# WHAT ARE QUANTUM COMPUTERS, AND HOW CAN WE TRAIN THEM IN PYTHON?

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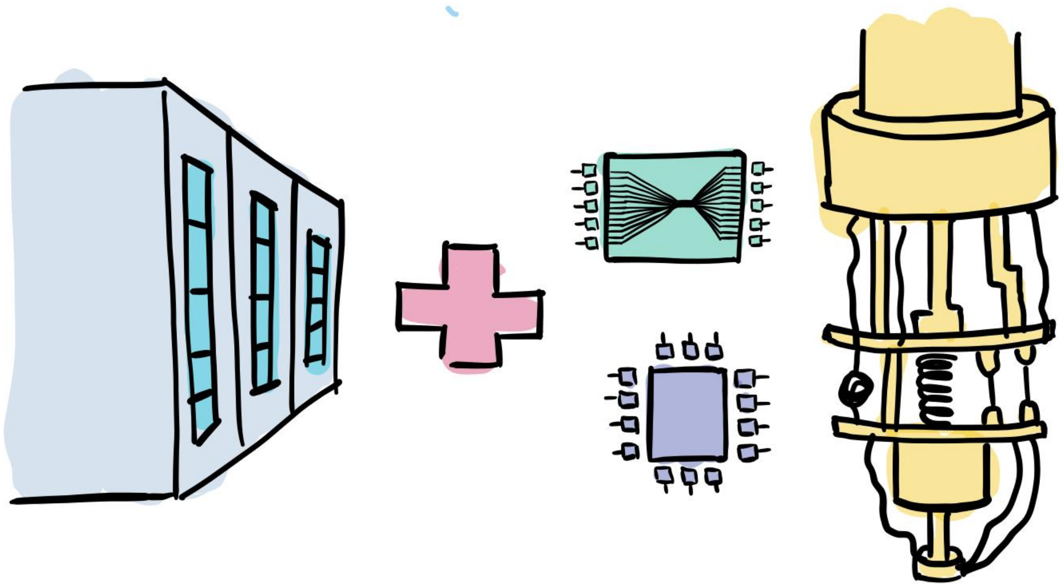
# WHAT ARE QUANTUM COMPUTERS?

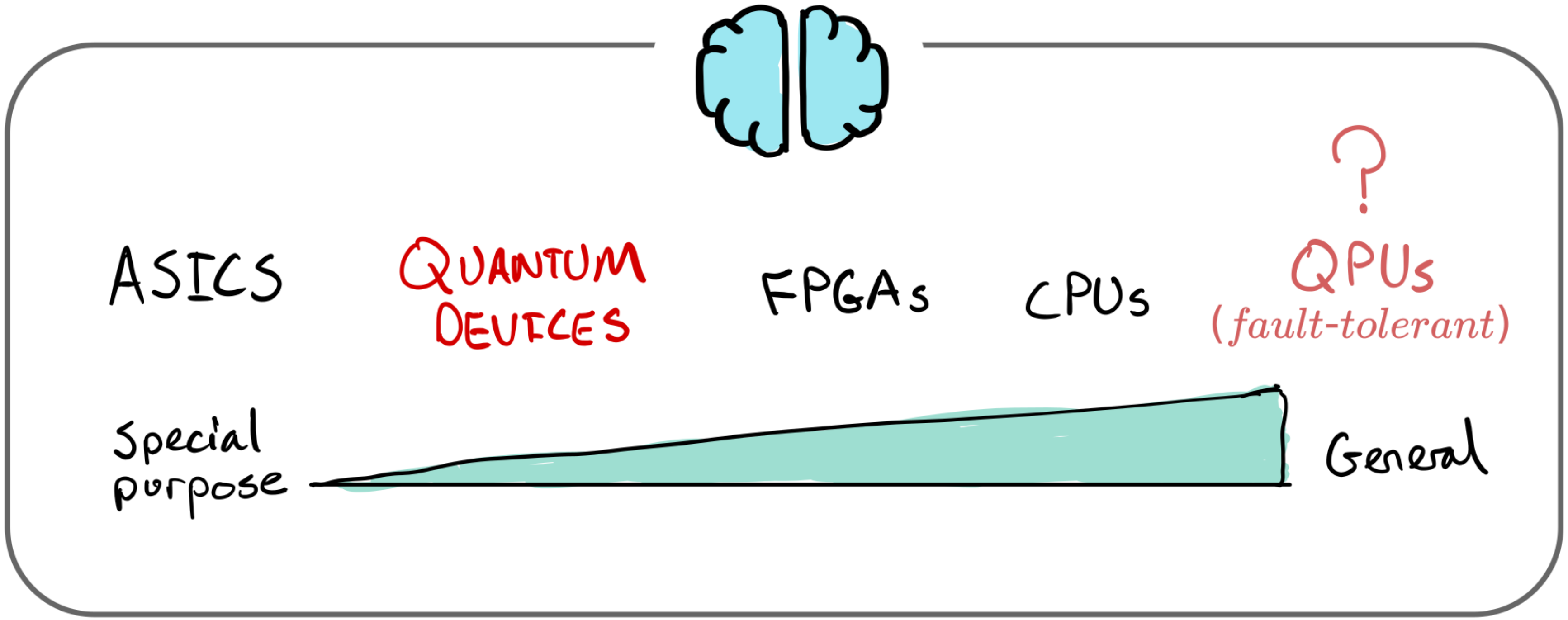
- **Programmable computers** that harness **subatomic particles** to store data and perform computation

