Quantum machine learning of graph-structured data

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Graph structures are ubiquitous throughout the natural sciences. In [1] we develop an approach that exploits the quantum source's graph structure to improve learning via an arbitrary quantum neural network (QNN) ansatz. In particular, we devise and optimize a self-supervised objective to capture the information-theoretic closeness of the quantum states in the training of a QNN. Numerical simulations show that our approach improves the learning efficiency and the generalization behavior of the base QNN. On a practical note, scalable quantum implementations of the learning procedure described in this paper are likely feasible on the next generation of quantum computing devices.

References

[1] Kerstin Beer, Megha Khosla, Julius Köhler, Tobias J. Osborne, and Tianqi Zhao. Quantum machine learning of graph-structured data. *Phys. Rev. A*, 108(1):012410, July 2023.