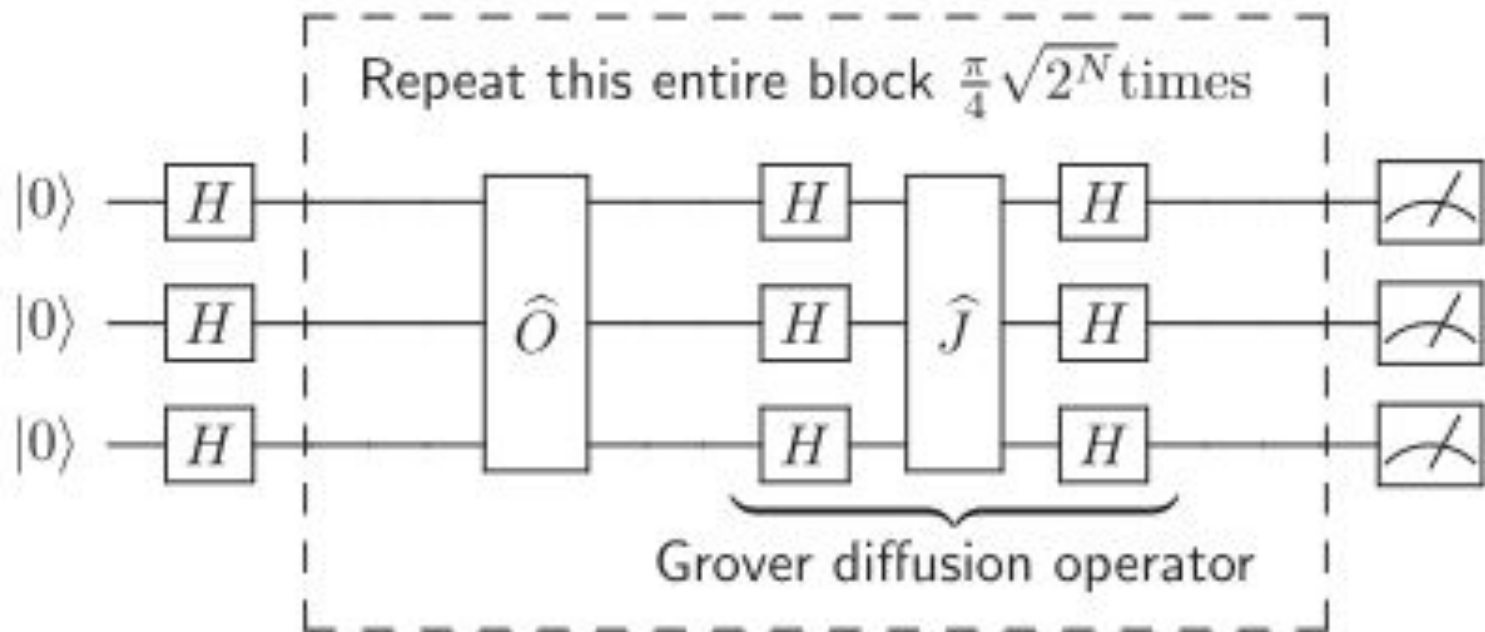
# Computação Quântica

# Motivação

- Aplicações em biologia, criptografia, química, computação gráfica e comunicações
- Algoritmos quânticos podem ter desempenho melhor que computadores clássicos em certas tarefas com fatoração de números inteiros, simulação de reações químicas e etc



# Algoritmo de Grover: circuito









## Qubits no Computador quântico

$$|\Psi\rangle = a|0\rangle + b|1\rangle = \begin{bmatrix} a \\ b \end{bmatrix} \quad a, b \in \mathbb{C}$$

$$|0\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad |1\rangle = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad \begin{aligned} p_0 &= |a|^2 \\ p_1 &= |b|^2 \\ |a|^2 + |b|^2 &= 1 \end{aligned}$$

# Portas Quânticas

Gate	Notation	Matrix
NOT ( Pauli- $X$ )		$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
Pauli- $Z$		$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$
Hadamard		$\frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$
CNOT ( Controlled NOT )		$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

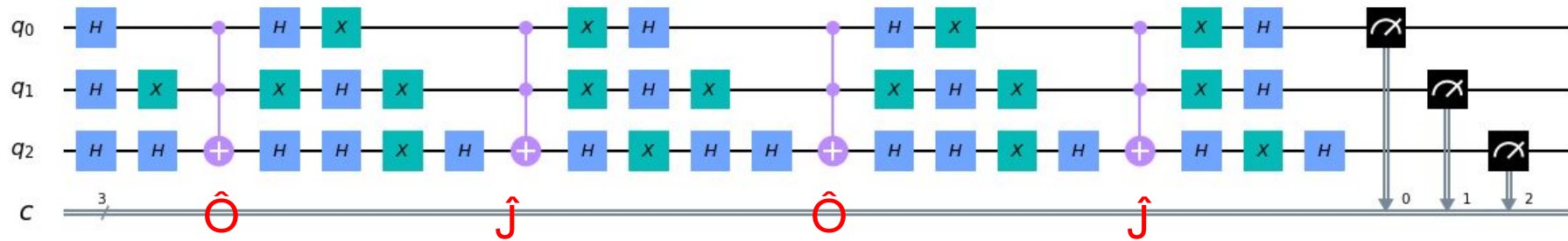


# Portas Quânticas

Exemplo:

$$H|\Psi\rangle = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \frac{1}{\sqrt{2}} \begin{bmatrix} a + b \\ a - b \end{bmatrix}$$

# Circuito Real de Grover



# Medida real de Grover

