QMS: Quantum Metropolis Center

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Abstract (Century Gothic 11)

The efficient resolution of optimization problems is one of the key issues in today's industry. This task relies mainly on classical algorithms that present scalability problems and processing limitations [1]. Quantum computing has emerged to challenge these types of problems. In this paper, we focus on the Metropolis-Hastings quantum algorithm [2] that is based on quantum walks. We use this algorithm to build a quantum software tool called Quantum Metropolis Solver (QMS). We validate QMS with the N-Queen problem [3] to show a potential quantum advantage in an example that can be easily extrapolated to an Artificial Intelligence domain [4]. We carry out different simulations to validate the performance of QMS and its configuration.

References

[1] R. Bellman, Proceedings of the National Academy of Sciences, Vol. 42, no. 10 (1956), p 767-769.

[2] J. Lemieux, B.Heim, D. Poulin, K. Svore, and M. Troyer, Quantum, vol. 4 (2020) p. 287.

[3] C. Bowtell and P. Keevash, arXiv preprint 2105.11431 (2021)

[4] I. P. Gent, C. Jefferson, and P. Nightingale, Journal of Artificial Intelligence Research, vol. 59 (2017) p. 815-848

Figures

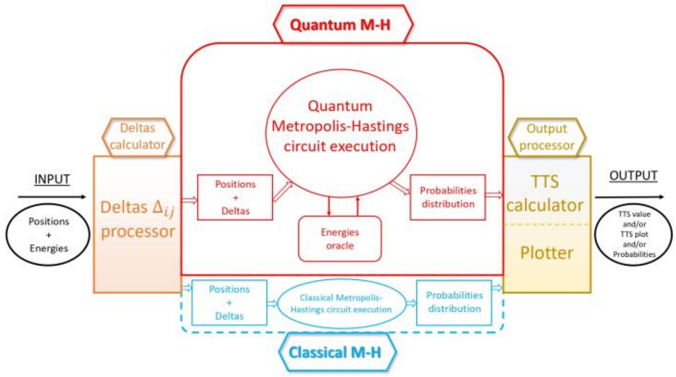

Figure 1: QMS architecture detailing how all modules are connected.

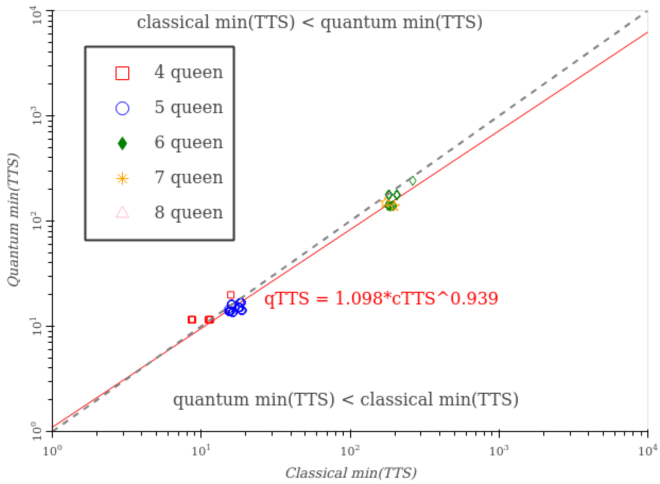

Figure 2: Results of QMS in N-Queen problem. The value is lower than 1 which means that there is a quantum advantage.