- Quantum properties such as **entanglement** and **superposition** allow computation in a **exceptionally large computational spaces**

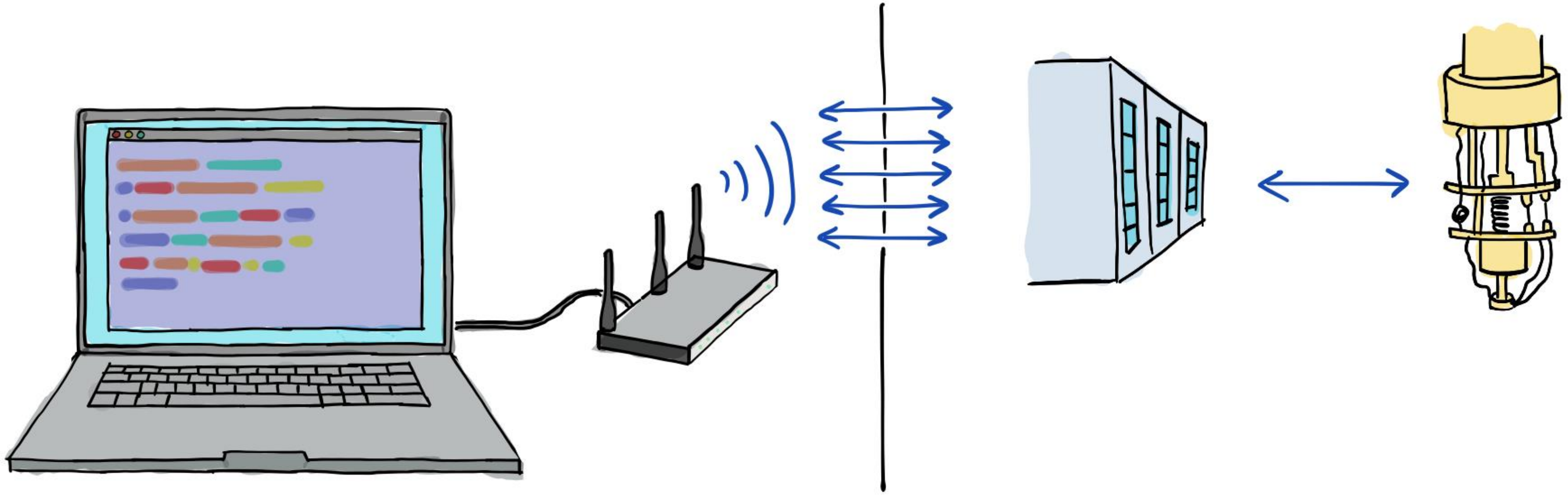
- Near-term quantum computers are **specialized devices**

- Near-term quantum computers are **small** and **noisy**






- Think of near-term quantum devices as black boxes
- They perform matrix-multiplication in exponentially large vector spaces
- We extract *classical* data from the black box via measurement statistics



