

Assignment 1

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Course: COMP2550

Part 1 General Questions

Question 1: What is the branch in the survey paper you find most interesting and why? (1 mark)

The application of Quantum Approximation Optimisation Algorithm (QAOA) on combinatorial optimisation problems is the most interesting branch in this survey from my perspective. Firstly, QAOA can aid the solving of NP problem. The approximation of the solutions for combinatorial optimization problems, which including NP-complete problems such as Boolean Satisfiability (SAT) problem, could be gained via QAOA [\[1\]](#). A polynomial algorithm for a specific NP-complete problem indicates that all NP-complete problems can be solved in polynomial complexity in terms of time [\[2\]](#). Thus, with the development of QAOA, NP-complete problems are possible to be resolved. Secondly, QAOA can be combined with the classical machine learning techniques like reinforcement learning for optimisation [\[1\]](#). With the support of mature and developed machine learning techniques, QAOA could be more feasible on practical problems.

References

[1] Cerezo, M., Arrasmith, A., Babbush, R., Benjamin, S.C., Endo, S., Fujii, K., McClean, J.R., Mitarai, K., Yuan, X., Cincio, L. and Coles, P.J., 2021. Variational quantum algorithms. *Nature Reviews Physics*, 3(9), pp.625-644. <https://doi.org/10.1038/s42254-021-00348-9>