# Quantum Reinforcement Learning

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# Inspiration -

Optimization based problems (may be QAOA)

Learning to Optimize Variational Quantum Circuits to Solve Combinatorial Problems - https://arxiv.org/abs/1911.11071

Reinforcement Learning assisted Quantum Optimization - https://arxiv.org/abs/2004.12323

Policy Gradient based Quantum Approximate Optimization Algorithm - https://arxiv.org/abs/2002.01068

Traveling salesman and related problem (TSP) – Classical

Learning Heuristics over Large Graphs via Deep Reinforcement Learning - https://arxiv.org/pdf/1903.03332.pdf

ATTENTION, LEARN TO SOLVE ROUTING PROBLEMS! - https://arxiv.org/pdf/1803.08475.pdf

True QRL –

Maze Problem - Quantum Reinforcement Learning: the Maze problem - https://arxiv.org/pdf/2108.04490.pdf

Reinforcement Learning in Different Phases of Quantum Control - https://arxiv.org/abs/1705.00565

Machine learning \& artificial intelligence in the quantum domain - https://arxiv.org/abs/1709.02779

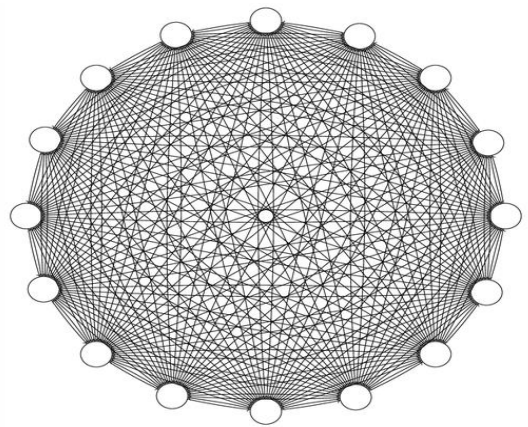
# Progress so far and plan ahead

Three meetings – September 17 and 24, October 1

Two ideas – Both RL helping Quantum Optimization

First idea – Solving a fully connected QUBO(Quadratic Unconstrained Binary Optimization) using Reinforcement Learning aided QAOA and compare results with QAOA and VQE

Timeline for First Idea – Have tested Code by November 5th



# Plan Ahead

Second idea – Use RL aided QAOA to solve TSP (Travelling Salesman Problem) and or Quantum Assisted RL

Timeline for Second Idea – Have tested Code by December 15th