PENNYLANE

Qiskit

Amazon Braket

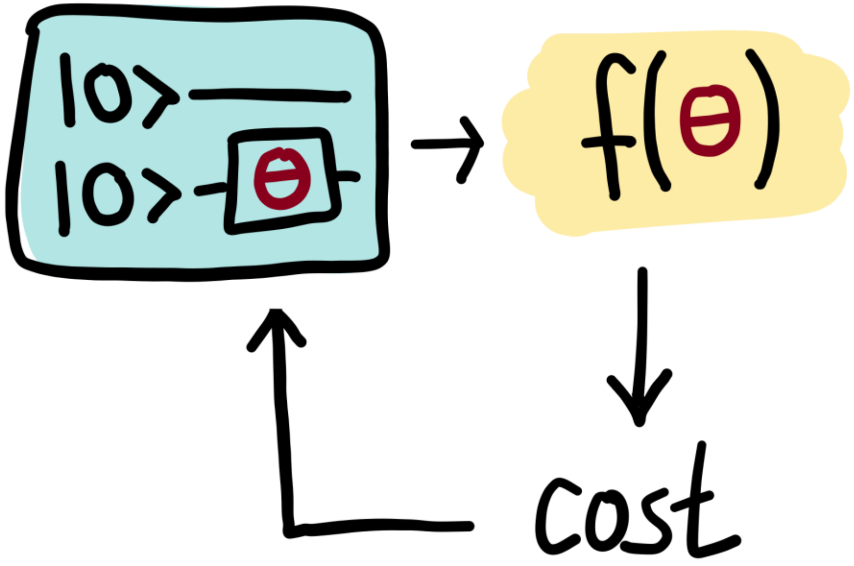
Cirq

# PARAMETRIZED QUANTUM FUNCTIONS

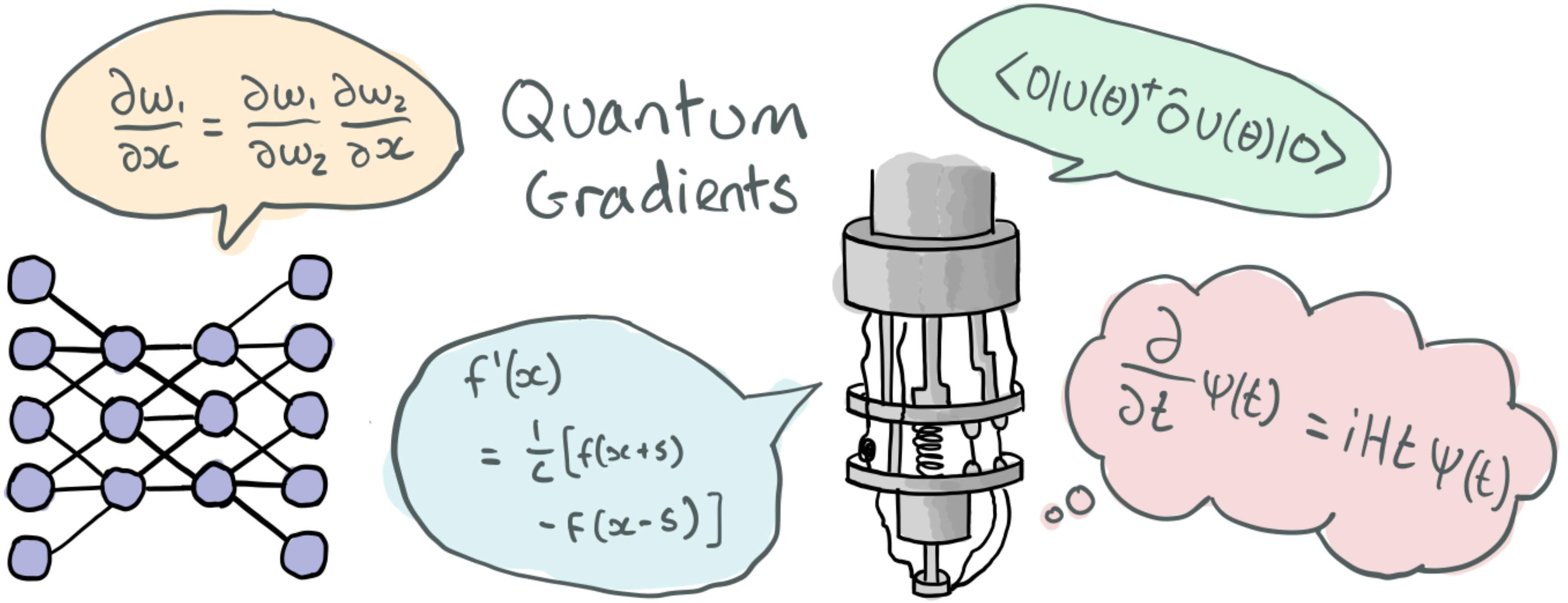
- Accepts floating point parameters

- Contains quantum instructions dependent on these parameters

