

Quantum circuit optimization based on tensor decomposition techniques

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The construction of quantum circuits for classical data using tensor network methods is attracting attention as a scalable methodology when approximation is possible. However, in order to ensure accuracy equivalent to classical calculations, it is necessary to decompose a multi-qubit quantum gate, which has an amount of information equivalent to classical information, into gates that can be executed on an actual machine. Therefore, we are developing a method to decompose multi-qubit unitary operators into basic gates using tensor decomposition methodology. In this presentation, we will introduce a hierarchical decomposition method to improve learning performance and a decomposition method using machine learning techniques aimed at optimizing network structure. We also discuss the advantages and disadvantages of each method and the problem range that the methodology can address.

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