**2. Use Case: Faster Drug Discovery with Quantum + AI**

**Problem**

Traditional computers struggle to simulate complex molecules or protein folding due to the combinatorial explosion of quantum states.

**Quantum Advantage**

Quantum computers naturally process quantum phenomena like entanglement and superposition, enabling them to:

Simulate molecular structures more efficiently

Explore massive chemical search spaces in parallel

Speed up optimization tasks like binding energy calculations

**AI + Quantum Synergy**

AI (e.g., deep learning) can predict molecular properties.

Quantum helps simulate those molecules more accurately and quickly.

Together, they reduce the time and cost of discovering viable drug candidates.

**Example:**

A Variational Quantum Eigensolver (VQE) could find the lowest energy state of a molecule (most stable), and AI could predict which of those molecules are most likely to succeed in clinical trials.