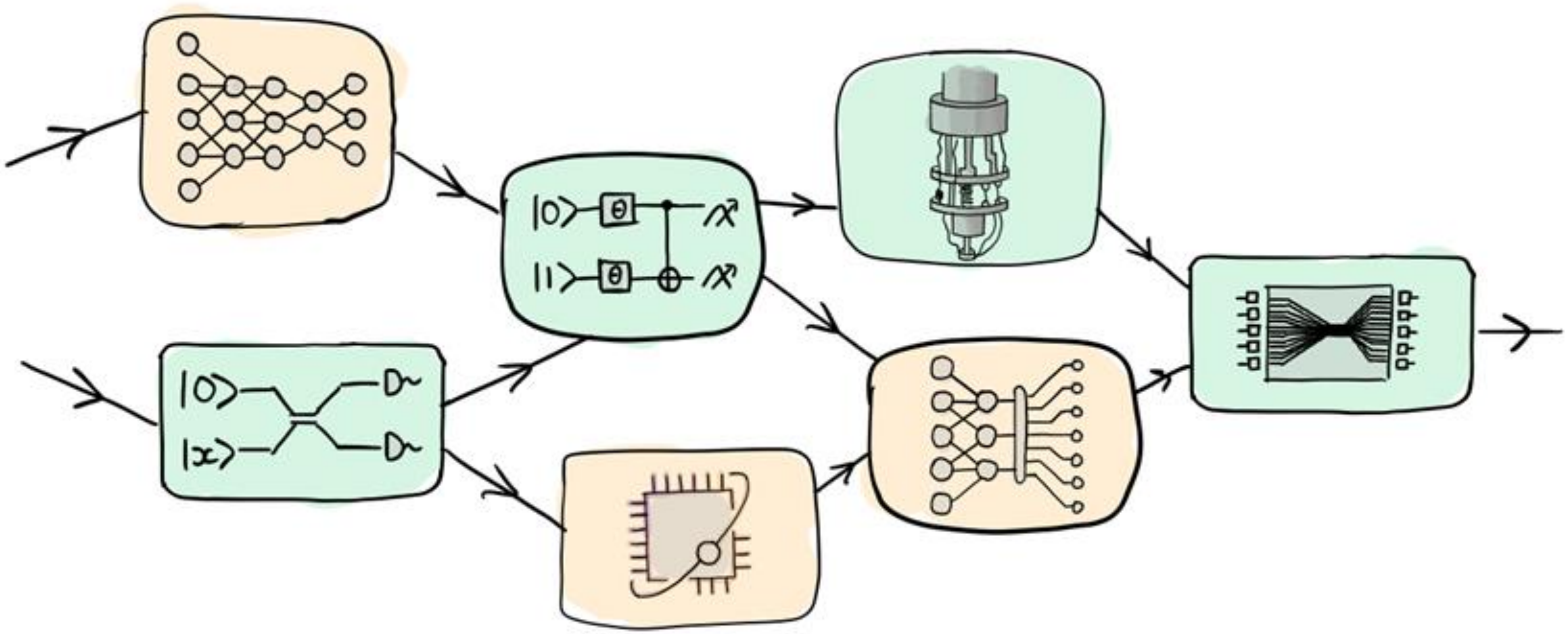
- Returns measurement statistics



# PLEASE CAN WE HAVE THE GRADIENT



# BUILDING A DIFFERENTIABLE QUANTUM PROGRAM




CAUTION
WET
FLOOR

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