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Symmetry/Asymmetry in Quantum Computing and Quantum Machine Learning Algorithms for High Energy Physics

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Message from the Guest Editors

Quantum computing was postulated in the early 1980s as way to perform computations that would not be tractable with a classical computer. With the advent of noisy intermediate-scale quantum computing devices, more quantum algorithms are being developed with the aim of exploiting the capacity of the hardware for machine learning applications. An interesting question is whether we will be able to develop quantum algorithms that will be able to outperform those classical machine learning algorithms used by the HEP community for decades.

The High Energy Physics community used classical machine learning algorithms to address a wide variety of challenging problems, including searches for the Higgs boson and physics beyond the standard model. This Special Issue aims to gather the latest developments in quantum machine learning algorithms to address challenging problems in particle physics, such as particle classification, track and vertex reconstruction, and physics simulation, beyond the standard model searches and quantum entanglement.

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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