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Tailoring Non-Abelian Gauge Theory for Digital Quantum Simulation

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Lattice gauge theory calculations exponentially hard on today's machines could become a reality with the advent of quantum computation. To get there, the choice of variables optimal for exploiting the quantum advantage will likely be quite different than what we are accustomed to. We give a construction of a non-Abelian gauge theory with quark matter using a loop-string formulation that has many desirable features from the viewpoint of digital quantum simulation. I will explain those features and why we believe this reformulation is the optimal Kogut-Susskind-equivalent paradigm currently available for simulation by universal quantum computers.

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