Portfolio Optimization

Team: LoCo Quantum

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Portfolio Optimization

- A potfolio optimization task provided by Vanguard

- The mathmatical formulation:

Constrained Quadratic Binary Optimization (CQBO)

- Why it matters:

CQBO is everywhere

Solution space scales exponentially as system size grows. NP-hard

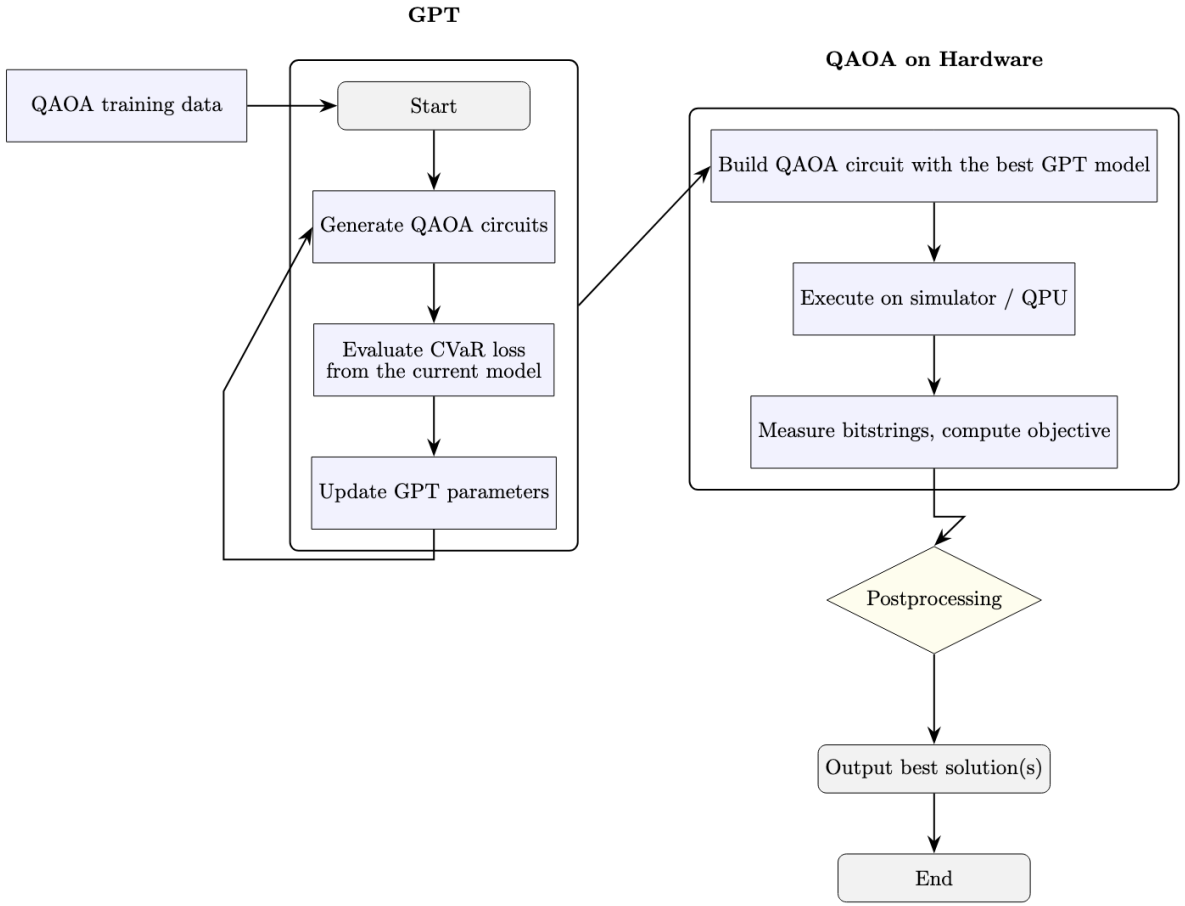
Our solution: sampling-based GPT-QAOA

- Goal: solve the 20-bond case
- Implemented with pennylane & pytorch
- Evolution of our solution:

Scale: 30 bonds --> 20 bonds

Loss function: Boltzmann--> CVaR

Gate pool: VQE gates --> QAOA gates

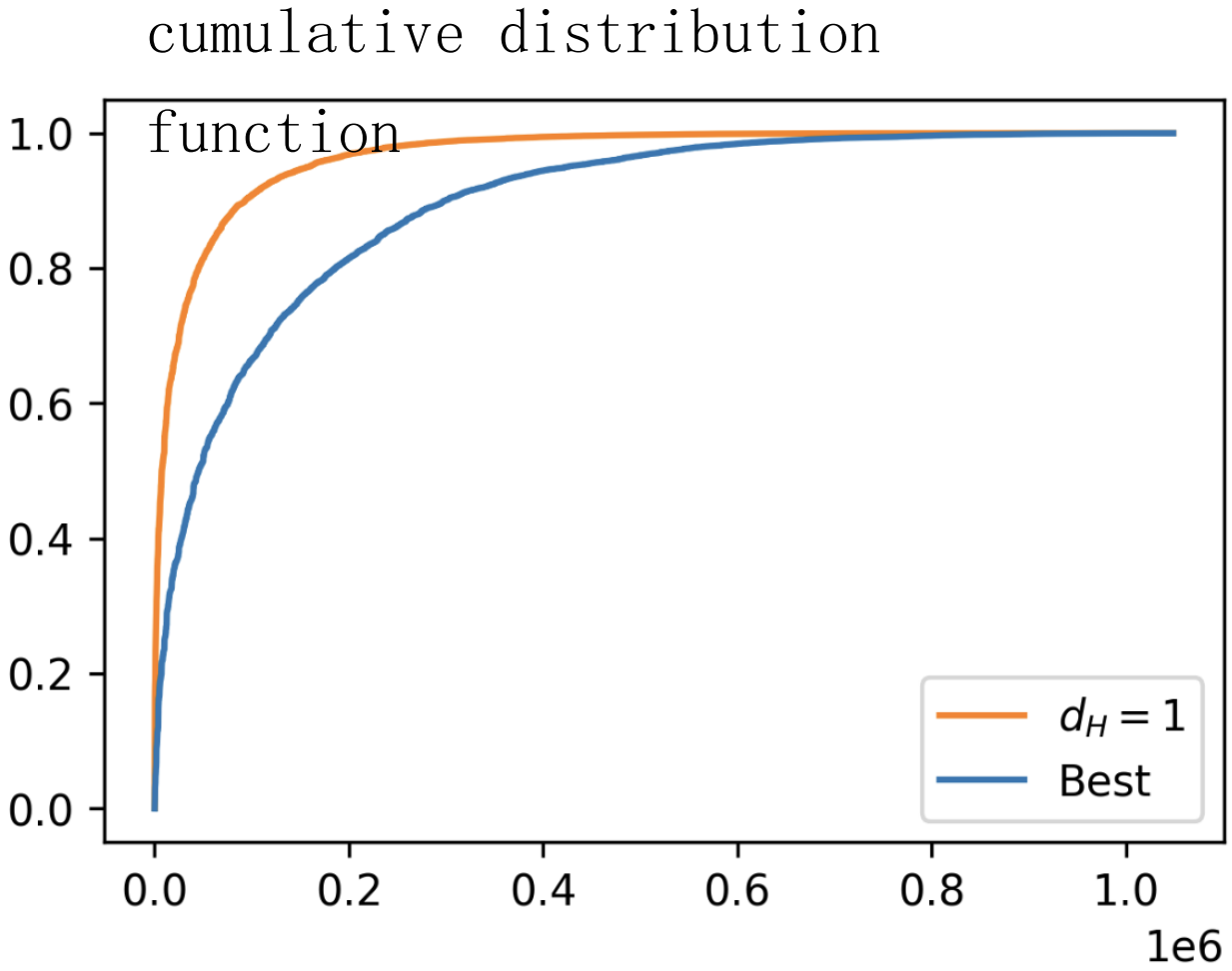


Results & impact

- Solved the 20-bond case:
- Metrics: CDF after local search

- Our contribution to Quantum Science and AI:

GPT+QAOA for combinational optimizations



Future scope

- Possible extension:

Simulate more bonds and run on real quantum computing hardwares e.g. IBM.

Optmize GPT training: loss function, e.g. Boltzmann and gate pool

- Limitations faced:

Limited simulation power: no more than 20 bonds

No access to quantum hardware. Can't test our algorithm on QPU