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Bridge between Classical & Quantum Machine Learning

Tuesday 25 October 2022 16:40 (20 minutes)

Tensor Networks (TN) are approximations of high-dimensional tensors designed to represent locally entangled quantum many-body systems efficiently. In this talk, we will discuss how to use TN to connect quantum mechanical concepts to machine learning techniques, thereby facilitating the improved interpretability of neural networks. As an application, we will use top jet classification against QCD jets and compare performance against state-of-the-art machine learning applications. Finally, we will discuss how to convert these models into Quantum Circuits to be compiled on a quantum device and show that classical TNs require exponentially large bond dimensions and higher Hilbert-space mapping to perform comparably to their quantum counterparts.

Significance

This study shows how to use Quantum inspired algorithms in Machine learning to increase the interpretability of the application and compile such networks in a quantum device to improve the representability of the network.

References

This talk is based on 2202.10471 [quant-ph] and 2106.08334 [hep-ph].
IRN Terascale: https://indico.in2p3.fr/event/26315/contributions/107811/
at LPSC: https://lpsc-indico.in2p3.fr/event/2873/

Experiment context, if any

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