Grover's quantum search

- Takes advantage of the **superposition** of states
- Algorithm consists in repeated application of the **Grover's operator** $U_G = U_\psi U_w$
- **Oracle** U_w: a black box that **marks** the solution with a phase

- **Quantum Grover**: $O(\sqrt{N})$

Search procedure

- Preparation of the superposition state

$$|\psi\rangle = \frac{1}{\sqrt{N}} \sum_x |x\rangle$$

- Oracle application

$$|x\rangle \xrightarrow{U_w} (-1)^{f(x)} |x\rangle$$

- Application of U_ψ

$$2 |\psi\rangle \langle\psi| - I$$

- Readout