

## Quantum Simulations for Lattice QCD

Quantum simulation of High Energy Physics (HEP) has seen remarkable growth in recent years. Nevertheless, there is a continuous need for advancements in the overall simulation framework. In my talk, I will first motivate the critical need for quantum computing in HEP and discuss recent developments. Then I will explore the roles of gauge redundancies in simulating field theories on a quantum computer, focusing on a specific element - digitization, the step to encode field variables into qubits. This is particularly relevant for gauge theories with local symmetries and field variables of infinite dimension. I will present the existence of error thresholds below which gauge-redundant digitizations combined with error correction provide higher fidelity than removing these redundancies.

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